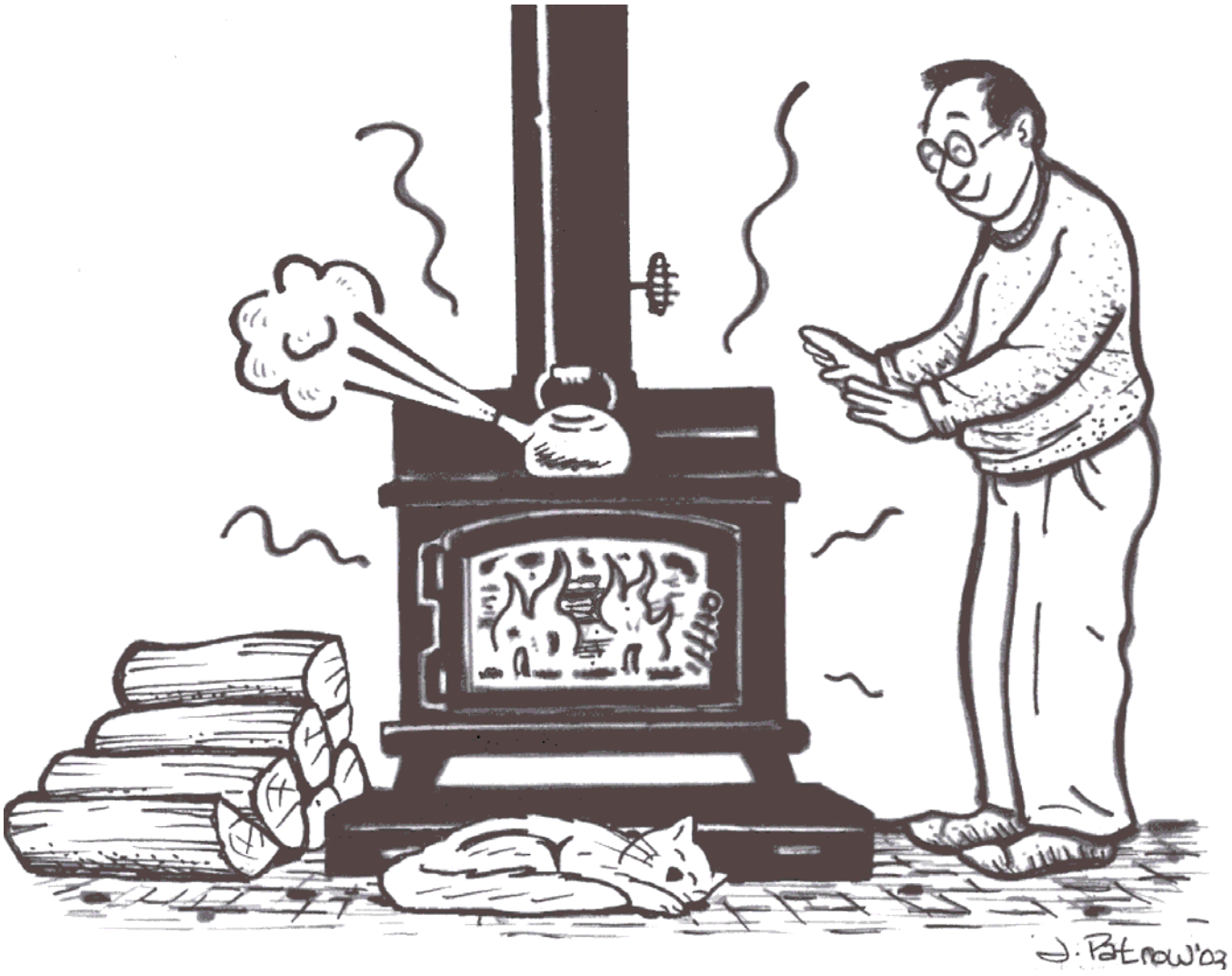
RESIDENTIAL FUELWOOD ASSESSMENT

STATE OF MINNESOTA

2002 – 2003 Heating Season



Minnesota Department of Natural Resources
Division of Forestry
Wood Utilization and Marketing Program

In cooperation with the

Minnesota Pollution Control Agency
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TABLE OF CONTENTS

List of Tables

EXECUTIVE SUMMARY

A total of 1,464 households responded to the Minnesota residential fuelwood study that was conducted for the 2002-2003 heating season. Approximately 656,343 cords of fuelwood were consumed by 391,677 households in Minnesota during the 2002-2003 heating season. This represents a volume decline of 12.63 % as compared to the 751,215 cords of fuelwood consumed by 393,000 households during the 1995-1996 heating season, and a 53% decline compared to the 1.42 million cords of fuelwood consumed by 520,000 households during the 1984-1985 heating season.

Comparing the 1984-1985 heating season to the 2002-2003 heating season, the location of wood burning households has shifted from rural communities (61% to 26%) to small towns (17% to 20%), very large towns (7% to 11%) and and large towns (16% to 43%). At the same time, the number of households consuming fuelwood as primary source of heat has remained relatively constant, while use for secondary heat source decreased from 46% to 30%, and for pleasure increased from 36% to 52%. These changes may be a reflection of the overall shift from burning fuelwood as a source of heat to burning fuelwood for pleasure where low cost natural gas is readily available, while reliance on fuelwood remains strong where natural gas is not available.

Households using wood as primary and secondary source of heat consumed 578,000 cords, or 88% of the fuelwood burned and represent 38% of all fuelwood consumers. The use of fuelwood as primary source of heat increased from 48% of the total volume in both the 1988-1989 and 1995-1996 heating seasons to 53% of the total volume in 2002-2003, while the use of fuelwood as secondary heat source declined from 44% to 35% of the total fuelwood consumed. Burning fuelwood for pleasure showed a moderate increase, from 8% during the 1988-1989 and 1995-1996 heating seasons to 12% of the fuelwood consumed in 2002-2003 heating season. These changes correspond to an increased availability of natural gas in the Twin Cities and towns of large sizes through out the state.

While the volume of fuelwood consumed has decreased, the proportion of fuelwood harvested by households remains high (60% of the volume in 2002-2003 compared to 62% in 1995-1996 and 51% in 1988-1989). Households that burn fuelwood as primary heat source are more likely to harvest their own wood (58% of the volume compared to 54% in 1995-1996 and 51% in 1988-1989 heating seasons).

Oak continues to be the most important species of fuelwood consumed, with 38% of the total volume. Birch and ash are the next most popular firewood species after the oak, with 13% and 10% respectively. Mixed species, which include the scrap lumber, pallets, sawmill slabs, and manufactured logs have been highly variable, fluctuating from 15% in 1988-1989 to 32% in 1995-1996 to 8% in 2002-2003.

Approximately 149,000 cords of the fuelwood harvested for the 2002-2003 heating season (Table 18) were harvested from live trees on forestland. This is a 22% decline from the 188,000 cords reported for the 1995-1996 heating season and a 38% decrease from the 237,000 cords reported for the 1988-1989 heating season, indicating a reduced impact of fuelwood consumption on the availability of growing stock for higher value products.

The decline in the volume of fuelwood consumed and the number of households that utilized the fuelwood appear to be closely tied to the cost and availability of fossil fuel, particularly natural gas. Unless there is an energy crisis like that of the early 1970s, the volume of fuelwood consumed is likely to remain near current levels or decline further.

INTRODUCTION

Project Purpose

During the summer and fall of 2003, the Minnesota Department of Natural Resources; the Minnesota Pollution Control Agency; the United States Department of Agriculture, Forest Service; and the Hearth, Patio and Barbecue Association conducted a survey to determine the volume of residential fuelwood burned during the 2002-2003 heating season. Similar surveys were conducted for the 1979-1980, 1984-1985, 1988-1989 and 1995-1996 heating seasons.
These surveys are part of a long-term effort to monitor trends in use of the fuelwood by residential households in Minnesota.

Survey Objectives

The objectives of this survey were to:

- Estimate the total volume of fuelwood harvested and consumed in Minnesota during the 2002-2003 heating season.
- Identify the suppliers of fuelwood (if fuelwood was purchased, given free, or self-harvested).
- Estimate the volume of fuelwood harvested from different land ownership (state land, federal land, forest industry and private lands).
- Estimate the volume of fuelwood harvested from the following wood supply categories: live and/or dead trees, logging residue, scrap lumber, and growing stock trees.
- Determine the geographic distribution of households burning fuelwood by type of usage (primary heating source, secondary heating source, or for pleasure), type of wood, and type of wood burning facilities used.
- Identify trends in residential fuelwood consumption over time.
- Identify types of residential wood burning facilities

Methods

The survey consisted primarily of a mailed survey questionnaire. When the expected number of responses was not obtained, a telephone interview was used to complete the survey. The combination of mailed survey questionnaire and telephone interviews was cost-effective.

The survey sample was based on the total number of households statewide based on 2000 census data obtained from the State Demographic Center. The state was divided up into five survey units based on the four USDA-Forest Service Survey Units for Minnesota forests, with the seven metropolitan counties comprising the fifth unit. The Units included Aspen-Birch, Northern Pine, Central Hardwoods, Metro and Prairie units as shown on the map in Figure 1.

The basic population and housing data for counties from the Bureau of Census indicated that there was no significant change in the number of households since previous fuelwood studies that were conducted during the 1988-1989 and 1995-1996 heating seasons. Since all units have at least 100,000 households, the sample size was stratified into five equal-size groups. Previous studies were designed to have a sampling error of plus/minus six percentage points at 95% confidence level. Based on calculations from the Minnesota Center for Survey Research at the University of Minnesota, it was determined that 267 completed surveys from each unit would satisfy the sample error requirement (Table1). Survey Sampling, Inc. (from Fairfield, CT), which provided the mailing list, estimated the number of survey questionnaires to be mailed out by factoring in the rate of deliverable mails at 80%, and the expected response rate at 35%. The total number of survey questionnaires mailed was 6,600. To mitigate the predicted lower

response rate for mailing questionnaires, a postcard was mailed in May 2003, two weeks before the survey questionnaire was sent out, to alert potential respondents about the upcoming survey questionnaire.

When the expected number of responses was not obtained from the mailed survey questionnaires, a selection of names was picked at random from the mailing list and telephone interviews were conducted to complete the study.

