

Vermont Residential Fuel Assessment

for the 2014-2015 Heating Season

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March, 2016

Between July 30, 2015 and August 17, 2015, the Vermont Department of Forests, Parks and Recreation (FPR), the Vermont Department of Public Service (DPS) and their contractor, the Castleton Polling Institute at Castleton University, conducted a random sample telephone survey of 509 Vermont households. FPR and DPS developed the survey questions based on previous residential fuel use surveys. Castleton Polling Institute conducted the telephone survey, analyzed the data and prepared tabular results. This survey continues a series of earlier surveys designed to assess residential heating fuel and firewood demand in Vermont. Prior studies of residential wood fuel demand were conducted for the 1981-82, 1983-84, 1985-86, 1987-88, 1989-90, 1991-92, 1993-94, 1995-96, 1997-98 and 2007-08 heating seasons. See previous Vermont Department of Public Service Residential Fuel Wood Assessments for the results of previous surveys. This report includes comparable data from all of the previous studies. In some cases, the numbers here will differ from what was previously published. The earlier data have been thoroughly examined and corrected as needed. (See Appendix II for details.) The work on which this report is based was funded by the Vermont Department of Public Service and the Vermont Department of Forests, Parks and Recreation through a grant from the US Department of Energy (Award No. EE0006207).

Highlights

- During the 2014-2015 heating season, 38% of Vermont households (96,951 households) burned wood for at least some space heating. This represents an increase of 20% in the number of households burning wood over the previous survey (2007-2008) when an estimated 80,744 households used wood. Usage of wood for space heat had been steadily declining from a high of 48% (1985-1986) at the time of the 1997-1998 survey.
- Trends in the use of wood as a primary vs. secondary space heating fuel have also changed since the 1997-1998 survey. Usage of wood as a primary heating fuel has increased from 16% of Vermont households in 1997-1998 to 20.1% of households in 2014-2015, reversing a steady decline from a high of 42% of households in 1981-1982. Wood usage as a supplemental fuel increased from 13.5% of households in 2007-2008 to 17.6% of households in 2014-2015.
- Vermont households burned an estimated 347,530 cords of wood in 2014-2015. This is an increase of 33,530 cords (10%) from the estimated 314,000 cords used during 2007-2008. The winter of 2014-15 had 8532 heating degree days (HDD), 8% more heating degree days than the winter of 2007-08.
- The average household using wood as a primary heating fuel burned 4.8 cords of wood during the 2014-2015 heating season; the average household using wood as a supplemental heating fuel burned 2.1 cords. Usage per primary burner has decreased from 5.4 cords per household in 2007-2008 to the present 4.8 cords. Usage per supplemental burner has also decreased slightly from 2.25 cords per household in 2007-2008 to the present 2.1 cords.
- During the 2014-2015 heating season, 12.08% of households (31,051) burned at least some wood pellets for space heating, up from an estimated 2.8% of households (6,987) in the 2007-2008 survey. In previous surveys, wood pellet usage was not significant enough to be reported.
- Vermont households heating with wood pellets burned an estimated 126,156 tons during 2014-2015. Households reporting that wood pellets were their primary heat source amounted to 8.4% of all Vermont households, while 3.7% of households reported using pellets as a supplemental heat source. Usage by primary pellet burners averaged 4.4 tons (8,800 lbs) for the heating season, while supplemental pellet users burned an average 3.3 tons (6,600 lbs) for the season.
- Nearly 3.3% (8,472 households) of Vermont households planned to install a new wood or pellet burning stove for the 2015-2016 heating season. An additional 0.5% (1,345 households) planned to install a used wood or pellet burning stove for the 2014-2015 heating season. Of these new installations, 1.5% (3,781 households) were in households which did not already have a wood or pellet burning appliance.
- During the 2014-2015 heating season, the three most common heating fuels for space heating were oil, natural gas/propane¹ and wood in that order. In all surveys prior to 2007-2008, the percentage of wood using households surpassed those using natural gas/propane. Electricity use for space heating has shown a steady decline since the 1985-86 survey. The percent of Vermont households using oil also declined in 2007-2008; a trend first noted in the 2007-2008 survey. Wood pellet fuel saw a significant increase in popularity over previous surveys and now ranks 4th in percent of household use. The use of natural gas for space heating has increased from 10% of households in the 1997-1998 survey to 17.63% in 2014-2015.
- The random sample survey of 509 households throughout the state was conducted by telephone between July 30, 2015 and August 17, 2015. The estimated sampling error (without adjusting for a

¹ For consistency with previous reports, natural gas and propane usage was combined. If each were taken as a separate fuel, wood would have been the second most common fuel choice.

design effect) for the total number of completed interviews (N=509), at a 95% confidence level with an assumed 50/50 response is (+/-) 4.34. This margin of error is based on the estimated total number of households (N=257,004) in Vermont. Any analysis utilizing a sub-group (i.e., comparing across counties or fuel types) will be much less precise and have a greater margin of error.

Introduction

Between July 30, 2015 and August 17, 2015, the Vermont Department of Forests, Parks and Recreation (FPR), the Vermont Department of Public Service (DPS) and their contractor, the Castleton Polling Institute at Castleton University, conducted a random sample telephone survey of 509 Vermont households. Figure 1 provides a breakdown of the geographic distribution of the sample in comparison to the percentage of population in each county. Appendix II provides the number of cases from each county as well as margins of error at the 95% confidence level for each county.

FPR and DPS developed the survey questions based on previous residential fuel use surveys. Castleton Polling Institute conducted the telephone survey, analyzed the data and prepared tabular results.

This survey continues a series of earlier surveys designed to assess residential heating fuel and firewood demand in Vermont. Prior assessments of residential wood fuel demand were conducted for the 1981-82, 1983-84, 1985-86, 1987-88, 1989-90, 1991-92, 1993-94, 1995-96, 1997-98 and 2007-2008 heating seasons. See previous Vermont Department of Public Service Residential Fuel Wood Assessments for the results of previous surveys. This report includes comparable data from all of the previous surveys. In some cases, the numbers here will differ from what was previously published.² The earlier data have been thoroughly examined and corrected as needed. (See Appendix I for details.)

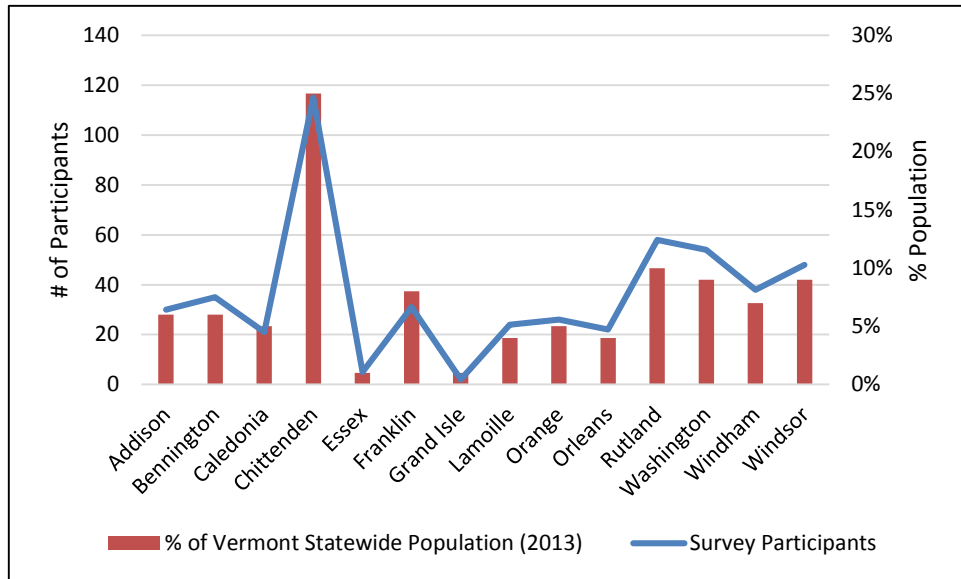


Figure 1: Geographic Distribution of Survey Sample and Percent of Vermont Population by County

The work on which this report is based was funded by the Vermont Department of Public Service and the Vermont Department of Forests, Parks and Recreation through a grant from the US Department of Energy (Award No. EE0006207).

² The 1997-98 and 2007-08 surveys used an improved methodology which reached households with either a listed or unlisted number. Previous surveys used only listed numbers. For the 2014-15 survey, a probability based, dual-frame landline and cellular telephone sample of Vermont was used. The goal was to complete 30% of the surveys utilizing the cell phone sample to increase the coverage of the survey by including households without landline telephones. Small differences between prior surveys and the 1997-98 survey and subsequent surveys may be the result of this change in methodology.

Fuels for Space Heating

Oil and wood were the most popular fuels used for space heating in Vermont households during the 2015 heating season. Fifty-one percent of Vermont homes used oil and 37% used wood as a primary or supplemental fuel source for space heating (Appendix I - Table 1).³ Wood pellets were used by 12% of Vermont households, an increase of nearly 9% of households since 2008. Oil is the heating fuel which has been used by more than half of the households throughout the period of the surveys. In contrast, the use of wood as a heating fuel declined steadily during the 1990's but continues to show slight increases since the 2008 heating season (Figure 2).