Table 1: Number of Households Sampled by Survey Unit and Corresponding Population

Survey Unit	Number of Households Sampled		Total Number of Households in Each Unit	Population in Each Unit 2000 census
	Target Number	Actual Number		
Aspen-Birch	267	301	107,719	262,780
Northern Pine	267	306	110,010	277,754
Central Hardwoods	267	348	357,036	967,087
Prairie	267	257	298,908	769,802
Metro	267	252	1,021,454	2,642,056
Total	1,335	1,464	1,895,127	4,919,479

Note: Number of households surveyed was based on 2000 census data.
As in previous surveys, responding households were classified by location by county, population size class and 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. Primary – Fuelwood provided the main source of heat in the home. The user may have another fuel system for back-up purposes. More than 50% of the household heating needs comes from wood.
3. Secondary – Fuelwood is used as a back-up heating system, with another fuel providing the major source of heating needs. Less than 50% of household heating needs comes from wood.
4. Pleasure – Fuelwood is burned for pleasure only. Some heating benefit may occur, but fuelwood is not considered as a heating system.

Households were also asked the type of wood burning unit used, species of wood burned, whether they purchased or cut their own fuelwood, the ownership where fuelwood was harvested from, the type (live, cull and/or dead) and portion (main trunk and/or top) of the tree utilized as fuelwood, and the location fuelwood was used (primary or secondary home and/or other building).

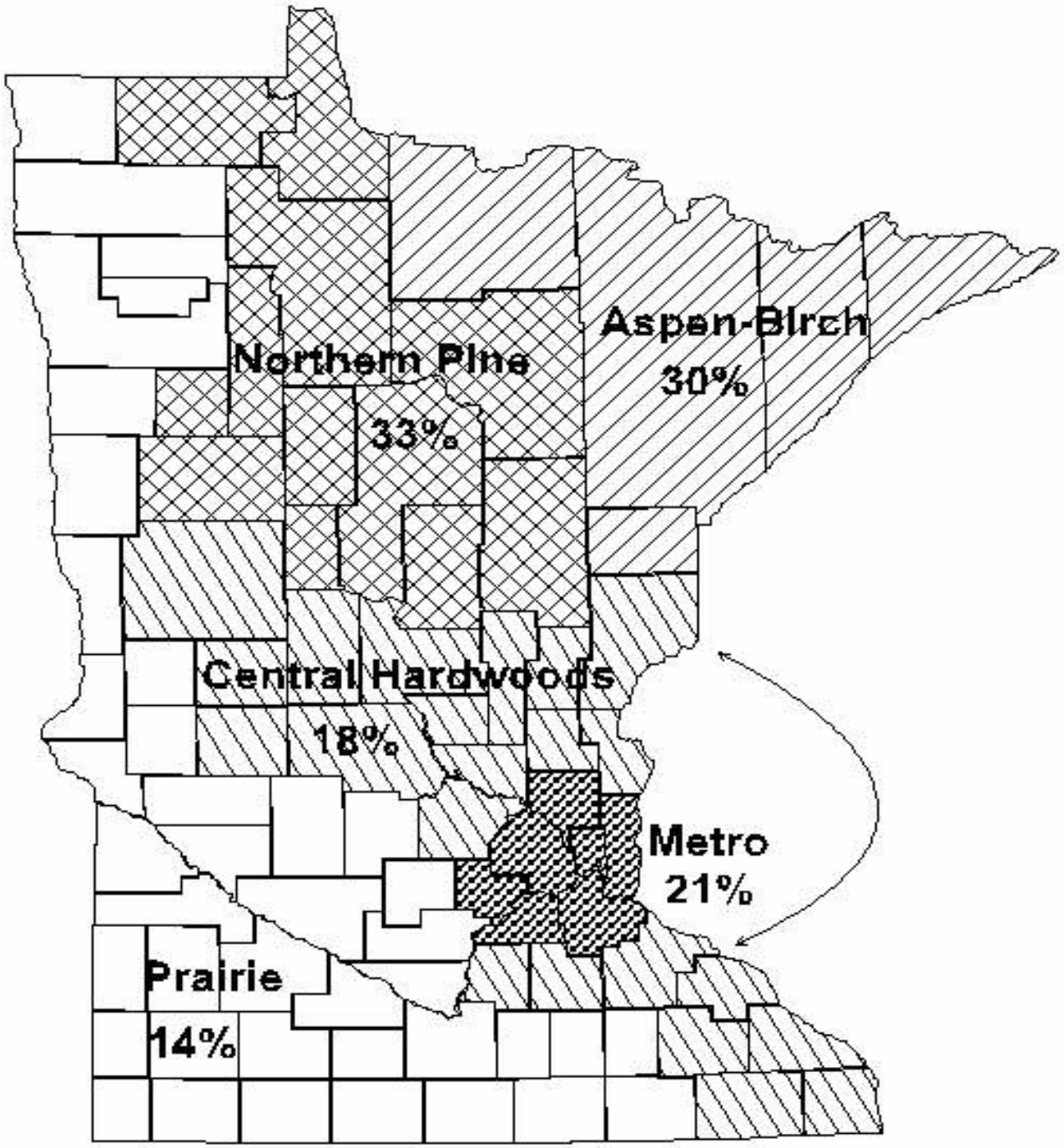
Logger Survey

A substantial portion of fuelwood consumed by household in Minnesota is purchased from commercial suppliers, primarily loggers. In an attempt to identify and quantify the sources of this portion of fuelwood consumed, 120 loggers were randomly selected from a statewide list of state timber sale permittees. The selected loggers were contacted by phone between May and June of 1996. They were surveyed to

determine the tree species and volume of fuelwood they sold to individual households. Loggers were also asked to identify land ownerships from which they harvested fuelwood, and whether the fuelwood sold came from growing stock trees or logging residues including slash and cull trees. The results were then extrapolated to an estimated 1,400 logging businesses statewide.

Since the number of logging businesses and the logging practices have not changed significantly since 1995-1996, the logger survey was not updated. Volume reported from the 1995-1996 heating season survey of loggers was used for this report.

Figure 1: Percent of total Households in Survey Units that Burned Fuelwood During the 2002-2003 Heating Season.



RESULTS

Characteristics of Fuelwood Users

Statewide, 20.7% of the households burn fuelwood (Table 2). This is a small decrease from the 25% identified in the 1995-1996 survey, and the 33% identified in the 1988-1989 survey. Each survey unit had a similar reduction in the proportion of households burning fuelwood. As shown in Figure 1, the percent of households burning fuelwood within each survey unit varies from 14% to 33%.

Fuelwood use varies considerably by survey unit (Table 2). The percentage of households burning wood as their primary source of heat is highest in the Northern Pine and Central Hardwoods units of the state. The highest proportion of households burning fuelwood as a secondary heat source is in the Metro and Prairie Units. Households burning primarily for pleasure are most heavily represented in the Metro unit.

Approximately 17.8% of the Minnesota households consuming fuelwood used it as their primary source of heat during the 2002-2003 heating season. Nearly 30% burn wood as a secondary source of heat, while more than 52.2% burned wood for pleasure (Table 2).

Table 2: Percent of Households Burning Fuelwood by Survey Unit

Survey Unit	Percentage of Households Burning Wood	Reason for Burning		
		Primary Heat	Secondary Heat	Pleasure
Aspen-Birch	33.3%	35.2%	31.9%	32.9%
Northern Pine	50.0%	30.2%	44.3%	25.5%
Central Hardwoods	17.7%	34.6%	35.0%	30.4%
Prairie	14.9%	14.3%	28.7%	57.0%
Metro	18.9%	6.3%	24.3%	69.4%
Statewide	20.7%	17.8%	30.0%	52.2%

This is a continuation of the trend away from using fuelwood for supplemental heat toward burning fuelwood for pleasure, while use for primary heat source is unchanged (Table 3).

Table 3: Percentage of Households Burning Fuelwood by Reason for Burning and Survey Year

Reason for Burning	1988-1989	1995-1996	2002-2003
Primary Heat	18%	15%	17.8%
Secondary Heat	46%	37%	30%
Pleasure	36%	48%	52.2%

Fuelwood consumption also varies with population density (Table 4). Households consuming fuelwood as primary or secondary source of heat are more likely to live in rural areas and smaller towns, and cut their own fuelwood. Households burning fuelwood primarily for pleasure are highest in larger towns through out the state, and are more likely to purchase their fuelwood.
The location of households consuming fuelwood has also shifted over time from rural areas to larger towns as shown in Table 4.

Table 4: Percentage of Households Burning Fuelwood by Population Unit and by Survey Year

Population Unit	1988-1989	1995-1996	2002-2003
Rural	61%	59%	26%
Small Town	17%	13%	20%
Large Town	15%	16%	43%
Very Large Town	7%	12%	11%

Households burning fuelwood identified six categories of wood burning facilities and seven combination categories of two or more types of wood burning facilities. There has been a substantial decrease in the proportion of wood stoves and wood furnaces, and an increase in regular and modified fireplace units (Table 5), reflecting the strong shift toward burning wood for pleasure noted earlier.

Table 5: Percent of Volume Burned by Type of Wood-burning Facility

Type of Wood-Burning Facility	Percent of Total		
	1988-1989	1995-1996	2002-2003
Wood Stove	46	44	15.4
Fireplace	17	9	20.9
Modified Fireplace	2	11	9.4
Wood Furnace	26	27	16.1
Wood Boiler	-	-	14.9
Fire Pit or Ring	-	-	0.5
Wood Stove/Fireplace	2	4	2.9
Wood Stove/Modified Fireplace	1	-	2.1
Wood Stove/Wood Furnace	-	3	2.0
Wood Stove or Fireplace/Wood Boiler	-	-	1.9
Fireplace/Wood Furnace	6	-	8.8
Fireplace/Modified Fireplace	-	-	1.4
Fireplace/Fire Pit	-	-	3.8
Total	100	100	100

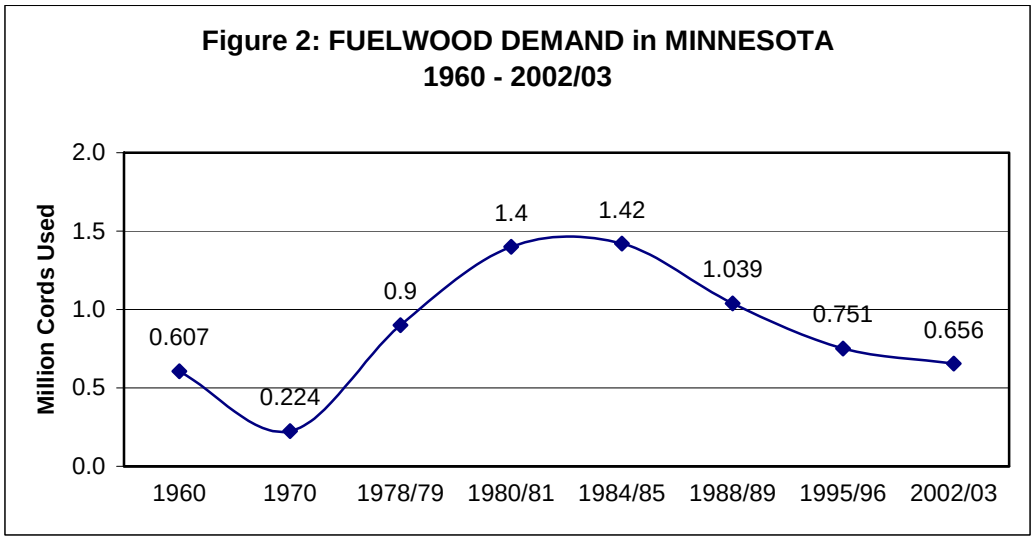
These data appear to indicate that the shift in reasons for consuming fuelwood is driven by cost and convenience. Increased access to low cost natural gas in large towns compared to rural areas appears to discourage households using wood as a source of heat, while those households located where wood continues to be the cheapest alternative continue to use wood as their primary fuel for heat.

It is also important to note that the number of households using fuelwood was relatively constant between the 1995-1996 (393,000) and 2002-2003 (391,000) heating seasons, yet the number of households with a wood burning facility in the 2002-2003 heating season (513,000) was nearly the same as in the1984-1985 heating season (520,000). The result could be a rapid increase in fuelwood consumption should the cost of other fuels, particularly natural gas, increase dramatically.

Volume of Fuelwood Consumed

The total volume of fuelwood consumed in Minnesota during the 2002-2003 heating season for heating residential homes and secondary buildings was 656,343 cords [(1)]. This is a decline of nearly 13% from the 1995-96 heating season, and a 54% decline since the 1988-1989 heating season (Figure 2).

[(1)] One standard cord is equal to 128 cubic feet of wood or a stack of wood four feet high by four feet deep by eight feet long.



Despite the shift toward burning wood for pleasure, the largest volume of fuelwood is still consumed for primary heat in rural areas outside the Metro survey unit (Tables 6).

Table 6: Percentage of Fuelwood Burned by Survey Unit and Reason for Burning.

Survey Unit	Reason for Burning			Survey Unit Percent of Total
	Primary Heat	Secondary Heat	Pleasure	
Aspen-Birch	67.9	23.4	8.7	17.7
Northern Pine	67.5	29.7	2.9	25.0
Central Hardwoods	68.6	26.0	5.4	23.5
Prairie	46.3	44.5	9.2	11.7
Metro	9.8	57.0	33.2	22.1
Percent of total	52.6	35.5	11.9	100.0

Table 7: Percentage of Fuelwood Burned by Reason for Burning by Survey Year

Reason for Burning	1988-1989	1995-1996	2002-2003
Primary Heat	48%	48%	52.6%
Secondary Heat	44%	44%	35.5%
Pleasure	8%	8%	11.9%

Table 8: Percentage of Volume Burned by Population Size

Population Size	Reason for Burning			Percent of Total
	Primary heat	Secondary heat	Pleasure	
Rural	55.2	36.4	26.9	45.2
Small Town	30.2	15.7	15.0	23.2
Large Town	14.6	39.2	50.4	27.6
Very Large Town	0.0	8.7	7.6	4.0
Percent of Total	52.6	35.5	11.9	100.0

The volume consumed for heating primary residences declined by 9% to 581,005 cords while the volume consumed to heat second homes and other buildings increased by over 100% to 75,338 cords (Table 9).

Table 9: Number of Cords Burned by Survey Unit and Place of Consumption.

Survey Unit			Place of fuelwood consumption		
	Number of Wood-Burning Facilities	Total Volume (Cords)	Primary Residence (Cords)	Secondary Residence (Cords)	Other Buildings * (Cords)
Aspen-Birch	35,891	116,020	90,752	12,589	12,678
Northern Pine	55,046	164,493	135,550	20,612	8,331
Central Hardwoods	63,339	154,114	138,628	7,452	8,035
Prairie	44,627	76,611	71,991	410	4,210
Metro	192,775	145,104	144,084	5	1,015
Statewide	391,677	656,343	581,005	41,068	34,270

Note: Other buildings include garages, business buildings, and recreational buildings.

The largest volume of fuelwood, nearly 90%, was consumed at primary residences. The Metro unit reported the largest amount of fuelwood burned in primary residences, 144,084 cords, while the Aspen-Birch and Prairie units reported the least volume of fuelwood burned in primary residences (90,7520 cords and 71,991 cords respectively).

The average volume burned by households using fuelwood as a primary heat source decreased significantly compared to previous surveys (Table 10). Statewide, major users burned an average of 5 cords during a heating season, with households in the Aspen-Birch and Northern Pine units burning more wood per household than those in the other survey units. This may be a result of differences in severity and length of heating seasons and/or the use of more efficient burning facilities.

Table 10: Average Number of Cords Burned per Household by Reason for Burning.

Reason for Burning	Burning Year		
	1988-1989	1995-1996	2002-2003
Primary Heat	6.1 cords	7.1 cords	5.0 cords
Secondary Heat	2.3 cords	2.0 cords	2.0 cords
Pleasure	0.5 cords	0.7 cords	0.4 cords

Type of Tree Species Burned as Fuelwood

The results of this survey were more specific than previous ones in order to determine the type of tree species (roundwood by species) and other wood products including wood residues from sawmills such as slabs, scrap lumber, recycled pallets and manufactured logs or wood pellets, burned by households. This information is very important for land managers to determine if there are preferences for the type of tree species burned and to predict potential utilization conflicts. A mixture of unidentified species and scrap lumber accounted for more than 8 percent of the volume reported. This is one fourth of the proportion found in 1995-1996 survey (32%). Oak was still the single most important tree species burned as fuelwood (Table 11). The proportion of ash consumed doubled.

Table 11: Percentage of Fuelwood Burned by Species - Statewide

Species	Burning Year		
	1988-1989	1995-1996	2002-2003
Oak	32	27	38
Birch	13	14	13
Ash	8	4	10
Elm	14	3	5
Maple	8	4	8
Aspen	7	10	8
Other Species	3	6	9
Mixed Species	15	32	8

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

Volume of Fuelwood Harvested

Note: A survey of loggers was not conducted during the 2002-03 survey. Volumes reported from the 1995-1996 survey of loggers that also harvested fuelwood from timber sales are used for the remainder of this report.

Approximately 60% of the fuelwood consumed in Minnesota was cut by homeowners themselves (Table 12) and approximately 40% was purchased. It is desirable to identify the sources of this wood to assess the impacts on different land ownership categories and competing uses of wood. The volumes cut by homeowners and loggers are reported separately because of significant differences in the data.

Table 12: Percentage of Fuelwood Cut by Households or Purchased by Reason for Burning.

Procurement Method	Reason for Burning			Percent of Total
	Primary Heat	Secondary Heat	Pleasure	
Fuelwood Cut by Households	58.2	35.3	6.5	60
Fuelwood Purchased	42.3	37.9	19.8	40
Percent of Total	51.9	36.4	11.8	100

Volume of Fuelwood Cut by Households

Individual households cut 393,521 cords of fuelwood for the 2002-2003 heating season, nearly an 11% decline in volume from the previous survey. The volume cut by households increased in Aspen-Birch and Northern Pine survey units but decreased in the other three units. Households using fuelwood as the primary source of heat harvested 58% of the total fuelwood cut by households (Table 13). This percent corresponds to a slight increase from the 54% reported for 1995-1996.

Table 13: Percentage of Fuelwood Cut by Households by Reason for Burning.

Reason for Burning	Heating Season		
	1988-1989	1995-1996	2002-2003
Primary Heat	50	54	58
Secondary Heat	45	37	35
Pleasure	5	9	7

Ninety-two percent, or 556,695 cords of fuelwood cut by households was harvested from private land (Table 14). In the Central Hardwoods unit, nearly all of the fuelwood cut by households sampled came from private lands. Most of the wood cut (84%) by residential households comes from dead or downed trees, land clearing, and logging residues (Table 15). Approximately 9.3% comes from live standing trees in the forest.

Table 14: Percentage of Fuelwood by Harvest Location/ Land Ownership

Harvest Location/ Land Ownership	Harvest by:	
	Households	Loggers
National Forests	0.6	2
Other Federal Lands	1.0	--
State Forests	2.0	29
County/Municipal Lands	4.3	18
Forest Industry Lands	0.3	9
Private Lands	91.8	42
Total	100.0	100

Table 15: Percentage of Fuelwood Cut by Households by Type of Material.

Type of Material	Percent
Live Trees from Forestland	9.3
Dead Trees from Forestland	53.9
Logging Residues from Forestland	7.0
Wooded Strips, Fence Rows, Yard Trees Outside City Limits	23.6
Cropland and Pasture	1.6
City Trees	4.6
Total	100.0

Volume of Fuelwood Purchased by Households

Households purchased over 238,000 cords of fuelwood for residential use during the 2002-2003 heating season. This is a decline of 13 percent from the 1995-96 heating season. Minnesota loggers supplied 115,000 cords to the purchased fuelwood based on the 1995-1996 Residential Fuelwood survey.

About 50% of the fuelwood harvested by loggers came from lands administered by public agencies, 42% from private land, and 9% from forest industry lands (Table 14). Only 111,000 cords of the firewood harvested by loggers came from forestland. The remaining volume (4,000 cords) came from pasture and other non-forest areas.

Unlike households that cut their own fuelwood, paper birch, not oak, made up the largest portion (38%) of fuelwood cut by loggers (Table 16). This is due to species availability in the area of the state in which most loggers work. However, oak is second in importance, representing 31% of the volume. Only 45% (50,000 cords) of the fuelwood harvested by loggers from forestlands came from live trees (Table 17). This reflects the strong increase in demand from industry for more volume and additional species as well as the decline in demand for fuelwood.

The remaining 123,000 cords of purchased fuelwood came from a variety of sources. Based on the 1994 report "Minnesota Wood Waste Studies" by the Minnesota Department of Natural Resources, slabs and lumber scraps sold or given away by sawmills (40,000 cords) and other wood using industries (22,000 cords) may account for the equivalent of 62,000 cords.

Tree services, land clearing companies, utility maintenance crews, or city maintenance crews also sell or give away fuelwood. These volumes are derived from urban and other non-forest trees. A 1992 study titled "Urban Tree Residue" by the Minnesota Department of Natural Resources found that these sources generated over 12,000 tons or over 5,000 cords in the seven-county Twin City metro area that may have been utilized for fuelwood. Expanding this volume statewide could represent approximately 8,000 cords. The source of the remaining volume (approximately 53,000 cords) is unclear. Some, but probably not all, is being imported into Minnesota, primarily from Wisconsin.