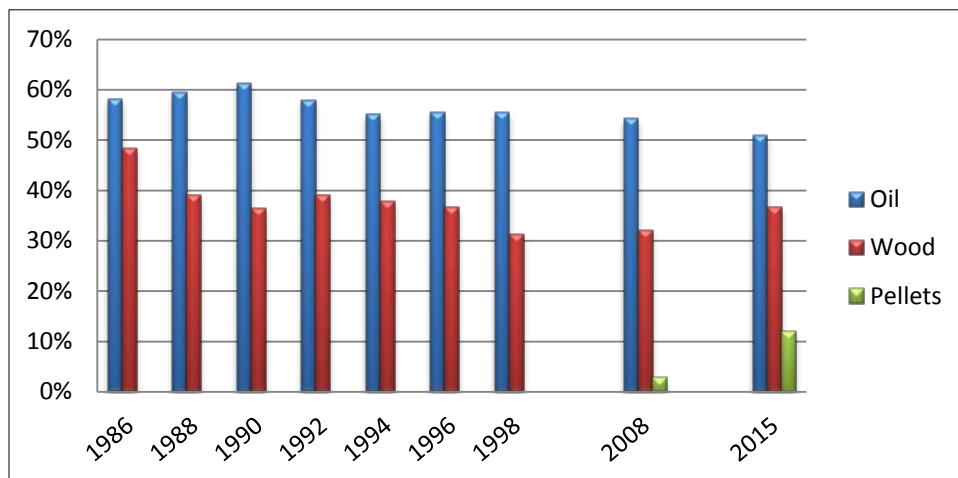


Figure 2: Percent of Vermont Households Using Oil, Wood and Wood Pellets as Primary and Supplemental Fuels for Space Heat

The overall use of electricity for space heating decreased from 13% in 1990, to just over 5% in 2015 (Figure 3)⁴.

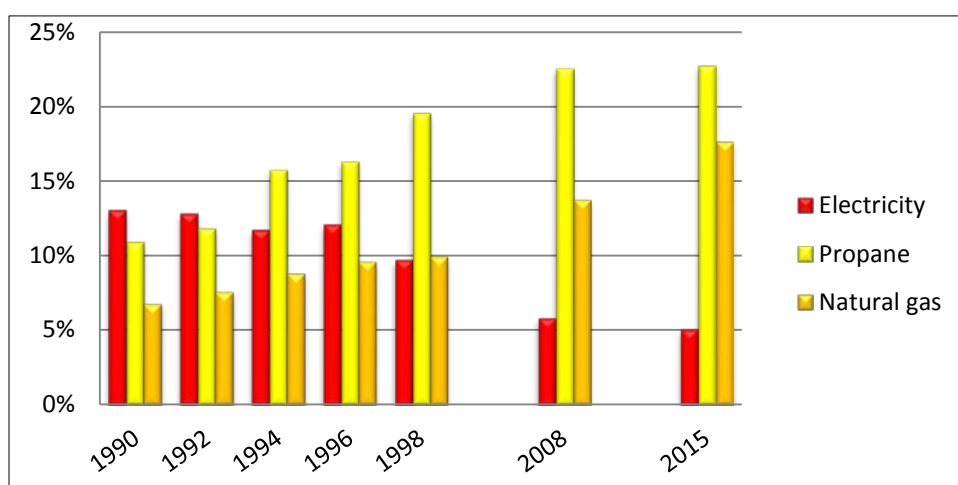


Figure 3: Percent of Vermont Households Using Electricity, Propane and Natural Gas as Fuels for Space Heat -- 3 year moving averages and 2008 and 2015 data

Natural gas usage increased from 14% in 2008, to the current 18%. Propane has moved from 11% during this same span of years to the current 23% of households. Kerosene use was 5.4% and coal usage was less than 1% in 2015. The percentage usage of either of these fuels has not changed substantially during the period of the surveys (Appendix I -Table 2).

³ The respondent was asked, "During the past heating season, what kind of fuel provided most of the heat for the home you lived in?" If the respondent needed help, the interviewer said, "Most means contributed more heat to the house than any other fuel. If multiple fuels were used, most does not necessarily mean more than 50% of the heat." The fuel specified by the respondent is regarded as the primary fuel for space heat. The respondent was asked if other fuels were used for space heat, and, if so, what those fuels were. Any fuel so specified was regarded as a supplemental fuel for space heat. The sampling frame was respondents whose primary residence was in Vermont in the previous winter. Vacationers and short-term visitors were not included.

⁴ Figure 3 includes 3 year moving averages for the years prior to 2008. These averages were not computed for the 2008 or 2015 data since there were multi-year gaps in data collection.

Wood for Space Heating

Thirty-seven percent of Vermont households (93,976 homes) burned wood for space heating (either primary or supplemental) during the 2014-2015 heating season. Fifty-three percent of those wood burning households used wood as the primary source of space heat during 2014-2015; 47% used wood as a supplemental source of space heat (Appendix I -Table 3).

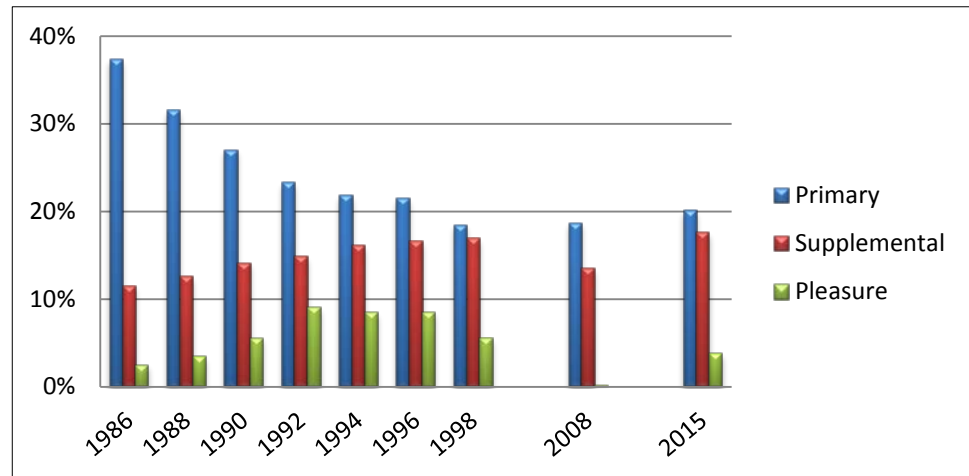


Figure 4: Percent of VT Households Using Wood for Space Heat

The percentage of households using wood as the primary fuel for space heat is less than half of what it was in 1981-1982 (Appendix I -Table 5). After declining steadily through the 1980's and 1990's, the percentage has increased by nearly 4% of households during the 2014-2015 season over the 1998 survey. After steady declines in the two previous surveys, the percentage of households using wood as a supplemental fuel also showed an increase of roughly 4% of households over the 2014-2015 survey (Figure 4).

An estimated 347,530 cords of wood were burned during the 2014-2015 season. Primary space heating wood burners used an average of 4.8 cords while supplemental burners used an average of 2.1 cords (Appendix I -Table 3). An estimated 513,810 cords of wood were burned during the 1981-1982 heating season (Appendix I -Table 7).

Consumption of wood per wood-burning household had generally declined for all types of wood burners since the first survey (Appendix I -Table 7). Previous surveys surmised that this decline was, at least in part, due to greater efficiencies in wood burning appliances. However, the 2007-2008 survey found a slight increase across all user categories⁵ over previous years. Data on cords burned per household by category from the 2014-2015 survey is consistent with the 1997-1998 survey. Inconsistent intervals between surveys makes any characterization of trends during the period from 1998 through 2015 impossible, however, wood usage reported during the last two surveys was very likely influenced by the volatile prices of oil, propane and natural gas. A sharp rise in petroleum prices was noted during the fall and winter of 2007-2008⁶ and again in 2011-2012 with prices remaining relatively stable until beginning to decrease sharply in the spring of 2014.

In previous surveys, some of the differences in wood consumption were attributed to the weather. The 1998-1998 Assessment stated, "Over the years of the Wood Fuel Surveys, there has been a consistent relationship between the number of heating degree days (HDD) and the number of cords burned by primary burners" (Appendix I -Table 9 and Figure 5). The 2007-2008 heating season had 8% fewer

⁵ Pleasure burners showed a significant increase in average usage in the 2007-2008 survey. This, however, represents data from a single respondent.

⁶ Vermont Fuel Price Reports: http://publicservice.vermont.gov/publications-resources/publications/fuel_report

HDDs than the long term annual mean⁷; yet saw significant increases in wood consumption, further supporting the hypothesis that oil and gas prices have an impact on usage of wood fuel.

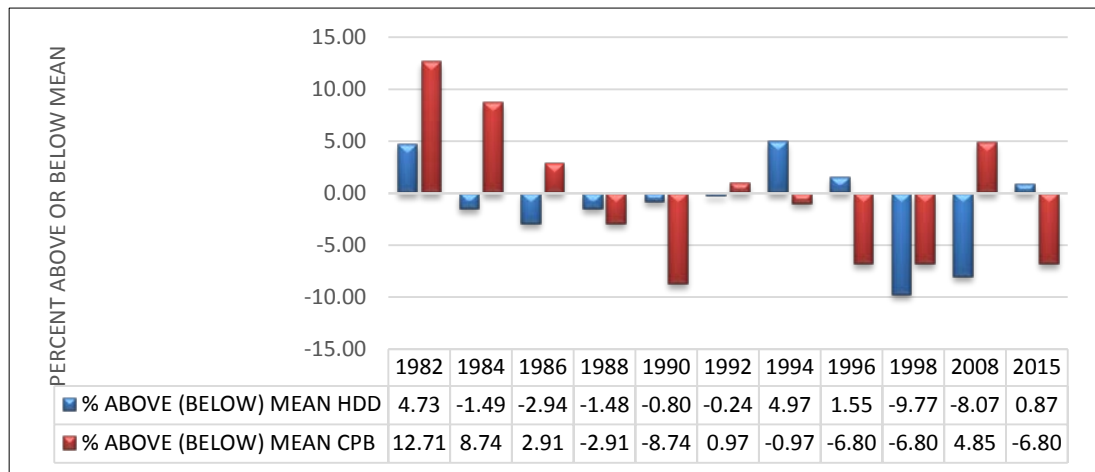


Figure 5: Relationship of Heating Degree Days to Cords Burned per Household 1981-1982 through 2014-2015

Wood Pellets for Space Heating

Slightly more than 12% of Vermont households burned wood pellets for space heat during the 2015 heating season (Figure 6). Seventy percent of pellet burning households reported that wood pellets were their primary source of heat, while 30% indicated that wood pellets were used for supplemental space heating (Appendix I - Table 4). An estimated 126,156 tons of wood pellets were burned during the 2014-2015 heating season (Appendix I - Table 8).

During the 2014-2015 heating season, primary space heating pellet burners used an average of 4.4 tons of pellets while

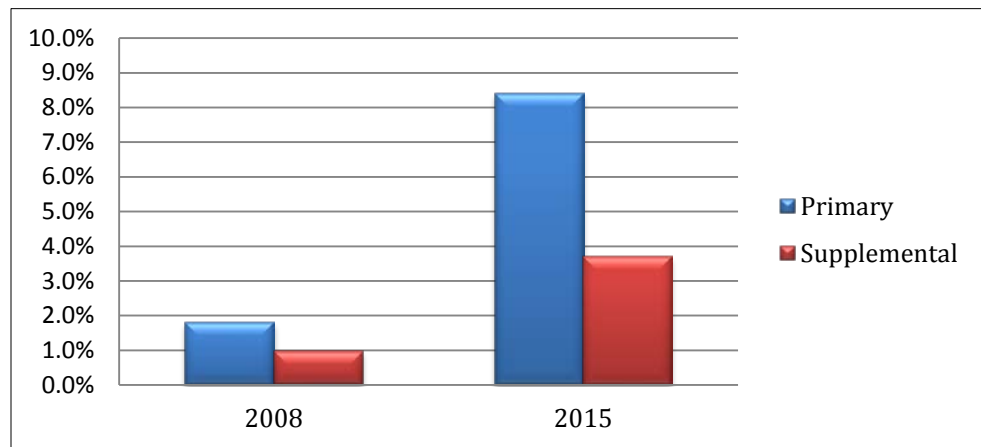


Figure 6: Percent of VT Households Using Pellets for Space Heat 2007-2008 and 2014-2015

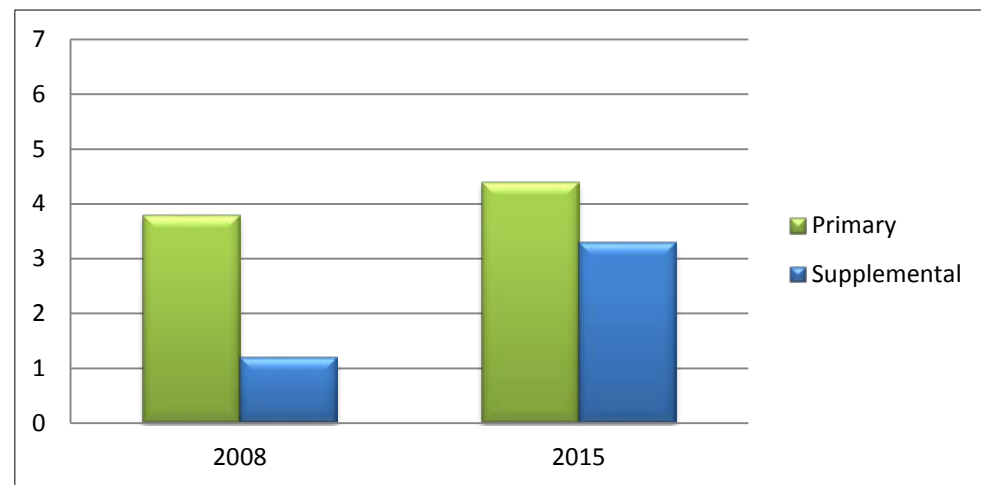


Figure 7: Tons of Pellets Burned per Household, 2007-2008 and 2014-2015

⁷ Long-term mean heating degree days was calculated using NOAA data for Vermont 1896-2015.

supplemental burners used 3.3 tons on average (Figure 7).

Demographics of Wood Burners & Wood Pellet Burners

Respondents were asked if their home was best described as: 1) a detached single-family home; 2) a townhouse or duplex; 3) a two, three or four family building; 4) part of a building with five or more units; or 5) other. In surveys prior to the 2007-2008 survey, a fifth category “mobile or manufactured home” was also included. In the 2007-2008 assessment, the mobile home question was included as a subset of detached single-family. In the 2014-2015 survey, if the respondent chose “other”, then they were given an option to describe the home as a mobile home. As in the previous survey, for purposes of analysis, categories 1 and 2 were combined.

Nearly all wood burners lived in single-family residences and owned their homes (Appendix I -Table 10). Less than 2% of households surveyed heated with cordwood or pellets in a building with two or more residential units. Just over 1% of households were classified as mobile homes that burned wood or pellets.

Most primary pellet burners and supplemental pellet burners also lived in single-family residences. Nearly all primary and supplemental pellet burners owned their homes. No surveyed households using pellets as a supplemental heat source reported renting, but less than 1% of primary pellet burning households were renters.

Geography of Wood Burning

County level estimates of wood burning from this survey are much less reliable than state level data. County level information is provided for consistency with previous surveys but should be used with caution.

The estimated volume of wood burned varied with the region of the state (Appendix I - Table 15). Figure 8 shows the distribution of wood burned by county⁸. The amount of wood burned in any given area could be expected to be a reflection of a combination of factors including; the availability of wood, the ownership of wood burning appliances, the size of the population⁹ and proportion of home owners versus renters in an area. The 2014-2015 survey results were similar to the previous two surveys,

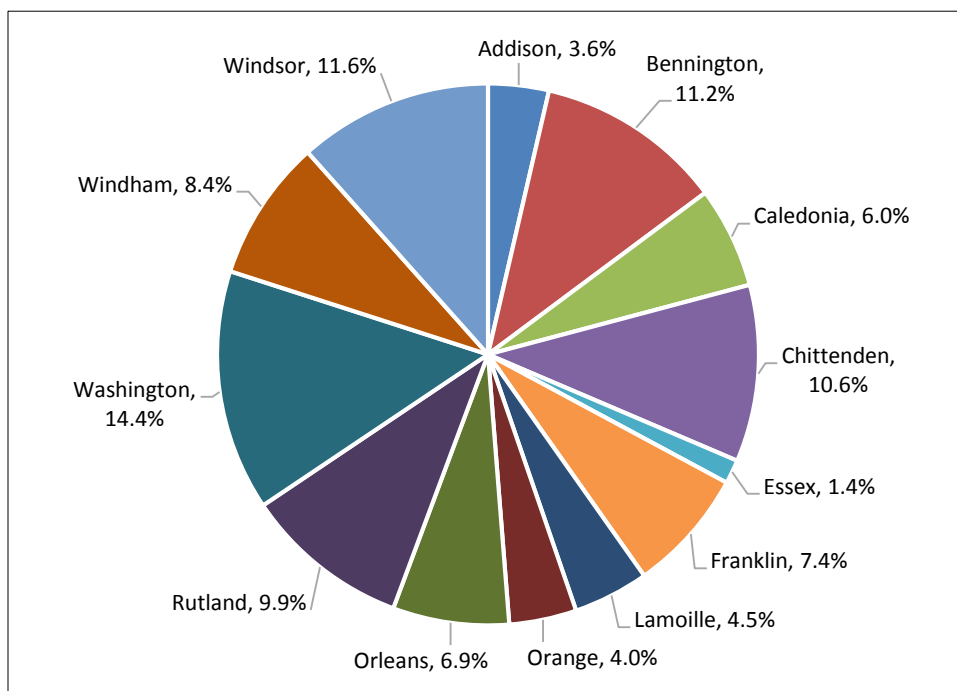


Figure 8: Percent of Total Cords Burned per County, 2014-2015

⁸ No Grand Isle County respondents reported burning wood.

⁹ The geographic distribution of survey responses can be found in Figure 1 and Appendix II

with the counties with the greatest number of households generally burning the most wood¹⁰. The exception to this was Bennington County which ranked number three in cords burned for the current survey but number 7 in the number of households. The 2014-2015 survey estimated a top-five county ranking (highest to lowest) of Washington (13.5%), Windsor (12.2%), Chittenden (11.6%), Franklin (8.9%) and Rutland (8.8%). Rutland County, with the second largest number of households in the state, was estimated to have consumed 12% of all wood burned by the 1997-1998 survey, 4.2% in the 2007-2008 survey, and 9.9% in the current survey; illustrating the potential for small sample sizes by county to influence results.

Pellet fuel use by county was also estimated for the 2014-2015 heating season (Appendix I -Table 15). Statewide, it is estimated that nearly 132,000 tons of pellets were used in Vermont households. Pellet fuel use was found to be highest in Rutland, Windsor, Orleans, Franklin and Washington counties, in that order. By comparison, the 2007-2008 survey estimated a statewide total of just over 20,000 tons. Franklin, Rutland, Windham, Chittenden and Washington counties were the top five pellet using counties but in a number of counties no pellet fuel use was reported.

Controlling for size of population by examining the amount of wood burned **per household**, the county distribution changed (Appendix I - Table 15 and Figure 9). During 2014-2015, the county with the highest volume of wood fuel consumed per household was Bennington County¹¹ followed by counties in northeast and north central Vermont. Chittenden County had the lowest mean wood fuel use per household. When the last three surveys are considered there is a relatively consistent pattern of higher wood use per household in Vermont's more rural counties (Appendix I -Table 16).