Table 16: Percentage of Fuelwood Cut by Loggers by Species - Statewide

Tree Species	Percent
Oak	32
Birch	38
Ash	8
Maple	16
Aspen	3
Other	3
Total	100

Table 17: Percent of Fuelwood by Type of Removal - Statewide

Type of Removal	Harvested By:	
	Households	Loggers
Live Standing Trees	49	45
Dead & Down Trees	54	6
Tops & Logging Residue	7	49
Total	100	100

Impact of Fuelwood Harvested on Commercial Forestland

Approximately 149,000 cords (Table 15) of fuelwood produced for the 2002-2003 heating season were harvested from live trees on forestland. This is an apparent decline from the 188,000 cords for 1995-1996 and the 237,000 cords reported for the 1988-1989, indicating a reduced impact of fuelwood use on the availability of growing stock for higher value forest products.

The household and logger surveys indicate fuelwood harvest removes approximately 109,000 cords of growing stock from commercial forestland. This corresponds to a 20% decrease in volume from the previous survey.

Table 18: Volume of Fuelwood Harvested from Growing Stock - Statewide

Harvested By:	Volume
Households	48,000 cords
Loggers	64,000 cords
Unidentified Sources	37,000 cords
Total	149,000 cords

The volume of 64,000 cords of growing stock that was harvested by loggers was estimated as follows: loggers reported that they harvested 50,000 cords and an estimated additional 14,000 cords that was not reported due to the failure in the 1995-1996 survey questionnaire to differentiate between slash (tops and broken and dead and down trees) and harvested but unutilized growing stock trees. An additional estimated volume of 37,000 cords of growing stock was included in the 53,000 cords of purchased fuelwood from unidentified sources (assuming 70 percent was harvested in Minnesota, and the proportion of growing stock was the same as that for fuelwood harvested by loggers).

The remaining fuelwood harvested in Minnesota comes from dead trees, logging slash, and trees on non-forest land. Non-forest lands include pastures, residential and commercial lots, parks, roads and street rights-of-way.

Trends in Household Fuelwood Consumption

The volume of fuelwood burned by Minnesota households has declined by almost 13% since the 1995-1996 heating season. Nearly 751,000 cords were burned at that time, compared to only 656,000 cords in 2002-2003 (Figure 2).

This drop is primarily attributable to four factors. The most important factor is probably the decline in the price of fossil fuel and the increased availability of natural gas. The increased industrial demand for wood to manufacture paper and other forest products is also an important factor. The latter has the greatest impact on the availability of fuelwood from aspen, birch, and maple. Other factors contributing to the

decline in residential fuelwood consumption include the amount of work (labor) associated with producing one's own fuelwood, the inconvenience of stoking and cleaning a wood burning facility, and the risk of structural fires and associated insurance cost attributed to wood burning facilities.

The fuelwood consumption trend may continue downward in the near future. One indicator is the number of households considering installing wood burning facilities. The number has shrunk dramatically from 16,173 households in 1996 to only 9,273 households in 2003. However, a significant increase in the price of fossil fuels, particularly of the natural gas, could result in a rapid increase in fuelwood consumption. While 391,677 households are currently consuming fuelwood, there are approximately 513,375 households with wood burning facilities.

APPENDICES

Table 1: Household Possession and Use of Wood-Burning Facilities by Survey Unit

Survey Unit	Number of Households (Bureau of the Census 2000)	Number of Households with Wood-Burning Facilities	Number of Households Burning Wood in 2002-2003	Number of Households Planning to Burn Wood in 2004	Number of Households Planning to Buy Wood-Burning Facilities	Number of Households Burning Wood and Planning to Buy Wood-Burning Facilities
Aspen-Birch	107,719	37,576	32,208	32,208	2,147	1,074
Central Hardwoods	357,036	77,169	62,764	63,763	3,087	1,029
Metro	1,021,454	295,897	218,883	214,830	-----	-----
Northern Pine	110,010	44,579	35,951	35,951	2,876	1,798
Prairie	298,908	58,153	41,870	43,033	1,163	-----
Total	1,895,127	513,375	391,677	389,816	9,273	3,900

Table 2: Residential Fuelwood Consumption by Reason for Burning and Survey Unit.

Survey Unit and Reason for Burning		Number of Wood Burning Facilities	Volume (cords)	Average Volume (cords per household)
Aspen-Birch	Pleasure	11,811	10,147	0.86
	Primary Heat	12,630	78,775	6.24
	Secondary Heat	11,451	27,098	2.37
	Total	35,891	116,020	3.23
Northern Pine	Pleasure	14,037	4,727	0.34
	Primary Heat	16,620	110,965	6.68
	Secondary Heat	24,388	48,801	2.00
	Total	55,046	164,493	2.99
Central Hardwoods	Pleasure	19,281	8,285	0.43
	Primary Heat	21,936	105,732	4.82
	Secondary Heat	22,122	40,097	1.81
	Total	**63,339**	**154,114**	**2.43**
Prairie	Pleasure	25,436	7,031	0.28
	Primary Heat	6,397	35,450	5.54
	Secondary Heat	12,794	34,130	2.67
	Total	44,627	76,611	1.72
Metro	Pleasure	133,762	48,153	0.36
	Primary Heat	12,160	14,288	1.18
	Secondary Heat	46,853	82,663	1.76
	Total	192,775	145,104	0.75
All Units	Pleasure	204,326	78,342	0.38
	Primary Heat	69,743	345,211	4.95
	Secondary Heat	117,607	232,789	1.98
	Total	391,677	656,343	1.68

Table 3: Residential Fuelwood Consumption by Type of Wood-Burning Facility and Survey Unit

Survey Unit and Reason for Burning		Number of Wood Burning Facilities	Volume (Cords)	Average Volume (Cords per Household)
Aspen-Birch	Woodstove	13,240	42,688	3.22
	Fireplace	5,784	3,077	0.53
	Fireplace Insert	1,789	1,409	0.79
	Wood Burning Furnace	1,074	5,010	4.67
	Wood Burning Boiler	3,937	33,998	8.64
	Fire Pit	1,074	1,342	1.25
	Combinations	8,994	28,496	3.17
	Total	35,891	116,020	3.23
Northern Pine	Woodstove	14,847	30,086	2.03
	Fireplace	19,530	20,108	1.03
	Fireplace Insert	2,517	6,946	2.76
	Wood Burning Furnace	8,988	61,627	6.86
	Wood Burning Boiler	2,157	25,166	11.67
	Fire Pit	358	138	0.39
	Combinations	6,649	20,423	3.07
	Total	55,046	164,493	2.99
Central Hardwoods	Woodstove	13,221	24,851	1.88
	Fireplace	21,339	14,098	0.66
	Fireplace Insert	6,174	12,162	1.97
	Wood Burning Furnace	6,174	20,707	3.35
	Wood Burning Boiler	4,116	37,813	9.19
	Fire Pit	1,029	1,029	1.00
	Combinations	11,287	43,454	3.85
	Total	63,339	154,114	2.43
Prairie	Woodstove	2,326	1,085	0.47
	Fireplace	20,220	14,487	0.72
	Fireplace Insert	3,489	11,491	3.29
	Wood Burning Furnace	3,489	19,772	5.67
	Wood Burning Boiler	1,163	2,326	2.00
	Fire Pit	7,543	193	0.03
	Combinations	6,397	27,256	4.26
	Total	44,627	76,611	1.72
Metro	Woodstove	8,345	3,858	0.46
	Fireplace	129,708	81,675	0.63
	Fireplace Insert	24,320	30,400	1.25
	Fire Pit	8,107	764	0.09
	Combinations	22,294	28,407	1.27
	Total	192,775	145,104	0.75
All Units	Woodstove	51,980	102,569	1.97
	Fireplace	196,581	133,445	0.68
	Fireplace Insert	38,289	62,408	1.63
	Wood Burning Furnace	19,724	107,117	5.43
	Wood Burning Boiler	11,372	99,302	8.73
	Fire Pit	18,110	3,466	0.19
	Combinations	55,621	148,037	2.66
	Total	391,677	656,343	1.68

Table 4: Residential Fuelwood Consumption by Type of Wood-Burning Facility and Reason for Burning

Type of facility	Primary heat		Secondary heat		Pleasure	
	Number of Wood-Burning Facilities	Volume (Cords)	Number of Wood-Burning Facilities	Volume (Cords)	Number of Wood-Burning Facilities	Volume (Cords)
Woodstove	20,917	61,485	24,843	38,276	6,220	2,807
Fireplace	360	90	43,681	78,706	152,541	54,648
Fireplace Insert	2,551	8,593	22,144	45,976	13,593	7,839
Wood Burning Furnace	13,990	81,274	5,734	25,842	--	--
Wood Burning Boiler	9,494	91,608	1,879	7,694	--	--
Fire Pit	--	--	--	--	18,110	3,466
Combinations	22,432	102,160	19,326	36,294	13,863	9,582
Total	69,743	345,211	117,607	232,789	204,326	78,342

Table 5: Residential Fuelwood Consumption in Primary Residences Within Each Survey Unit

Primary Residence of Wood Burners	Number of Wood-Burning Households	Volume (Cords)	Average Volume (Cords per Household)
Aspen-Birch	25,767	90,752	3.52
Northern Pine	56,591	138,628	2.45
Central Hardwoods	202,669	144,084	0.71
Prairie	31,277	135,550	4.33
Metro	38,381	71,991	1.88
Total	354,685	581,005	1.64

Table 6: Residential Fuelwood Consumption in Secondary Residences Within Each Survey Unit by Wood Burners of Each Unit

Primary Residence of Wood Burners	Location of secondary residence [1]										All Units	
	Aspen-Birch		Northern Pine		Central Hardwoods		Prairie		Metro			
	Number of Households	Volume (Cords)	Number of Households	Volume (Cords)	Number of Households	Volume (Cords)	Number of Households	Volume (Cords)	Number of Households	Volume (Cords)	Number of Households	Volume (Cords)
Aspen-Birch	11,094	15,111	1,074	454	358	89	--	--	358	7	12,883	15,662
Central Hardwoods	719	1,097	6,831	8,769	360	90	--	--	--	--	7,909	9,955
Metro	--	--	2,058	669	9,260	12,505	1,029	386	--	--	12,347	13,559
Northern Pine	1,163	1,628	1,163	1,163	1,163	67	3,489	4,210	--	--	6,978	7,068
Prairie	8,107	7,431	24,320	17,888	4,053	2,736	4,053	24	4,053	1,013	44,587	29,093
Total	21,083	25,267	35,446	28,943	15,194	15,487	8,572	4,620	4,411	1,020	84,705	75,338

[1] Includes secondary residences, recreational buildings, business buildings, and other places of consumption.