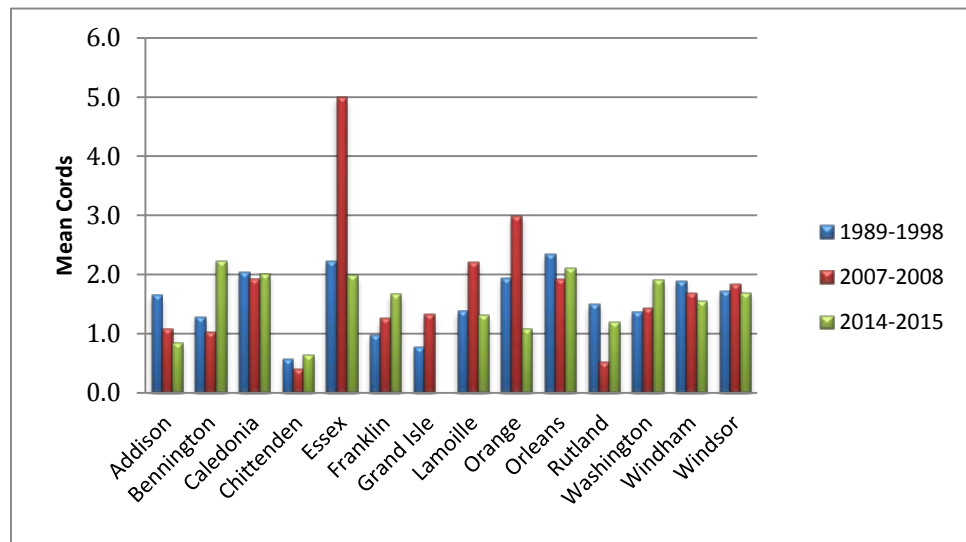


Figure 9: Mean Cords Burned per Household by County, 1989-1998, 2007-2008 and 2014-2015

When summarized by county, the percentage of households with one or more wood burning appliances was relatively consistent across the state, with most counties ranging from roughly 40-50% (Appendix I - Table 15 and Figure 10)¹². The exceptions were Chittenden and Rutland Counties which rank number one and two, respectively, in terms of numbers of households. Percent of households with one or more pellet burning appliances varied more from county to county but exhibited no clear trends. This is likely

¹⁰ In the 1997-98 assessment, "Five counties (Windsor, Rutland, Windham, Washington and Chittenden), counties with large populations, burned more than half of the wood burned in the state."

¹¹ Six respondents from Bennington Co reported burning wood during the 2014-2015 heating season.

¹² A household with any kind of wood burning appliance was counted.

due in part to the lower overall percentage of pellet burning households and the variability of the estimates at the county level.

Characteristics of Wood Fuel

Forty-six percent of households using cordwood during the 2015-2016 heating season reported that the wood was cut by someone in the household, an immediate family member or a friend. Slightly over 40% of households purchased their wood and 13% of wood burning households used some of each (Appendix I -Table 11). Of the purchased wood, the vast majority (73%) was purchased cut and split. Nearly 17% was purchased in log lengths and slightly more than 1% was purchased as unsplit blocks (Appendix I -Table 12).

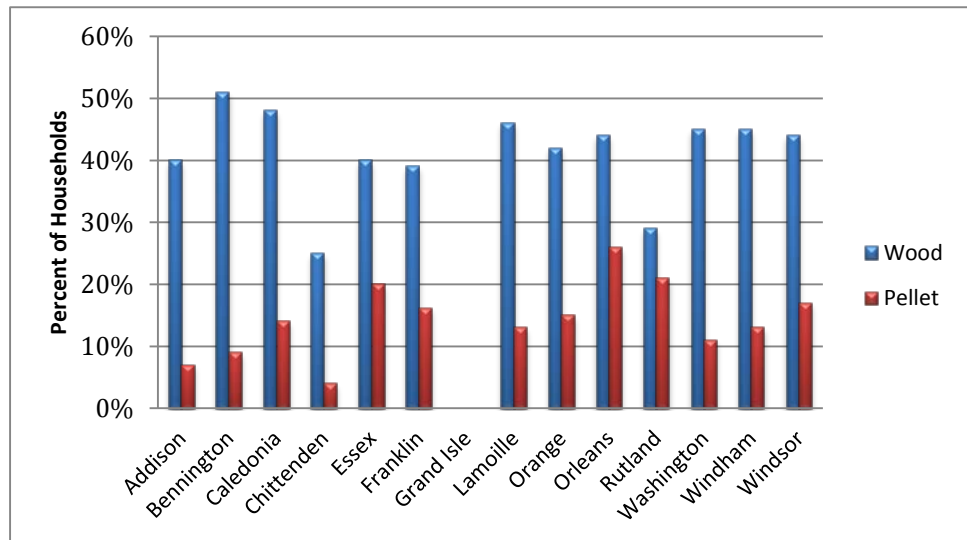


Figure 10: Percent of Households with Wood and Pellet Burning Appliances by County, 2014-2015

Wood burners were also asked where and for how long they stored their wood prior to burning. Over 54% of wood burning households reported storing wood in either a shed or basement prior to burning. Another 37% reported that they stored wood outside covered. Only 9% reported that their wood was stored outside and exposed to the weather (Appendix I -Table 13). When asked how long their wood was stored prior to burning, 67% reported that their wood had been stored 6 months or longer (Appendix I -Table 14).

Wood Burning Appliances

Appendix I -Table 17 shows the reported usage of various types of wood and pellet burning appliances during the 2015 heating season. The most commonly used appliance was a wood stove purchased after the date when stoves were required to be EPA Certified.¹³ Thirty

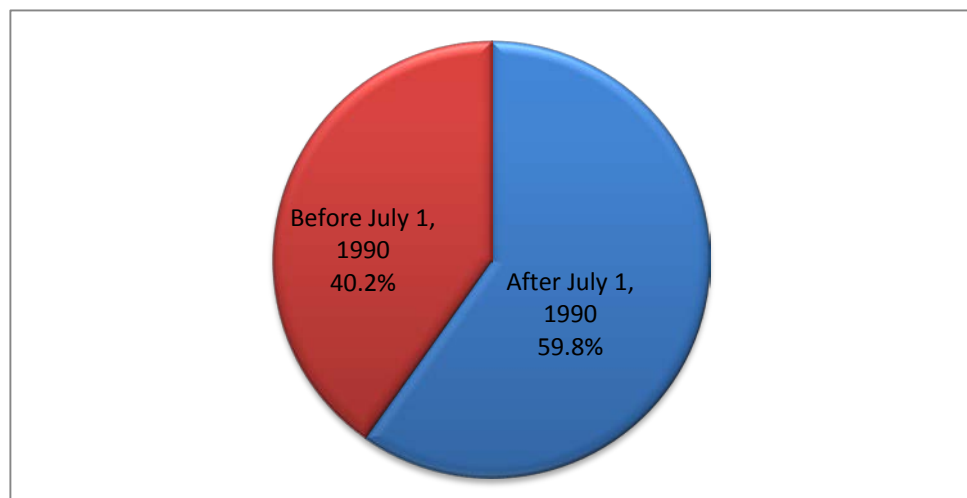


Figure 11: Percent of Wood Stove or Inserts Purchased New, Before or After July 1, 1990

¹³ Survey respondents were asked if their stove was purchased after July 1, 1990. After this date, all woodstoves were required to be EPA Certified. All pre-1990 woodstoves are, therefore, considered to be uncertified. Surveys prior to that completed for the 2007-2008 heating season asked respondents to classify their appliance as; Air Tight Stove (non-EPA Approved), Non Air Tight Stove, EPA Approved Stove, Wood Furnace, Combination Furnace and Open Fireplace.

percent of the Vermont households said that they had at least one woodstove, and of those respondents, 60% said that their stove was purchased new after July 1, 1990, implying the appliance was certified (Figure 11). Respondents that indicated their appliance was purchased after the EPA certification date were further asked if the appliance was a catalytic stove or a non-catalytic stove. Very few respondents indicated their stove was non-catalytic, but the high percentage of households that indicated they did not know if it was catalytic or non-catalytic suggests that this data may be unreliable.

Ownership of wood stoves had been steadily decreasing over the period of the surveys, but showed an increase in numbers for the last two survey periods.¹⁴ The current survey estimates that over 150,000 wood or pellet heating appliances were used in Vermont during the winter of 2014-2015, an increase of more than 57,000 units over the 1997-1998 figures (Appendix I -Table 18).

Data from the current survey indicates that overall usage of non EPA Certified wood stoves has declined since the 1997-1998 survey, but the number of these units is still substantial, with over 40% of wood burners having used at least one during the heating season (Appendix I -Table 15). The estimated total number of "EPA Certified" stoves in use more than doubled over the previous survey. This was the first survey since EPA Certification was instituted that the percentage of EPA Certified appliances exceeded the number of non-certified ones. (Appendix I -Table 18).

Previous survey results had indicated a slow but steady decline in the number of wood furnaces/boilers in use, but data from the 2007-2008 season showed that the total number of units has nearly doubled since the 1997-1998 survey to more than 22,000 Appendix I - (Table 18). The current survey indicates a decline to just over 16,000. The small sample size and associated variability may account for at least some of this change.

The current survey also asked that respondents characterize their wood furnace/boiler as an indoor or outdoor unit and to further indicate the purchase date of outdoor units (Appendix I -Table 17). Purchase dates corresponded to implementation dates of Outdoor Wood Boiler emissions standards imposed by the State of Vermont to limit particulate matter emissions¹⁵. Units purchased "on or after March 31, 2010" must meet the most stringent standard. Of the 19,308 wood furnace/boilers in use, 11,423 were indoor units and 5,017 were outdoor units. Fifty-eight percent (2,898) of the outdoor units were purchased prior to October 1, 2009 and were not subject to emissions standards. An estimated 924 units or 18% were purchased on or after October 1, 2009 and before March 31, 2010 and thus assumed to be Phase 1 compliant. Twenty-four percent were purchased on or after March 31, 2010 and are assumed to be Phase 2 compliant with the lowest prescribed particulate matter emissions limits.

The total numbers of fireplaces in use during the 2014-2015 heating season declined to levels not seen since the mid 1980's (Appendix I -Table 18).

The increased use of pellet burning appliances was among the most striking results of the survey when compared with the 2007-2008 season. Over 27,000 pellet stoves and over 4,900 pellet furnaces or boilers in use, an increase of more than 22,000 and 3,000 units respectively (Appendix I -Table 18).

The 2007-2008 assessment showed a large increase in the percentage of households which had installed or were planning to install a new wood or pellet burning appliance. The estimated numbers of new appliance installations had not been this high in the history of the survey, and when measured as a percentage of all households were only exceeded in the 1983-1984 survey (Appendix I -Table 19). Record high fossil fuel prices during the 2007-2008 heating season may explain the increase in the number of Vermonters planning to turn to wood fuel.

¹⁴ In 1995-1996 and earlier surveys, the question was, "What appliances do you have in the home?" In 1997-1998, 2007-2008 and 2014-2015 the question was, "What appliances did you use in the last heating season?"

¹⁵ Environmental Protection Regulations, Chapter 5, Air Pollution Control; 2014: VT AGENCY OF NATURAL RESOURCES; Montpelier, Vermont: <http://www.vtwoodsmoke.org/pdf/2015-02-06-%20DEC%202014%20Revised%20OWB%20Regs-stand%20alone.pdf>

The 2014-2015 assessment results indicate that over 9,800 households planned to install a new or used wood or pellet burning appliance for the coming heating season (2015-2016). Of those planning to install a new or used appliance, over 3,321 were “new” wood or pellet burners who did not already own an appliance (Appendix I -Table 19). This was considerably lower than the previous survey when approximately 6% of the survey respondents, representing over 15,000 households, said that they had installed or were planning to install a new wood burning appliance for the 2008-2009, heating season. Of those respondents planning to install new wood burning appliances, 53% planned to install a wood burning stove and 47% planned to install a pellet burning stove (Appendix I -Table 20). None of the households surveyed planned to install wood or pellet burning furnaces or boilers.

Fuel oil prices, on a per million Btu basis, which prior to the 2014-2015 heating season had been consistently higher than wood or pellet fuel prices, are likely to have influenced homeowners heating plans.

Wood Fuel Availability

In recent years, a combination of weather and supply logistics have led to concerns over availability of wood and pellet fuels. This further results in questions regarding the wisdom of wood fuel conversions. In an attempt to quantify the true extent of supply shortages and delivery delays, wood fuel users were asked about any negative experiences that they encountered in obtaining firewood or pellets during the 2014-2015 heating season.

Of the cordwood burners who had purchased wood for the 2014-2015 heating season, 9% reported experiencing delays in delivery, nearly 6% reported having to burn green wood, 3% found that their regular supplier had gone out of business and just under 3% were told by their supplier that they would be unable to supply them (Appendix I -Table 21). Overall, nearly 71% experienced none of the listed problems.

Pellet users reported experiencing a higher rate of negative situations when purchasing pellets for the 2014-2015 heating season (Appendix I -Table 22). Twenty-eight percent of respondents reported that their regular supplier was out of pellets or ran-out of pellets during the season, 27% reported suppliers rationing pellets and 15% experienced delays in delivery. Fifty-eight percent of respondents reported having none of the listed experiences.

Appendix I – Tables

Table 1: Fuels Used for Space Heating in Vermont, 2014-2015

Fuel	Primary	% of	Supplemental	% of	Total	% of
	Households	State	Households	State	Households	State
Oil	94,962	36.9%	36,049	14.0%	131,011	51.0%
Wood	51,764	20.1%	42,212	16.4%	93,976	36.6%
Electricity	4,463	1.7%	8,489	3.3%	12,952	5.0%
Propane	31,617	12.3%	26,778	10.4%	58,395	22.7%
Natural Gas	43,153	16.8%	2,169	0.8%	45,322	17.6%
Kerosene	7,356	2.9%	6,556	2.6%	13,912	5.4%
Coal	0	0.0%	544	0.2%	544	0.2%
Wood Pellets	21,614	8.4%	9,437	3.7%	31,051	12.1%
Solar	0	0.0%	1,139	0.4%	1,139	0.4%
Other	1,088	0.4%	17,639	6.9%	18,727	7.3%
Don't know	987	0.4%	521	0.2%	1,508	0.6%
Total	257,004	100.0%	151,533	58.96%	408,537	158.96%

Table 2: Fuels Used for Space Heat, 1985-1998, 2007-2008 and 2014-2015
Number and Percent of Households Using Each Fuel for Primary or Supplemental Heat¹⁶
(Does not include wood pleasure burners)

Fuel	1985-1986	1987-1988	1989-1990	1991-1992	1993-1994	1995-1996	1997-1998	2007-2008	2014-2015
Oil	116,300	117,300	125,650	123,255	119,759	122,412	124,045	136,244	131,011
	58.2%	59.5%	61.2%	58.0%	55.1%	55.5%	55.5%	54.3%	51.0%
Wood	96,600	78,000	74,552	84,141	82,339	81,402	70,083	80,744	93,976
	48.3%	39.1%	34.9%	39.1%	37.9%	36.6%	31.3%	32.2%	36.6%
Propane	15,300	16,800	34,310	21,861	43,624	40,689	44,521	56,538	58,395
	7.7%	8.3%	17.0%	10.3%	20.1%	18.5%	20.0%	22.5%	22.7%
Natural Gas	13,200	10,100	18,070	19,232	18,880	24,744	21,884	34,502	45,322
	6.6%	5.0%	8.9%	9.0%	8.7%	11.2%	10.0%	13.8%	17.6%
Electricity	31,100	30,000	17,831	31,575	25,288	21,522	17,200	14,564	12,952
	15.5%	14.9%	7.0%	14.8%	11.6%	9.8%	7.7%	5.8%	5.0%
Kerosene	11,800	26,000	10,078	15,854	13,332	14,425	20,051	20,210	13,912
	5.9%	12.9%	4.8%	7.5%	6.1%	6.5%	9.0%	8.1%	5.4%
Coal	4,800	4,400	1,799	513	3,069	2,319	215	2,476	544
	2.4%	2.2%	2.6%	0.2%	1.4%	1.1%	0.1%	1.0%	0.2%
Wood Pellets								6,988	31,051
								2.8%	12.1%

¹⁶ The wood pellet column was added in 2008 (no data shown in the table for previous surveys).

Table 3: Households Burning Wood for Space Heating, 2014-2015¹⁷

Type of Use	Number of Households	Percent of All Households	Percent of Wood Space Heating Households	Cords Burned	Mean Cords per Household
Primary	51,764	20.1%	53.4%	249,669	4.8
Supplemental	45,187	17.6%	46.6%	95,082	2.1
Total Space Heating	96,951	37.7%	100.0%	344,751	3.6
Fireplace Only	9,638	3.8%		2,780	0.3
Total	106,589	41.5%		347,530	3.3

Table 4: Households Burning Wood Pellets for Space Heating, 2014-2015

Type of Use	Number of Households	Percent of All Households	Percent of Wood Space Heating Households	Tons of Pellets Burned	Mean Tons per Household
Primary	21,614	8.4%	69.6%	94,838	4.4
Supplemental	9,437	3.7%	30.4%	31,318	3.3
Total Space Heating	31,051	12.1%	100.0%	126,156	4.1

¹⁷ The total number of cords burned indicated here is the best estimate calculated by summing the cords burned by primary and supplemental wood burners. This total is not the same as the total calculated by multiplying the mean number of cords by the number of wood burning households.

Table 5: Classification of Wood Burners, Vermont Households^{18,19}

	1981-1982	1983-1984	1985-1986	1987-1988	1989-1990	1991-1992	1993-1994	1995-1996	1997-1998	2007-2008	2014-2015
Not a Wood Burner	79,400	100,100	100,900	110,300	112,234	104,087	123,861	119,048	148,349	169,688	150,415
	43.1%	52.4%	50.5%	54.6%	54.8%	49.0%	57.0%	54.0%	66.3%	67.6%	58.5%
Total Wood Burning Households	104,700	91,000	98,800	91,756	92,574	108,543	93,495	101,331	75,367	81,183	106,589
	56.9%	47.6%	49.5%	45.4%	45.2%	51.0%	43.0%	46.0%	33.7%	32.4%	41.5%
1. Pleasure Burner Only	7,329	4,550	2,200	13,700	18,185	24,402	11,156	19,929	5,284	439	9,638
	4.0%	2.4%	1.1%	6.8%	8.9%	11.5%	5.1%	9.0%	2.4%	0.2%	3.8%
2. Burners for Space Heat	97,371	86,450	96,600	78,000	74,389	84,141	82,339	81,402	70,083	80,744	96,951
	52.9%	45.2%	48.4%	38.6%	36.3%	39.6%	37.9%	36.9%	31.3%	32.2%	37.7%
A. Primary Burner	77,478	63,700	73,000	49,800	40,648	53,974	44,176	41,434	36,490	46,951	51,764
	42.1%	33.3%	36.6%	24.7%	19.8%	25.4%	20.3%	18.8%	16.3%	18.7%	20.1%
B. Supplemental Burner	19,893	22,750	23,600	28,200	33,741	30,167	38,163	39,968	33,593	33,793	45,187
	10.8%	11.9%	11.8%	14.0%	16.5%	14.2%	17.6%	18.1%	15.0%	13.5%	17.6%
Total Households	184,100	191,100	199,700	202,000	204,808	212,630	217,356	220,379	223,716	250,871	257,004
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

¹⁸ Tabulations for 1983-1984 were produced using revised total numbers of households from the 1987-1988 report along with percentages published in the 1983-1984 report.

¹⁹ For 2007-2008, "Pleasure Burning" includes only one respondent. 26 of 27 respondents who indicated using a fireplace also stated that they burn cordwood for space heating.