Table 7: Survey Units Where Residents of Each Unit Burn Wood

Primary Residence of Wood Burners and where Residents Burn Wood		Number of Households	Survey Unit where Wood is Burned					Consumption by Wood Burners of each Unit (Cords)	Average Volume (Cords per Household)
			Aspen-Birch (Cords)	Northern Pine (Cords)	Central Hardwoods (Cords)	Prairie (Cords)	Metro (Cords)		
Aspen-Birch	Burn Outside of Unit	1,074	--	454	--	--	--	454	0.42
	Burn Within Unit	30,419	105,770	--	--	--	--	105,770	3.48
	Burn Within and Outside of Unit	716	94	--	89	--	7	191	0.27
	Total	32,208	105,864	454	89	--	7	106,415	3.30
Northern Pine	Burn Outside of Unit	719	1,079	--	90	--	--	1,168	1.62
	Burn Within Unit	34,872	--	144,158	--	--	--	144,158	4.13
	Burn Within and Outside of Unit	360	18	162	--	--	--	180	0.50
	Total	35,951	1,097	144,319	90	--	--	145,506	4.05
Central **Hardwood**s	Burn Outside of Unit	2,058	--	514	--	386	--	900	0.44
	Burn Within Unit	59,677	--	--	149,743	--	--	149,743	2.51
	Burn Within and Outside of Unit	1,029	--	154	1,389	--	--	1,543	1.50
	Total	62,764	--	669	151,132	386	--	152,187	2.42
Prairie	Burn Outside of Unit	1,163	--	1,163	--	--	--	1,163	1.00
	Burn within Unit	38,381	--	--	--	75,487	--	75,487	1.97
	Burn Within and Outside of Unit	2,326	1,628	--	67	714	--	2,409	1.04
	Total	41,870	1,628	1,163	67	76,201	--	79,059	1.89
Metro	Burn Outside of Unit	12,160	--	2,209	--	24	--	2,233	0.18
	Burn Within Unit	170,242	--	--	--	--	115,033	115,033	0.68
	Burn Within and Outside of Unit	36,481	7,431	15,679	2,736	--	30,064	55,910	1.53
	Total	218,883	7,431	17,888	2,736	24	145,097	173,176	0.79
All Units	Burn Outside of Unit	17,174	1,079	4,340	90	410	--	5,918	0.34
	Burn Within Unit	333,591	105,770	144,158	149,743	75,487	115,033	590,191	1.77
	Burn Within and Outside of Unit	40,912	9,171	15,995	4,281	714	30,071	60,233	1.47
	Total	391,677	116,020	164,493	154,114	76,611	145,104	656,343	1.68

Table 8: Residential Fuelwood Consumption by Reason for Burning and when First Burned Wood

Reason for Burning and when First Burned Wood		Number of Households	Volume (Cords)	Average (Cords per Household)
Pleasure	Last year	9,513	2,534	0.27
	2 years ago	11,238	3,016	0.27
	3 years ago	5,798	2,571	0.44
	4 years ago	12,876	2,291	0.18
	5 or more years ago	164,902	67,930	0.41
	Total	204,326	78,342	0.38
Primary Heat	Last year	1,077	10,749	9.98
	2 years ago	1,523	14,147	9.29
	3 years ago	5,440	7,164	1.32
	4 years ago	3,136	18,090	5.77
	5 or more years ago	58,567	295,061	5.04
	Total	69,743	345,211	4.95
Secondary Heat	Last year	3,221	8,747	2.72
	2 years ago	716	3,221	4.50
	3 years ago	719	3,955	5.50
	4 years ago	4,478	7,905	1.77
	5 or more years ago	108,473	208,962	1.93
	Total	117,607	232,789	1.98
All Reasons	Last year	13,810	22,030	1.60
	2 years ago	13,477	20,384	1.51
	3 years ago	11,957	13,690	1.14
	4 years ago	20,491	28,287	1.38
	5 or more years ago	331,942	571,952	1.72
	Total	391,677	656,343	1.68

Table 9: Residential Fuelwood Consumption by Type of Fuelwood

Survey Unit and Type of Roundwood Burned		Number of Wood-Burning Facilities	Type of fuelwood			Total Volume (Cords)	Average (Cords per Household)
			Roundwood (Cords)	Wood Residues and Scrap Lumber (Cords)	Manufactured Logs or Wood Pellets (Cords)		
Aspen -Birch	Roundwood	20,623	53,775	--	--	53,775	2.61
	Combination	15,268	50,091	11,707	447	62,245	4.08
	Total	35,891	103,865	11,707	447	116,020	3.23
Northern Pine	Roundwood	36,257	86,798	--	--	86,798	2.39
	Wood residues	719	--	2,527	--	2,527	3.51
	Manufactured Logs	360	--	--	12	12	0.03
	Combination	17,710	64,760	9,695	701	75,156	4.24
	Total	55,046	151,558	12,222	713	164,493	2.99
Central Hardwoods	Roundwood	40,121	81,923	--	--	81,923	2.04
	Wood Residues	1,029	--	2,943	--	2,943	2.86
	Manufactured Logs	2,058	--	--	83	83	0.04
	Combination	20,131	60,894	7,732	539	69,166	3.44
	Total	63,339	142,818	10,675	622	154,114	2.43
Prairie	Roundwood	30,088	55,543	--	--	55,543	1.85
	Wood Residues	1,163	--	17	--	17	0.01
	Manufactured Logs	2,326	--	--	936	936	0.40
	Combination	11,049	17,624	2,425	65	20,114	1.82
	Total	44,627	73,167	2,443	1,001	76,611	1.72
Metro	Roundwood	138,054	103,661	--	--	103,661	0.75
	Wood Residues	4,053	--	91	--	91	0.02
	Manufactured Logs	8,107	--	--	547	547	0.07
	Combination	42,561	31,353	7,904	1,547	40,804	0.96
	Total	192,775	135,015	7,995	2,094	145,104	0.75
All Units	Roundwood	265,144	381,701	--	--	381,701	1.44
	Wood Residues	6,964	--	5,579	--	5,579	0.80
	Manufactured Logs	12,850	--	--	1,578	1,578	0.12
	Combination	106,719	224,722	39,464	3,300	267,486	2.51
	Total	391,677	606,422	45,043	4,878	656,343	1.68

Table 10: Residential Fuelwood Consumption by Type of Fuelwood, Survey Unit, and Detailed Type of Burning Facility

Survey Unit and Detailed Type of Burning Facility		Total Volume (Cords)	Manufactured Logs or Pellets (Cords)	Roundwood (Cords)	Wood Residues or Scrap Lumber (Cords)
Aspen-Birch	Regular Fireplace	5,319.5		5,189.5	130.0
	Modified Fireplace/Insert	5,832.1	100.4	5,332.2	399.5
	Certified Catalytic Fireplace Insert	178.9		178.9	
	Conventional Woodstove	32,803.2	6.1	29,928.6	2,868.5
	Fire Pit/Ring	6,760.2	80.5	5,842.1	837.6
	Wood Burning Boiler	35,608.1	250.5	30,597.9	4,759.7
	Wood Burning Furnace	10,856.7		10,480.9	375.8
	Certified Catalytic Woodstove	7,726.9	9.8	6,607.3	1,109.8
	Certified Non-Catalytic Woodstove	10,934.2		9,922.7	1,011.5
	Grand Total	116,019.8	447.3	104,080.1	11,492.4
Northern Pine	Regular Fireplace	28,192.1	220.4	26,693.1	1,278.7
	Modified Fireplace/Insert	9,102.9		7,365.3	1,737.6
	Conventional Woodstove	21,628.1	107.9	19,808.3	1,711.9
	Fire Pit/Ring	364.1	7.5	287.1	69.5
	Wood Burning Boiler	25,165.7	251.7	22,433.4	2,480.6
	Wood Burning Furnace	67,425.0	125.9	63,218.3	4,080.7
	Certified Catalytic Woodstove	4,269.8		3,541.6	728.2
	Certified Non-Catalytic Woodstove	8,345.6		8,210.5	135.1
	Grand Total	164,493.3	713.3	151,557.6	12,222.4
Central Hardwoods	Regular Fireplace	26,565.1	185.5	25,824.2	555.4
	Modified Fireplace/Insert	5,777.4		5,160.0	617.4
	Certified Non-Catalytic Fireplace Insert	7,572.9		4,630.1	2,942.7
	Conventional Woodstove	16,686.4	230.5	15,272.7	1,183.3
	Fire Pit/Ring	2,057.8		1,955.0	102.9
	Wood Burning Boiler	41,414.1		38,610.3	2,803.8
	Wood Burning Furnace	38,849.0	205.8	37,305.6	1,337.6
	Certified Non-Catalytic Woodstove	15,191.6		14,059.8	1,131.8
	Grand Total	154,114.3	621.8	142,817.7	10,674.9
Prairie	Regular Fireplace	19,755.9	974.6	18,430.7	350.6
	Modified Fireplace/Insert	17,524.5		17,059.3	465.2
	Conventional Woodstove	3,372.9		3,070.5	302.4
	Fire Pit/Ring	678.5	26.8	606.4	45.4
	Wood Burning Boiler	2,326.1		1,628.3	697.8
	Wood Burning Furnace	32,565.9		31,984.3	581.5
	Certified Non-Catalytic Woodstove	387.6		387.6	
	Grand Total	76,611.5	1,001.4	73,167.1	2,442.9
Metro	Regular Fireplace	85,542.4	1,243.1	81,310.0	2,989.4
	Modified Fireplace/Insert	35,331.6	425.6	34,480.4	425.6
	Certified Non-Catalytic Fireplace Insert	2,533.4		253.3	2,280.0
	Conventional Woodstove	6,357.4	425.6	5,290.0	641.8
	Fire Pit/Ring	7,350.8		6,651.6	699.2
	Wood Burning Furnace	6,080.1		5,472.1	608.0
	Certified catalytic Woodstove	1,080.9		864.7	216.2
	Certified Non-Catalytic Woodstove	827.6		692.5	135.1
	Grand Total	145,104.1	2,094.3	135,014.5	7,995.3
All Units	Regular Fireplace	165,375.1	2,623.6	157,447.4	5,304.1
	Modified Fireplace/Insert	73,568.4	526.0	69,397.2	3,645.3
	Certified Non-Catalytic Fireplace Insert	10,106.2	0.0	4,883.5	5,222.7
	Certified Catalytic Fireplace Insert	178.9	0.0	178.9	0.0
	Conventional Woodstove	80,848.0	770.1	73,370.0	6,707.9
	Fire Pit/Ring	17,211.5	114.8	15,342.2	1,754.6
	Wood Burning Boiler	104,514.0	502.2	93,269.9	10,741.9
	Wood Burning Furnace	155,776.5	331.7	148,461.2	6,983.6
	Certified Catalytic Woodstove	13,077.6	9.8	11,013.6	2,054.3
	Certified Non-Catalytic Woodstove	35,686.6	0.0	33,273.0	2,413.6
	Grand Total	656,343.0	4,878.0	606,637.0	44,827.9