Table 6: Classification of Wood Pellet Burners, Vermont Households, 2014-2015

	# of Households	Percent of All Households
Not a Wood Pellet Burner	225,953	87.9%
Total Wood Pellet Burning Households	31,051	12.1%
A. Primary Burner	21,614	8.4%
B. Supplemental Burner	9,437	3.7%
Total Households	257,004	100.0%

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Table 7: Cords of Wood Burned in the Last Heating Season, Vermont Households (compared to previous years)

	1981-1982	1983-1984	1985-1986	1987-1988	1989-1990	1991-1992	1993-1994	1995-1996	1997-1998	2007-2008	2014-2015
Total Cords Burned	519,000	424,000	451,000	322,000	277,129	352,112	330,006	295,409	249,873	314,233	347,530
Cords Burned by Primary Burners	456,720	356,160	386,000	251,000	191,771	279,503	225,711	198,993	178,495	245,630	249,669
Cords/Primary Burner	6	5.6	5.3	5.0	4.7	5.2	5.1	4.8	4.8	5.4	4.8
Cords Burned by Supplemental Burners	57,090	63,600	64,000	61,000	74,042	64,521	96,946	87,321	70,027	67,724	95,082
Cords/Supplemental Burner	2.7	2.8	2.7	2.2	2.2	2.1	2.5	2.2	2.1	2.3	2.1
Total Cords Burned for Space Heating	513,810	419,760	450,000	312,000	265,813	344,024	322,657	286,314	248,522	313,354	344,751
Cords Burned in Open Fireplace	5,190	4,240	1,000	10,000	11,316	8,088	7,349	9,094	1,351	878	2,780
Cords/Open Fireplace Burner	1	0.9	0.4	0.7	0.6	0.3	0.7	0.5	0.3	2.0	0.3

Table 8: Tons of Wood Pellets Burned in the Last Heating Season, Vermont Households 2014-2015

	Tons of Wood Pellets Burned 2014-2015
Total Wood Pellets Burned	126,156
Tons Wood Pellets Burned by Primary Burners	94,838
Wood Pellets/Primary Burner	4.4
Wood Pellets Burned by Supplemental Burners	31,318
Wood Pellets/Supplemental Burner	3.3

Table 9: Heating Degree Days, July 1- June 30, Burlington, Vermont^{20,21}

	1981-1982	1983-1984	1985-1986	1987-1988	1989-1990	1991-1992	1993-1994	1995-1996	1997-1998	2007-2008	2014-2015	Mean
Heating Degree Days (HDD)	8,877	8,333	8,216	8,334	8,390	8,437	8,900	8,591	7,705	7,826	8,532	8,457
Percent Above (Below) Mean HDD	4.7%	-1.5%	-2.9%	-1.5%	-0.8%	-0.2%	5.0%	1.6%	-9.8%	-8.1%	0.9%	
Cords per Primary Burner (CPB)	5.9	5.6	5.3	5	4.7	5.2	5.1	4.8	4.8	5.4	4.8	5.2
Percent Above (Below) Mean CPB	12.7%	8.7%	2.9%	-2.9%	-8.7%	1.0%	-1.0%	-6.8%	-6.8%	4.9%	-6.8%	

Table 10: Wood Burning by Type of Residence and Ownership of Residence, Vermont Households, 2014-2015²²

	Type of Residence					Own or Rent	
	Single Family Detached	Townhouse or Duplex	Two, Three, or 4 Family Building	Five or More Units	Mobile Home/ Trailer	Own the House	Rent the House
Primary Wood Burner	19.8%	0.0%	0.2%	0.0%	0.5%	19.6%	0.2%
Supplemental Wood Burner	16.6%	0.2%	0.5%	0.0%	0.0%	16.8%	0.6%
Pleasure Burner	3.6%	0.0%	0.2%	0.0%	0.0%	3.5%	0.0%
Primary Pellet Burner	8.0%	0.0%	0.0%	0.4%	0.2%	7.8%	0.6%
Supplemental Pellet Burner	3.3%	0.2%	0.2%	0.0%	0.4%	3.7%	0.0%
All Wood Burners	51.4%	0.4%	1.0%	0.4%	1.2%	51.4%	1.4%

²⁰ Heating Degree Days (HDD) for Vermont, July 1- June 30 for each heating season. Long term mean HDDs calculated for all years 1896-2015.

²¹ Heating Degree Days higher than the mean indicates a heating season colder than the mean.

²² The "All Wood Burners" row will not add up to the sum of rows above in all cases as some respondents burned both cordwood and wood pellets.

Table 11: Method of Obtaining Firewood, Vermont Households Which Burned Cordwood: 2014-2015

How Wood was Obtained	Percent of Wood Burning Households
Cut by yourself or a member of your immediate family	42.6%
Cut by friend	3.8%
Purchased (by respondent)	40.2%
Some of each	13.3%

Table 12: Form of Wood Purchased, Vermont Households Which Burned Cordwood and Purchased Wood: 2014-2015

Form Cordwood Purchased	Percent
Cut & Split	73.1%
Unsplit Blocks	1.2%
Log Length	16.8%
Some Other Form	1.0%
Don't know	0.8%

Table 13: Wood Storage Location, Vermont Households Which Burned Cordwood: 2014-2015

Cordwood Storage Location	Percent
Woodshed or similar roofed structure	40.8%
Basement	13.3%
Outside covered	36.8%
Outside uncovered	9.0%

Table 14: Length of Time which Cut Wood was Stored Prior to Burning, Vermont Households Which Burned Cordwood: 2014-2015

Cordwood Storage Time	Percent
6 months or less	32.8%
6 to 12 months	40.2%
12 to 18 months	17.8%
More than 18 months	9.2%

Table 15: Wood Burning Appliances and Wood Burned for Space Heat by County, 2014-2015

County	Cords Burned per Year for Space Heat, 2014-2015 ²³	Mean Cords Burned per Household per Year, 2014-2015 ²⁴	Percent of Households with One or More Wood or Pellet Burning Appliance, 2014-2015 ²⁵	Percent of Households with One or More Wood Burning Appliance, 2014-2015 ²⁶	Tons of Pellets Burned per Year for Space Heat, 2014-2015 ²⁷	Mean Tons of Pellets Burned per Household per Year, 2014-2015 ²⁸	Households with One or More Pellet Burning Appliance, 2014-2015 ²⁹
Addison	11,946	0.84	47%	40%	2,832	0.20	7%
Bennington	34,509	2.23	60%	51%	5,072	0.33	9%
Caledonia	25,139	2.01	62%	48%	5,058	0.40	14%
Chittenden	40,156	0.64	28%	25%	8,051	0.13	4%
Essex	5,500	1.98	40%	40%	2,220	0.80	20%
Franklin	30,939	1.66	55%	39%	11,115	0.60	16%
Grand Isle ³⁰	*	*	*	*	*	*	*
Lamoille	13,200	1.31	54%	46%	3,863	0.38	13%
Orange	12,926	1.08	54%	42%	7,728	0.65	15%
Orleans	23,280	2.11	61%	44%	18,000	1.63	26%
Rutland	30,747	1.19	48%	29%	28,224	1.10	21%
Washington	46,766	1.90	55%	45%	9,769	0.40	11%
Windham	30,149	1.55	58%	45%	2,586	0.13	13%
Windsor	42,223	1.69	60%	44%	27,207	1.09	17%
Vermont	347,479	1.35	48%	38%	131,723	0.51	12%

²³ Cords of wood burned per year by county was calculated as a weighted sum of respondents answers to number of cords burned.

²⁴ Mean cords burned per household was calculated by dividing the total cords burned in each county by the total number of households in that county.

²⁵ Percent of households with one or more wood or pellet burning appliance was calculated by dividing the number of households reporting one or more wood or pellet burning appliance by the total number of households in the county.

²⁶ Percent of households with one or more wood burning appliance was calculated by dividing the number of households reporting one or more wood burning appliance by the total number of households in the county.

²⁷ Tons of pellets burned per year by county was calculated as a weighted sum of respondents answers to number of tons burned.

²⁸ Mean tons of pellets burned per household was calculated by dividing the total tons burned in each county by the total number of households in that county.

²⁹ Percent of households with one or more pellet burning appliance was calculated by dividing the number of households reporting one or more pellet burning appliance by the total number of households in the county.

³⁰ No respondents from Grand Isle County reported burning wood during the 2014-2015 heating season.

Table 16: Wood Burned for Space Heating 2014-2015, 2007-2008 and 1989-1998 (averaged)

County	Cords Burned per Year for Space Heat 2014-2015	Mean Cords Burned per Household per Year 2014-2015	Statewide Rank: Mean Cords Burned per Household per Year 2014-2015	Cords Burned per Year for Space Heat 2007-2008	Mean Cords Burned per Household per Year 2007-2008	Statewide Rank: Mean Cords Burned per Household per Year 2007-2008	Cords Burned per Year for Space Heat 1989-1998 ³¹	Mean Cords Burned per Household per Year 1989-1998	Statewide Rank: Mean Cords Burned per Household per Year 1989-1998
Addison	11,946	0.84	12	14,594	1.08	11	19,784	1.64	7
Bennington	34,509	2.23	1	15,652	1.02	12	17,674	1.28	11
Caledonia	25,139	2.01	3	23,234	1.92	5	22,949	2.04	3
Chittenden	40,156	0.64	13	23,415	0.40	13	28,546	0.57	14
Essex	5,500	1.98	4	10,285	5.00	1	5,461	2.22	2
Franklin	30,939	1.66	7	22,871	1.26	10	14,581	0.98	12
Grand Isle	*	*	14	4,915	1.33	9	1,802	0.77	13
Lamoille	13,200	1.31	9	22,264	2.21	3	10,976	1.38	9
Orange	12,926	1.08	11	34,536	2.99	2	19,076	1.94	4
Orleans	23,280	2.11	2	19,053	1.93	4	22,291	2.35	1
Rutland	30,747	1.19	10	13,077	0.52	14	36,268	1.50	8
Washington	46,766	1.90	5	33,600	1.43	8	30,005	1.36	10
Windham	30,149	1.55	8	30,109	1.69	7	31,954	1.89	5
Windsor	42,223	1.69	6	45,747	1.84	6	39,540	1.72	6
Vermont	347,479	1.35		313,354	1.53		300,907	1.55	

³¹ Cords burned for surveys from 1989-1998 averaged.

Table 17: Types of Wood Burning Appliances Used in Vermont Households ("last heating season"), 2014-2015

Type of Appliance	Number of Households Using at Least One	Percent of all Households Using at Least One	Percent of Wood Burning Households Using at Least One
Wood Stove³²	77,957	30.33%	63.49%
Stoves Purchased Before 1990 ³³	29,704	11.56 %	24.19 %
Stoves Purchased 1990 or Later	41,062	15.98 %	33.44 %
Catalytic Stoves ³⁴	21,649	8.42%	17.63%
Non-Catalytic Stoves	444	0.17%	0.36%
Wood Pellet Stove	27,040	10.52%	22.02%
Pellet Furnace or Boiler	4,943	1.92%	4.03%
Wood Stove Insert in Fireplace	11,143	4.34%	9.07%
Inserts Purchased before 1990	2,574	1.00 %	2.10 %
Inserts Purchased 1990 or Later	7,534	2.93 %	6.14 %
Catalytic Inserts	2,883	1.12%	2.35%
Non-Catalytic Inserts	6,812	2.65%	5.55%
Fireplace with no Insert	9,638	3.75%	7.85%
Wood Furnace	16,440	6.40%	13.39%
Indoor Wood Furnace	11,423	4.44%	9.30%
Outdoor Wood Furnace	5,017	1.95%	4.09%
Purchased Before 10/2009	2,898	1.13%	2.36%
Purchased Between 10/09 and 4/10	924	0.36%	0.75%
Purchased After 4/10	1,195	0.46%	0.97%
Combination Furnace	2,868	1.12%	2.34%

³² Survey participants were asked if they used a wood stove or wood stove insert in a fireplace. If they answered yes, they were then asked if it was purchased after July 1, 1990. If they responded yes, they were then asked if the woodstove or wood stove insert was a catalytic stove. Because a portion of respondents did not know when the stove was purchased or did not know if it was a catalytic stove, the sum of the subsets will not equal the total number of households that reported using wood stoves.

³³ "Stoves Purchased Before 1990" and "Stoves Purchased 1990 or Later" are subsets of "Wood Stoves."

³⁴ "Catalytic Stoves" and "Non-Catalytic Stoves" are subsets of "Stoves Purchased 1990 or Later." 9658 households did not know if the stove was catalytic or not.

Table 18: Wood Burning Appliances Used in the “Last Heating Season,” Vermont Households

Type of Appliance	1981-1982	1983-1984 ³⁵	1985-1986	1987-1988	1989-1990	1991-1992 ³⁶	1993-1994	1995-1996	1997-1998	2007-2008 ³⁷	2014-2015
Air Tight Stove or Insert (Not EPA Certified)³⁸	51,069	45,590	58,200	50,250	50,486	56,448	35,283	35,794	31,548	35,018	32,278
	27.7%	23.9%	29.1%	24.9%	24.7%	26.5%	16.2%	16.2%	14.1%	14.0%	12.6%
Non Air Tight Stove or Insert (Not EPA Certified)	13,658	13,494	17,500	19,850	14,366	13,072	14,719	13,923	11,178	***	***
	7.4%	7.1%	8.8%	9.8%	7.0%	6.1%	6.8%	6.3%	5.0%	***	***
EPA Certified Stove	0	0	0	7,500	9,035	10,306	17,318	21,814	18,835	22,715	48,596
	0.0%	0.0%	0.0%	3.7%	4.4%	4.8%	8.0%	9.9%	8.4%	8.4%	18.9%
Wood Furnace	20,478	15,377	19,200	16,300	16,342	13,582	17,714	14,825	11,708	22,315	16,440
	11.1%	8.0%	9.6%	8.1%	8.0%	6.4%	8.2%	6.7%	5.2%	8.9%	6.4%
Combination Furnace	4,957	3,936	5,200	9,200	7,745	8,444	4,667	4,596	6,085	7,513	2,868
	2.7%	2.1%	2.6%	4.6%	3.8%	4.0%	2.1%	2.1%	2.7%	3.0%	1.1%
Open Fireplace	11,234	6,566	32,300	14,286	54,654	38,997	31,800	19,929	13,671	14,516	9,638
	6.1%	3.4%	16.2%	7.1%	26.7%	18.3%	14.6%	9.0%	6.1%	5.8%	3.8%
Wood Pellet Stoves³⁹										4,861	27,040
										1.9%	10.5%
Wood Pellet Furnace/Boiler										1,480	4,943
										0.6%	1.9%
Total Heating Appliances	101,396	84,963	132,400	117,386	152,628	140,849	121,501	110,881	93,025	115,366	150,029
Total Households	184,100	191,100	199,700	202,000	204,809	212,630	217,356	220,379	223,716	250,871	257,004

³⁵ In 1983-1984, the following population estimates were obtained: Furnace unspecified: 19,313; stove (type unspecified): 59,084; fireplace (unspecified if open or modified): 6,566. To provide estimates consistent with the other years, the 1983-1984 data were adjusted in the following ways:

- Furnace responses were distributed between wood furnace and combination furnace using the means of the proportion of each in the 1981-1982 and 1985-1986 survey data.
- Stove responses were distributed between air tight and non airtight using the means of the proportions in 1981-1982 and 1985-1986 survey data.

³⁶ The 1991-1992 questionnaire is no longer available so it was not possible to tell what data corresponded to the EPA approved stove question. Therefore, the total number of air tight stoves indicated by respondents was apportioned between EPA and non EPA according to the proportions indicated in the previously published report for 1991-1992.

³⁷ Starting with the 2007-2008 survey, participants were not asked if their wood burning appliance was an air-tight or non air-tight stove, nor were they asked if the stove was EPA Certified. If the appliance was purchased new after July 1, 1990, it was assumed to have been an EPA Certified stove.

³⁸ For surveys prior to 1997-1998 in which it is not known if a wood stove insert in a fireplace was EPA approved, wood stove inserts were included in air tight stoves, not EPA certified.

³⁹ 2007-2008 was the first season for which data on wood pellet stoves was included in the survey.

Table 19: Households Planning to Install New or Used Wood and Pellet Burning Appliances including Current Wood and Pellet Appliance Owners, 2014-2015^{40,41}

	1981-1982	1983-1984	1985-1986	1987-1988	1989-1990	1991-1992	1993-1994	1995-1996	1997-1998	2007-2008 New	2007-2008 Used	2014-2015 New	2014-2015 Used
Households	9,851	13,157	5,000	3,500	1,686	2,122	1,292	1,697	7,452	15,017	3,025	8,472	1,345
Percent of all Households	5.4%	6.9%	2.5%	1.7%	0.8%	1.0%	0.6%	0.8%	3.3%	6.0%	1.2%	3.3%	0.5%
Wood Appliance Owners													
Wood Appliance Owners										6,083	2,586	4,175	885
Percent of all Households										2.4%	1.0%	1.6%	0.3%
Pellet Appliance Owners													
Pellet Appliance Owners										668	0	1,420	0
Percent of all Households										0.3%	0.0%	0.6%	0.0%
Non-wood/Pellet Owners													
Non-wood/Pellet Owners										8,934	439	3,321	460
Percent of all Households										3.6%	0.2%	1.3%	0.2%
Current Wood/Pellet Owners													
Current Wood/Pellet Owners										6,083	2,586	5,151	885
Percent of all Households										2.4%	1.0%	2.0%	0.3%

⁴⁰ Respondents planning to install an appliance by whether they already had an appliance (included new and used appliances). For 2014-2015, count of all households: 257004

⁴¹ Number of "Current Wood/Pellet Owners" is less than the sum of "Wood Appliance Owners" and "Pellet Appliance Owners" because some households reported owning both appliances.

Table 20: Households Planning to Install New Wood and Pellet Burning Appliances by Type, Vermont Households, 2014-2015

Appliance Type	Number of Households	Percent of Those Installing New Appliances
Wood Stove	4,271	53.2%
Pellet Stove	3,757	46.8%
Indoor Wood Furnace or Boiler	0	0.0%
Outdoor Wood Furnace or Boiler	0	0.0%
Pellet Furnace or Boiler	0	0.0%
Total	8,028	100.0%

Table 21: Reported Negative Experiences Encountered when Purchasing Cordwood, Vermont Households Which Burned Cordwood: 2014-2015

Reported Negative Experience	Percentage
Regular supplier out of business	3.3%
Regular supplier unable to supply	2.8%
Delays in delivery	9.0%
Unable to get dry wood	1.0%
Had to burn green wood	5.8%
Other	5.4%
None of these experiences	70.8%

Table 22: Reported Negative Experiences Encountered when Purchasing Wood Pellets, Vermont Households Which Burned Pellets: 2014-2015

Reported Negative Experience	Percentage
Regular supplier out or ran out of pellets	27.8%
Rationing of wood pellets	26.5%
Delays in delivery	15.2%
Other	1.4%
None of these experiences	57.5%

Appendix II – Survey Procedures**Prior Year Surveys**

Prior year surveys for which the raw data are still available, 1989-1990 through 1995-1996, were cleaned with standard consistency checks. For the 1995-1996 survey, it was necessary to weight the data to compensate for a telephone book sampling frame in which some areas of the state appeared in more than one book. For these reasons, the tabulations here of prior year surveys do not always match the findings published previously. In spite of the data cleaning, data irregularities may exist. Specifically, data from the 1989-1990 and 1991-1992 surveys look somewhat odd. In the previous survey, three year averages were used to help show trends where these data abnormalities exist. In the 2007-2008 and 2014-2015 assessments however, the ten year data gap made this presentation of the data impossible.