Table 11: Residential Fuelwood Consumption of Roundwood by Species Group and Survey Unit

Species Group	All Units (Cords)	Survey Unit				
		Aspen-Birch (Cords)	Northern Pine (Cords)	Central Hardwoods (Cords)	Prairie (Cords)	Metro (Cords)
Softwoods						
Eastern Red-cedar	1,200	1,200	--	--	--	--
Northern White Cedar	1,071	--	--	261	810	--
Pine	42,095	8,108	14,003	6,024	6,706	7,254
Total Softwoods	44,366	9,305	14,006	6,284	7,516	7,254
Hardwoods						
Maple	53,753	14,747	13,995	8,168	3,372	13,470
Boxelder	2,365	--	98	2,260	6	--
Birch	87,518	35,357	28,811	6,668	810	15,872
Ash	67,359	14,339	14,397	13,259	16,957	8,409
Walnut/Butternut	1,394	--	--	*	1,394	--
Cottonwood	4,560	--	*	4,521	37	1
Aspen	52,858	21,682	19,918	3,272	303	7,682
Oak	250,062	8,259	54,272	82,292	29,372	75,867
Basswood	9,621	--	3,461	4,095	786	1,280
Elm	32,565	176	2,598	11,998	12,614	5,180
Total Hardwoods	562,056	94,560	137,551	136,533	65,651	127,760
Total All Species	606,422	103,865	151,558	142,818	73,167	135,015

* Less than 1 cord.

Table 12: Residential Fuelwood Consumption by Method of Procurement and Survey Unit

Survey Unit and Procurement Method		Number of Wood-Burning Facilities	Procurement method			Total Fuelwood (Cords)	Average (Cords per Household)
			Volume Cut (Cords)	Volume Purchased (Cords)	Volume Other [1] (Cords)		
Aspen-Birch	Cut	9,172	21,703	--	--	21,703	2.37
	Purchased [1]	15,745	--	42,373	--	42,373	2.69
	Cut and Purchased [1]	10,974	33,379	13,295	5,271	51,945	4.73
	Total	35,891	55,081	55,667	5,271	116,020	3.23
Northern Pine	Cut	21,214	46,918	--	--	46,918	2.21
	Purchased [1]	17,378	--	42,394	--	42,394	2.44
	Cut and Purchased [1]	16,453	47,947	22,514	4,720	75,181	4.57
	Total	55,046	94,865	64,908	4,720	164,493	2.99
Central Hardwoods	Cut	21,936	65,656	--	--	65,656	2.99
	Purchased [1]	22,703	--	19,517	--	19,517	0.86
	Cut and Purchased [1]	18,700	55,451	8,749	4,742	68,942	3.69
	Total	63,339	121,106	28,266	4,742	154,114	2.43
Prairie	Cut	12,776	33,683	--	--	33,683	2.64
	Purchased [1]	26,035	--	22,621	--	22,621	0.87
	Cut and Purchased [1]	5,815	13,849	4,947	1,512	20,307	3.49
	Total	44,627	47,532	27,567	1,512	76,611	1.72
Metro	Cut	44,587	44,677	--	--	44,677	1.00
	Purchased [1]	113,733	--	52,236	91	52,327	0.46
	Cut and Purchased [1]	34,454	30,259	9,127	8,715	48,100	1.40
	Total	192,775	74,935	61,363	8,806	145,104	0.75
All units	Cut	109,686	212,637	--	--	212,637	1.94
	Purchased [1]	195,595	--	179,140	91	179,231	0.92
	Cut and Purchased [1]	86,396	180,884	58,632	24,959	264,475	3.06
	Total	391,677	393,521	237,772	25,050	656,343	1.68

[1]*Includes gift wood, free wood, leftover wood, etc.*

Table 13: Residential Fuelwood Consumption of Purchased Fuelwood by Survey Unit and Size of Fuelwood

Survey Unit and Size of Wood Purchased		Number of Wood-Burning Facilities	Volume (Cords)	Average (Cords per Household)
Aspen-Birch	16 inch	9,499	5,969	0.63
	24 inch	358	716	2.00
	4 foot	358	2,505	7.00
	8 foot or 100 inch	6,639	46,298	6.97
	Random Length Roundwood	358	179	0.50
	Total	17,212	55,667	3.23
Northern Pine	16 inch	11,722	13,006	1.11
	24 inch	1,480	5,700	3.85
	4 foot	360	2,517	6.99
	6 foot	539	1,330	2.47
	8 foot or 100 inch	4,971	33,984	6.84
	Tree Length	205	3,926	19.15
	Random Length Roundwood	727	3,807	5.24
	Random Length Residues	754	638	0.85
	Total	20,759	64,908	3.13
Central Hardwoods	16 inch	19,706	15,194	0.77
	24 inch	1,646	3,704	2.25
	6 foot	535	2,593	4.85
	Random Length Roundwood	1,617	1,528	0.94
	Random Length Residues	2,178	5,248	2.41
	Total	25,682	28,266	1.10
Prairie	16 inch	23,150	15,919	0.69
	24 inch	2,908	11,631	4.00
	Random Length Residues	1,163	17	0.01
	Total	27,221	27,567	1.01
Metro	16 inch	95,600	44,946	0.47
	24 inch	8,107	3,040	0.37
	8 foot or 100 inch	2,027	11,349	5.60
	Random Length Roundwood	8,107	2,027	0.25
	Total	113,840	61,363	0.54
All units	16 inch	159,678	95,035	0.60
	24 inch	14,499	24,791	1.71
	4 foot	717	5,022	7.00
	6 foot	1,074	3,923	3.65
	8 foot or 100 inch	13,637	91,632	6.72
	Tree length	205	3,926	19.15
	Random Length Roundwood	10,808	7,541	0.70
	Random Length Residues	4,096	5,903	1.44
	Total	204,714	237,772	1.16

Table 14: Residential Fuelwood Consumption by Survey Unit and Place of Consumption

Survey Unit and Place of Consumption		Number of Wood-Burning Facilities	Primary Residence (Cords)	Secondary Residence (Cords)	Other Buildings [1] (Cords)	Total Fuelwood (Cords)	Average (Cords per Household)
Aspen-Birch	Primary Residence	19,325	77,383	--	--	77,383	4.00
	Secondary Residence	3,222	--	3,126	--	3,126	0.97
	Other Buildings [1]	2,147	--	--	4,033	4,033	1.88
	Combination	11,197	13,369	9,463	8,645	31,477	2.81
	Total	35,891	90,752	12,589	12,678	116,020	3.23
Northern Pine	Primary Residence	28,042	122,410	--	--	122,410	4.37
	Secondary Residence	10,930	--	3,449	--	3,449	0.32
	Other Buildings [1]	4,038	--	--	3,585	3,585	0.89
	Combination	12,037	13,140	17,163	4,746	35,049	2.91
	Total	55,046	135,550	20,612	8,331	164,493	2.99
Central Hardwoods	Primary Residence	50,417	116,300	--	--	116,300	2.31
	Secondary Residence	3,446	--	608	--	608	0.18
	Other Buildings [1]	1,029	--	--	1,543	1,543	1.50
	Combination	8,446	22,328	6,844	6,491	35,663	4.22
	Total	63,339	138,628	7,452	8,035	154,114	2.43
Prairie	Primary Residence	34,892	67,787	--	--	67,787	1.94
	Secondary Residence	5,082	--	410	--	410	0.08
	Other Buildings [1]	2,326	--	--	721	721	0.31
	Combination	2,326	4,204	--	3,489	7,693	3.31
	Total	44,627	71,991	410	4,210	76,611	1.72
Metro	Primary Residence	166,189	114,020	--	--	114,020	0.69
	Other Buildings [1]	4,053	--	--	1,013	1,013	0.25
	Combination	22,532	30,064	5	2	30,071	1.33
	Total	192,775	144,084	5	1,015	145,104	0.75
All units	Primary Residence	298,865	497,901	--	--	497,901	1.67
	Secondary Residence	22,681	--	7,593	--	7,593	0.33
	Other Buildings [1]	13,593	--	--	10,896	10,896	0.80
	Combination	56,538	83,104	33,475	23,373	139,953	2.48
	Total	391,677	581,005	41,068	34,270	656,343	1.68

[1] *Include: garages, business buildings, and recreational buildings.*

Table 15: Residential Fuelwood Consumption by Survey Unit and Community Size

Survey Unit and Community Size		Number of Households	Volume (Cords)	Average (Cords per Household)
Aspen-Birch	Rural	18,609	71,714	3.85
	Small Town	6,084	22,208	3.65
	Large Town	7,515	12,493	1.66
	Total	32,208	106,415	3.30
Northern Pine	Rural	22,649	94,392	4.17
	Small Town	9,347	36,282	3.88
	Large Town	3,955	14,832	3.75
	Total	35,951	145,506	4.05
Central Hardwoods	Rural	25,723	80,597	3.13
	Small Town	20,578	49,373	2.40
	Large Town	16,463	22,217	1.35
	Total	62,764	152,187	2.42
Prairie	Rural	8,141	31,519	3.87
	Small Town	10,468	8,692	0.83
	Large Town	23,261	38,848	1.67
	Total	41,870	79,059	1.89
Metro	Rural	28,374	18,264	0.64
	Small Town	32,427	36,072	1.11
	Large Town	117,548	92,604	0.79
	Very Large Town	40,534	26,236	0.65
	Total	218,883	173,176	0.79
All Units	Rural	103,496	296,486	2.86
	Small Town	78,904	152,627	1.93
	Large Town	168,742	180,994	1.07
	Very Large Town	40,534	26,236	0.65
	Total	391,676	656,343	1.68

Table 16: Residential Fuelwood Consumption by Community Size

Household Size	Total Volume (Cords)	Reason for Burning		
		Primary Heat	Secondary Heat	Pleasure
Rural	296,486.5	190,606.3	84,773.5	21,106.6
Small Town	152,627.1	104,262.1	36,605.6	11,759.5
Large Town	180,993.8	50,343.1	91,143.3	39,507.5
Very Large Town	26,235.6	--	20,266.9	5,968.6
Total	656,343.0	345,211.5	232,789.4	78,342.2

Table 17: Residential Fuelwood Production (in cords) by Households by Survey Unit and Source of Material

Survey Unit	All Sources	Cities and Towns	Windbreaks, Fencerows, Rural Yards	Pasture and Cropland	Woodlands		
					Standing Live Trees	Logging Waste	Dead Trees
Aspen-Birch	77,973	1,873	24,213	--	8,686	7,244	35,956
Northern Pine	128,193	3,167	15,107	--	22,197	12,744	74,978
Central Hardwoods	182,595	3,145	43,522	8,746	14,168	17,374	95,640
Prairie	64,995	1,409	16,911	--	2,253	124	44,298
Metro	70,151	15,117	19,516	--	1,005	--	34,514
All Units	523,907	24,710	119,270	8,746	48,309	37,486	285,386

Table 18: Residential Fuelwood Production (in cords) by Households from Roundwood by Species Group and Source of Material

Species Group	All Sources	Cities and Towns	Windbreaks, Fencerows, Rural Yards	Pasture and Cropland	Woodlands		
					Standing Live Trees	Logging Waste	Dead Trees
Softwoods							
Cedar	634	63	98	--	23	--	450
Tamarack	2,045	--	391	--	91	--	1,563
Pine	35,010	2,277	7,229	926	3,382	3,163	18,033
Total Softwoods	37,689	2,340	7,718	926	3,496	3,163	20,046
Hardwoods							
Maple	42,356	1,191	9,107	1,939	3,157	2,856	24,106
Boxelder	12,293	223	5,585	104	387	95	5,898
Birch	62,716	3,305	13,562	--	9,447	10,923	25,480
Hackberry	896	--	456	--	439	--	--
Ash	56,885	3,535	13,198	2,334	5,653	3,982	28,184
Locust	673	--	673	--	--	--	--
Walnut	224	--	114	--	110	--	--
Cottonwood	6,724	--	3,423	--	8	--	3,293
Aspen	54,095	1,891	10,385	--	8,381	5,901	27,537
Oak	202,404	11,650	36,152	2,976	13,946	7,701	129,980
Basswood	13,787	60	5,980	--	761	1,972	5,015
Elm	33,167	516	12,917	467	2,524	894	15,849
Total Hardwoods	486,220	22,371	111,552	7,820	44,813	34,324	265,342
Total of All species	523,907	24,710	119,270	8,746	48,309	37,486	285,388

Table 19: Residential Fuelwood Production (in cords) by Homeowners by Ownership Class and Source of Material

Ownership Class	All Sources	Cities and Towns	Windbreaks, Fencerows, Rural Yards	Pasture and Cropland	Woodland		
					Standing Live Trees	Logging Waste	Dead Trees
National Forests	3,319	--	--	--	606	301	2,412
Other Federal Lands	5,279	--	--	--	2,071	1,023	2,186
State Lands	10,522	--	--	--	2,931	3,094	4,496
County/Municipal Land	23,326	--	--	--	1,001	5,116	17,209
Forest Industry Land	1,840	--	--	--	582	590	668
Private Land	479,621	24,710	119,270	8,746	41,118	27,363	258,414
All ownerships	523,907	24,710	119,270	8,746	48,309	37,486	285,386

Table 20: Residential Fuelwood Production (in cords) by Household from Roundwood by Species Group and Ownership class

Species Group	All Ownerships	Ownership Class					
		National Forest	Other Federal	State	County/ Municipal	Forest Industry	Private
Softwoods							
Cedar	634	--	--	--	--	--	634
Tamarack	2,045	--	--	--	--	--	2,045
Pine	35,010	72	1,023	1,435	1,400	--	31,080
Total	37,689	72	1,023	1,435	1,400	--	33,759
Hardwoods							
Maple	42,356	337	70	840	928	253	39,927
Boxelder	12,293	--	--	2	38	--	12,253
Birch	62,716	870	2,272	2,041	4,457	664	52,411
Hackberry	896	--	--	--	--	--	896
Ash	56,885	328	569	537	6,680	101	48,670
Locust	673	--	--	--	--	--	673
Walnut	224	--	--	--	--	--	224
Cottonwood	6,724	--	--	--	*	--	6,723
Aspen	54,095	444	488	1,792	2,371	681	48,319
Oak	202,404	1,053	829	3,800	5,281	138	191,302
Basswood	13,787	192	15	16	21	2	13,541
Elm	33,167	21	14	58	2,149	2	30,922
Total	486,220	3,245	4,257	9,086	21,925	1,841	445,861
All species	523,907	3,319	5,279	10,522	23,326	1,840	479,621

***** *Less than ½ cord.*

Table 21: Residential Fuelwood Production (in cords) by Homeowners from Roundwood by Species Group and Survey Unit

Species Group	All Units	Survey Unit				
		Aspen-Birch	Northern Pine	Central Hardwoods	Prairie	Metro
Softwoods						
Cedar	634	122	--	--	511	--
Tamarack	2,045	--	--	--	2,045	--
Pine	35,010	9,401	16,706	4,236	2,591	2,075
Total	37,689	9,523	16,706	4,236	5,147	2,075
Hardwoods						
Maple	42,356	4,371	8,733	15,735	1,222	12,295
Boxelder	12,293	--	318	8,980	2,297	698
Birch	62,716	26,297	22,099	8,011	140	6,169
Hackberry	896	--	--	891	--	4
Ash	56,885	6,047	7,559	16,671	19,932	6,677
Locust	673	--	--	--	--	673
Walnut	224	--	--	223	--	1
Cottonwood	6,724	--	--	6,673	16	35
Aspen	54,095	23,228	24,981	3,845	33	2,009
Oak	202,404	8,217	43,544	89,409	26,218	35,016
Basswood	13,787	145	2,081	9,636	--	1,924
Elm	33,167	145	2,172	18,286	9,990	2,574
Total	486,220	68,450	111,487	178,360	59,848	68,075
All species	523,907	77,973	128,193	182,595	64,995	70,151

Table 22: Residential Fuelwood Production (in cords) by Homeowners by Ownership Class and Survey Unit

Ownership Class	All Units	Survey Unit				
		Aspen-Birch	Northern Pine	Central Hardwoods	Prairie	Metro
National Forests	3,319	755	2,564	--	--	--
Other Federal Lands	5,279	--	5,279	--	--	--
State Land	10,522	787	9,329	--	--	405
County/Municipal Land	23,326	5,651	4,476	44	5,859	7,296
Forest Industry Land	1,840	121	1,720	--	--	--
Private Land	479,621	70,659	104,825	182,552	59,136	62,450
All Ownerships	523,907	77,973	128,193	182,595	64,995	70,151

Table 23: Volume of Fuelwood (in cords) by Category of Wood Burning Facilities

CATEGORY OF WOOD BURNING FACILITIES	MANUFACTURED LOGS & PELLETS	ROUNDWOOD	WOOD RESIDUE	TOTAL
Regular Fireplace	2,624	157,447	5,304	165,375
Fire Pit/ring	115	15,342	1,755	17,212
Modified Fireplace/Insert	526	69,397	3,645	73,568
Certified Non-Catalytic Fireplace Insert	--	4,883	5,223	10,106
Certified Catalytic Fireplace Insert	--	179	--	179
Conventional Woodstove	770	73,370	6,708	80,848
Wood Burning Boiler	502	93,270	10,742	104,514
Wood Burning Furnace	332	148,461	6,984	155,777
Certified Catalytic Woodstove	10	11,014	2,054	13,078
Certified Non-Catalytic Woodstove	--	33,273	2,414	35,687
Grand Total	4,878	606,637	44,828	656,343

Table 24: Types of Wood Burning Facilities with Corresponding SCC Codes

CATEGORY OF WOOD BURNING FACILITIES	SCC DESCRIPTION	SCC
Regular Fireplace	Fireplaces: General	2104080001
Fire Pit/Ring	Fireplaces: General	2104080001
Modified Fireplace/Insert	Fireplaces: Inserts - Non-EPA-Certified	2104080002
Certified Non-Catalytic Fireplace Insert	Fireplaces: Inserts - Non-Catalytic, EPA-Certified	2104080003
Certified Catalytic Fireplace Insert	Fireplaces: Inserts - Catalytic, EPA-Certified	2104080004
Conventional Woodstove	Woodstoves - Conventional	2104080010
Wood Burning Boiler	Woodstoves - Conventional	2104080010
Wood Burning Furnace	Woodstoves - Conventional	2104080010
Certified Catalytic Woodstove	Woodstoves – Catalytic, EPA-Certified	2104080030
Certified Non-Catalytic Woodstove	Woodstoves - Non-Catalytic, EPA-Certified	2104080050

SCC: Source Classification Code

Table 25: Mass of Fuelwood Burned by SCC in the 2002-2003 Heating Season.

SCC	Mass of Wood Burned (in ton) 2002-2003 Survey	Percent of Wood Burned 2002-2003 Survey	Mass of Wood Burned (in ton) 1995-1996 Survey	Percent of Wood Burned 1995-1996 Survey
2104008001	205,600	25.33	356,351	35.56
2104008002	91,284	11.25	58,065	5.79
2104008003	11,532	1.42	3,598	0.36
2104008004	224	0.03	1,452	0.14
2104008010	442,952	54.57	536,161	53.50
2104008030	15,936	1.96	13,404	1.34
2104008050	44,180	5.44	33,219	3.31
Total	811,709	100.00	1,002,249	100.00

Table 26: Weight Percent of Wood Burned by Set of Emission Factors in the 2002-2003 Heating Season.

EMISSION FACTORS	SCC FOR FIREPLACES	SCC FOR FIREPLACES WITH INSERTS	SCC FOR WOODSTOVES	PERCENT BASED ON 2002-2003 SURVEY	PERCENT BASED ON 1995-1996 SURVEY
Non-Certified*	2104008001	2104008002	2104008010	91.15	94.84
Certified Catalytic	---	2104008004	2104008030	1.99	1.48
Certified Non-Catalytic	---	2104008003	2104008050	6.86	3.67

** Emission factors for CO, NOx, PM10, PM2.5, and VOC under 2104008001 are different from those under 2104008002 and 2104008010.*

Sources of Secondary Calculation of Fuelwood Volumes

A. From "Minnesota Wood Waste Studies, 1994" by the Minnesota Department of Natural Resources, Division of Forestry

Primary mills: Sawmills and other primary wood processing industries
See Appendix Table II-F Volume by Fuel Use Class by Residue Category.
97,257 green tons of slabs and edgings utilized for domestic fuel at 2.293 tons/cords = 39,797 cords.

Secondary Wood Processors: Cabinet, millwork, window and related companies
See Appendix III-H Total Expanded Residue Volume by MN County & Residue Use Class.
127,495 dry tons (8% moisture) of fuel sold or given away. Assume: 1 dry ton = 1.84 green tons, 2.293 green tons = 1 cord. This means 1 dry ton would = 1.84/2.293 = 0.80 cords/ton. 127,495 tons X 0.80 cords/ton = 101,996 cords.
Assume the ration of domestic (residential) to other fuel uses as observed for the primary mills (20.5%). 101,996 cords X 0.205 =21,909 cords utilized for domestic fuel.

B. From "Urban Tree Residue, An Assessment of Wood Residue From Tree Removal and Trimming Operations in the Seven-County Metro Area of Minnesota", March 1992, by the Minnesota Department of Natural Resources, Division of Forestry.
See the tabular breakdown of data on page 11.
The total tonnage of tops and brush and mixed wood sold or given away is 12,281 green tons. Assume 2.293 tons = 1 cord. 12,281 tons/2.293 tons/cord = 5,356 cords.

C Growing stock inappropriately identified as logging waste in the logger fuelwood survey.
Loggers identified a total volume of 54,383 cords of fuelwood as derived from logging residue. The questions on the survey did not make it clear that trees the logger did not have a ready for market for should not be included in logging waste. While there is not scientific way to account for this, it was felt some adjustment would be appropriate. For this reason it was assumed that 25 percent or approximately 14,000 cords of the logging waste volume was actually from growing stock.

D. Growing stock included in fuelwood from unidentified sources.

It is possible that a significant portion of the 90,000 cords of fuelwood from unidentified sources came from forestlands in Minnesota. For the purpose of estimation assume that 70 percent came from Minnesota, and the proportion of growing stock was the same as that for fuelwood harvested by loggers (58%). The volume of growing stock would be 36,540 cords.

E. Fuelwood densities:
- The density of manufactured logs/pellets was determined as 1.0989 tons/cord
- The density of wood residues was estimated as 1.0368 tons/cord
- The density of roundwood, 1.2526 tons/cord, was calculated as a weighted average density of 13 species burned in the state

MINNESOTA
RESIDENTIAL FUELWOOD ASSESSMENT

County name:_____
City name:_____

	BURN SEASON (YEAR)		STATE ID		POP UNIT	COUNTY (FIP)			SURVEY # IN COUNTY		

The above table is for office use only

Do you have a wood burning appliance/unit or a fireplace? (1= yes, 2= no)----------

1. How many wood burning appliances/units or fireplaces do you have? ----------
2. Where are these appliances/units located? Primary residence: ----------
   Secondary residence: ----------
   Recreational building: ----------
   Business building: ----------
3. Did you burn wood last year 2002? (1= yes, 2= no)----------
4. Did you burn wood this year 2003? (1= yes, 2= no)----------
5. Do you plan to burn wood next year? (1= yes, 2= no)----------
6. Do you plan to install wood-burning appliance within one year? (1= yes, 2= no) ----------
7. Do you plan to burn wood next year? (1= yes, 2= no)----------

If you answer "NO" to all the above questions 1 thru 7, then go to question # 18.

8. What type of wood burning appliance do you have (check all that apply)? ----------

	TYPE OF WOOD BURNING APPLIANCE	YES	YEAR BOUGHT OR INSTALLED	BRAND AND MODEL
1	Conventional woodstove			
2	Certified catalytic woodstove			
3	Certified non-catalytic woodstove			
4	Regular fireplace			
5	Modified fireplace			
6	Conventional fireplace insert indoor			
7	Conventional fireplace insert outdoor			
8	Certified catalytic fireplace insert			
9	Certified non-catalytic fireplace insert			
10	Pellet insert			
11	Masonry heater			
12	Wood burning furnace			
13	Wood burning boiler			
14	Pellet stove			
15	Fire pit/ring			

9. What type of fuel did you burn during the last 12 months? (Check all boxes that apply)? ----------

Type of fuel	Yes	Type of fuel	Yes
Round wood		Crates/pallets	
Split wood		Lumber	
Slabs		Densified logs	
Wood pellets		Other type	
Wax fireplace logs		Sawdust	

10. How much fuelwood did you burn between April 1st, 2002 and April 30, 2003? ----------

(Record to nearest whole unit of measure: see code below): ----------
Circle number next to unit of measure for volume indicated above: ----------

VEHICLE
1. ¾ ton pick up.
2. ½ ton pick up.
3. Small pickup truck (Nissan, Toyota, Ranger, S-10, etc.)
4. Full size car trunk
5. Small size car trunk
6. Suburban (Carryall)
7. Full size van
8. Small size van
9. Small hatchback
10. Small station wagon
11. Station wagon

WEIGHT
12. Pounds of green wood
13. Pounds of dry wood
14. Tons of green wood
15. Tons of dry wood

TREES
23. 5 inch trees
24. 10 inch trees
25. 15 inch trees
26. 20 inch trees
27. 25 inch trees
28. 30 inch trees
29. 40 inch trees

BUNDLES
22. Bundles

OTHER
66. Pallets
67. Board feet
68. Other Specify.

VOLUME
16. Cubic feet (Length x Width x Height)
17. Cords: 4'x 8'x 12" (1/4 std. cord)
18. Cords: 4'x 8'x 16" (1/3 std. cord)
19. Cords: 4'x 8'x 18"
20. Cords: 4'x 8'x 24" (1/2 std. cord)
21. Cords: 4'x 8'x 4' (1 std. cord)

PELLETS
71. Tons
70. Bags: weight per bag/lbs

PIECES
30. Pieces length in inches

11. When did you start burning wood in a regular basis (Check in box that apply)? ----------

	Yes		Yes
This year		Four years ago	
Last year		Five years ago	
Two years ago		Six years ago	
Three years ago		More than six years ago	

12. Why did you burn fuelwood and what percent of the volume of wood burned was for each purpose? ----------

	Yes	Percent		Yes	Percent
Primary source of heat			Pleasure only		
Supplemental source of heat			List other reasons		

13. Where did you burn this fuelwood and what percent of the total volume was burned at each location? ----------

Location	Yes	Percent	County
Primary residence			
Secondary residence			
Business building			
Others			

14. How many times did you have a fire using fuelwood between April 2002 and April 2003? ----------

	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MARCH
Primary residence												
Secondary residence												
Business building												
Others												

15. How long did your fire last (average) and how many pieces/volume of fuelwood did you use per fire? ----------

	Number of hours	Number of pieces/volume
Weekdays		
Weekends		
Holidays		

16. What species did you burn and what percent of the total volume burned for each species?

(your sum should equal 100 percent)

HARDWOODS											SOFTWOODS				
Oak	Birch	Ash	Elm	Maple	Aspen	Bass-wood	Mixed wood	Other # 1	Other # 2	Other # 3	Pine	Cedar	Mixed Soft wood	Other # 1	Other # 2
22	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*

17. If you purchased fuelwood, what length was the fuelwood? ----------

LENGTH	YES	LENGTH	YES
12 inches		Random slabs	
16 inches		Random endings	
24 inches		Mixed slabs and endings	
48 inches		Random round wood	
72 inches		Mixed round wood	
100 inches		Tree length	

18. Did you or a member of your household harvest fuelwood between April 2002 and April 2003?

(1= yes, 2= no) ----------

If you answer "NO" to question # 18, then go to the end of the questionnaire and follow instructions on returning the completed questionnaire. And thank you for your participation.
Otherwise, please continue with question # 19.

19. What percent of fuelwood was harvested by members of your household? ----------

20. How much fuelwood did members of your household cut between April 2002 and April 2003? ----------
(Record to nearest whole unit of measure: see code below): ----------
(Record number next to unit of measure for volume indicated above): ----------

VEHICLE
1. ¾ ton pick up.
2. ½ ton pick up.
3. Small pickup truck (Nissan, Toyota, Ranger, S-10, etc.)
4. Full size car trunk
5. Small size car trunk
6. Suburban (Carryall)
7. Full size van
8. Small size van
9. Small hatchback
10. Small station wagon
11. Station wagon

WEIGHT
12. Pounds of green wood
13. Pounds of dry wood
14. Tons of green wood
15. Tons of dry wood

TREES
23. 5 inch trees
24. 10 inch trees
25. 15 inch trees
26. 20 inch trees
27. 25 inch trees
28. 30 inch trees
29. 40 inch trees

BUNDLES
22. Bundles

OTHER
66. Pallets
67. Board feet
68. Other Specify.

VOLUME
16. Cubic feet (Length x Width x Height)
17. Cords: 4'x 8'x 12" (1/4 std. cord)
18. Cords: 4'x 8'x 16" (1/3 std. cord)
19. Cords: 4'x 8'x 18"
20. Cords: 4'x 8'x 24" (1/2 std. cord)
21. Cords: 4'x 8'x 4' (1 std. cord)

PELLETS
71. Tons
70. Bags: weight per bag/lbs

PIECES
30. Pieces length in inches

21. What percent of the volume was harvested from woodland: ----------

	Yes	Percent		Yes	Percent
Live & standing tree			Logging residue (tops/slash)		
Dead & standing tree			Rural/agricultural land clearing		
Down wood			Urban land clearing/tree removal		

22. What percent of fuelwood you harvested came from (the sum of your percent should be equal to 100): ----------

	Yes	Percent		Yes	Percent
Live trees in fence rows			Live trees in backyard		
Dead trees in fence rows			Dead trees in backyard		
Live trees in windbreaks			Live trees within town limits		
Dead trees in windbreaks			Dead trees outside town limits		

23. What percent of volume you harvested came from (the sum of the volume should be equal to 100 percent): ----------

	Yes	Percent		Yes	Percent
Private land			State land		
County land			National forest land		
Municipal land			Other federal land		
Land owned by forest industry			Don't know		

24. In what counties you harvested fuelwood?

County name: 1:_____ Percent from county: 1:_____
2:_____ 2:_____
3:_____ 3:_____
4:_____ 4:_____

25. What species did you cut and what percent of the total volume burned for each species?

(Sum should equal 100 percent)

HARDWOODS																		SOFTWOODS									
Oak		Birch		Ash		Elm		Maple		Aspen		Bass-wood		Mixed wood		(list) Other #		(list) Other # 2		(list) Other # 3		Pine		Cedar		Mixed sftwd		(list) Other # 1		(list) Other # 2	

THANK YOU FOR YOUR PARTICIPATION

Please return your completed questionnaire in the enclosed postage-paid envelope to:

Minnesota Department of Natural Resources
Division of Forestry
1200 Warner Road
St. Paul, MN 55106

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