2007-2008 Assessment

The 2007-2008 Vermont Residential Fuel Assessment is based on a telephone survey of Vermont households whose primary residence in the preceding winter was in Vermont. The sample was drawn by Random Digit Dial (RDD) to insure that both listed and unlisted numbers were included. The frame was all qualifying Vermont households with telephones found in blocks of telephone numbers which have at least one listed residential number. The sample was a proportionate, stratified sample: it was selected so that the number of respondents in a county was proportional to the estimated number of households in the county.

Interviewers asked to speak with the person who was most familiar with how the house was heated last winter. If that person was not available, the respondent was asked for a good time to call back to reach that person. Standard survey protocols applied. The contractor called at different times of the day and different days of the week. Up to six attempts were made to reach the appropriate person in the household. Up to three attempts were made to convert soft refusals. The sample size of 482 allows a 95% confidence interval with plus or minus 4.48% width for tabulations using the whole sample.

ICF Macro conducted the survey during March, 2009.

2014-2015 Assessment

Castleton Polling Institute at Castleton University was contracted by the Vermont Department of Forests, Parks and Recreation (FPR) to conduct the 2014-2015 Vermont Residential Fuel Assessment Survey. The survey was intended to further track residential fueling trends in the state of Vermont. The survey was last conducted in 2009 by another contractor on behalf of FPR.

The questionnaire was provided by FPR to the Polling Institute. The survey was conducted in English over the telephone. Please see Appendix III for the full survey instrument.

A probability based, dual-frame landline and cellular telephone sample of Vermont was used. The goal was to complete 30% of the surveys utilizing the cell phone sample to increase the coverage of the survey by including households without landline telephones. The sample was proportionally stratified by county. The sample was purchased from ASDE Survey Sampler, Inc. Appendix IV provides additional details from ASDE on the procedures utilized to generate the sample of telephone numbers. Interviewers were instructed to speak with the adult (age 18 years of age or older) in a private residence who was most familiar with how the house was heated during the past heating season (October 1, 2014 to April 30, 2015). Those whose primary residence was not in Vermont during the past heating seasons were screened out of the survey. A total of 509 interviews (153 from the cell phone sample) were completed between July 30, 2015 and August 17, 2015.

The 509 interviews were weighted to the 2013 U.S. Census American Community Survey population projections of the number of households in each Vermont county to adjust for the base probability of selection and

nonresponse. None of the sampling errors or statistical tests were adjusted for the design effects due to weighting or clustering.

The estimated sampling error (without adjusting for a design effect) for the total number of completed interviews (N=509), at a 95% confidence level with an assumed 50/50 response is (+/-) 4.34. This margin of error is based on the estimated total number of households (N=257,004) in Vermont. Any analysis utilizing a sub-group (i.e., comparing across counties or fuel types) will be much less precise and have a greater margin of error. As a reference for users of the 2014-2015 data, Figure 1 displays the margin of error at the 95% confidence level with an assumed 50/50 response for each Vermont county (without adjusting for design effect).

Figure 1. Estimated Margin of Error (95% confidence level, 50/50 response split) Per County Sub-Sample

County	Number of Cases 2014-2015	Margin of Error(+/-)
Addison	30	17.87%
Bennington	35	16.55%
Caledonia	21	21.37%
Chittenden	115	9.13%
Essex	5	43.79%
Franklin	31	17.59%
Grand Isle	2	69.28%
Lamoille	24	19.98%
Orange	26	19.20%
Orleans	23	20.41%
Rutland	58	12.85%
Washington	53	13.45%
Windham	38	15.88%
Windsor	48	14.13%
OVERALL	509	4.48%

For more information concerning the methodology of the 2014-2015 Vermont Residential Fuel Assessment Survey, please contact Castleton Polling Institute at polling@castleton.edu or via telephone at 802-770-7040.

Appendix III – 2015 Vermont Residential Fuel Assessment Survey

Intro1.

Hello, my name is _____. I'm calling on behalf of the Vermont Department of Forests, Parks, and Recreation to conduct a brief survey on energy use in Vermont. We're calling Vermont residents to find out how people heated their homes the last heating season. Are you the person in this household who is most familiar with how your house was heated during the past heating season (October 1st to April 30th)?

- 1 Yes
- 2 Unavailable (callback)
- 3 Refusal

[ONLY ASKED IF A CELL PHONE] Are you in a safe place to talk?

[ONLY ASKED IF INTRO1=2] IDCB.

May I please have their first name so I can ask for them when I call back?

[IF INTRO1=2] CBIntro.

Hi, may I please speak to %ID%?

Hello, my name is _____. I'm calling on behalf of the Vermont Department of Forests, Parks, and Recreation to conduct a brief survey on energy use in Vermont. We're calling Vermont residents to find out how people heated their homes last winter. Are you the person in this household who is most familiar with how your house was heated during the past heating season (October 1st to April 30th)?

- 1 Yes
- 2 Unavailable
- 3 Refusal

ELIG1.

Is this a private residence?

[PROMPT IF NEEDED: "As opposed to a business or commercial property?"]

[PROMPT IF NEEDED: "A private residence may be rented or owned."]

- 1 Yes
- 2 No [GO TO NONQUAL]
- 3 DON'T KNOW [GO TO NONQUAL]
- 4 REFUSED [GO TO NONQUAL]

ELIG2.

During the past heating season, October 1, 2014 to April 30, 2015, was your primary residence in Vermont?

- 1 Yes
- 2 No [GO TO NONQUAL]
- 3 DON'T KNOW [GO TO NONQUAL]
- 4 REFUSED [GO TO NONQUAL]

County.

What county did you reside in during the past heating season (October 1, 2014 - April 30, 2015)?

- 1 ADDISON COUNTY
- 2 BENNINGTONCOUNTY
- 3 CALEDONIA COUNTY
- 4 CHITTENDEN COUNTY
- 5 ESSEX COUNTY
- 6 FRANKLIN COUNTY
- 7 GRAND ISLE COUNTY
- 8 LAMOILLE COUNTY
- 9 ORANGE COUNTY
- 10 ORLEANS COUNTY
- 11 RUTLAND COUNTY

- 12 WASHINGTON COUNTY
- 13 WINDHAM COUNTY
- 14 WINDSOR COUNTY
- 15 DON'T KNOW
- 15 REFUSED

INTRO3.

Is the house you live in now the same house that you lived in during the past heating season?

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

A1.

During the past heating season, what kind of fuel provided most of the heat for the home you lived in?

By the past heating season, I mean any date between October 1, 2014 and April 30, 2015.

[PROMPT IF NEEDED: "Most means contributed more heat to the house than any other fuel. If multiple fuels were used, most does not necessarily mean more than 50% of the heat."]

[PROMPT IF NEEDED: "What kind of fuel did you use as your primary source of heat during the last heating season?"]

- 1 Fuel oil
- 2 Bio-Heat (alternative to traditional fuel oil made by replacing a percentage of the fossil fuel by blending in processed vegetable oil, known as biodiesel)
- 3 Wood
- 4 Wood Pellets (cylindrical pellets [about ¼ inch in diameter and 1 inch long] made from recycled sawdust)
- 5 Propane (also called bottled or tank gas)
- 6 Natural gas (from underground pipes serving the neighborhood)
- 7 Electricity- Baseboard
- 8 Electricity- Heat Pump
- 9 Kerosene
- 10 Coal
- 11 Solar
- 12 Other Fuel (SPECIFY)
- 13 DON'T KNOW
- 14 REFUSED

[ONLY IF A1=2] **A1a.**

What is the percentage of "Bio" in the Bio-heat blend (for example, a 2% addition of Bio mixed with regular fuel oil would be "2%")?

[FOR "DON'T KNOW" ENTER 8888]

[FOR "REFUSED TO ANSWER" ENTER 9999]

A1c.

Was [INSERT PRIMARY FUEL FROM A1] used during the last heating season to fuel any of the following appliances in addition to heating?

[PROMPT IF NEEDED: "Domestic water means water that is used for a respondent's hot water tank to heat the water for their faucets and showers. This does not include water used for any space heating purposes."]

A1c_1. Domestic Water Heater

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

A1c_2. Kitchen Range/Cook Stove

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

A1c_3. Clothes Dryer

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

A1c_4. Other (specify)

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF A1=1] **A2a.**

Approximately how much Fuel Oil did you use during the past heating season?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Gallons _____
- 2 Dollar Amount _____
- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF A1=3] **A2b.**

Overall, approximately how many standard cords of wood did you burn during the past heating season for heat as a primary heating fuel that you used to heat your home? This would include any wood you may have burned in your fireplace for heating purposes. The unit of measure for wood use is a standard cord, which is a volume of wood 4 feet by 4 feet by 8 feet.

[INTERVIEWER: if the respondent says they used wood "runs," ask what that would be in cords.]

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Cords _____
- 2 Runs _____
- 3 Dollar Amount _____
- 4 Other
- 5 DON'T KNOW
- 6 REFUSED

[ONLY ASKED IF A2B=4] **A2bother.**

Please Specify:

[ONLY ASKED IF A1=2] **A2bio.**

Approximately how much bio-heat did you use LAST winter?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Gallons _____
- 2 Dollar amount _____
- 3 DON'T KNOW

4 REFUSED

[ONLY ASKED IF A1=4] **A2c.**

Approximately how much wood pellets did you use LAST winter?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Bags _____
- 2 Tons _____
- 3 Dollar Amount _____
- 4 Other _____
- 5 DON'T KNOW
- 6 REFUSED

[ONLY ASKED IF A2c=4] **A2cother.**

Please Specify:

[ONLY ASKED IF A1=5] **A2d.**

Approximately how much propane did you use during the past heating season?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Gallons _____
- 2 Dollar amount _____
- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF A1=6] **A2e.**

Approximately how much natural gas did you use during the past heating season?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Cubic feet _____
- 2 Dollar Amount _____
- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF A1=7 or 8] **A2f.**

Approximately how much electricity did you use during the past heating season?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Kilowatt-hours of electricity _____
- 2 Dollar amount _____
- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF A1=9] **A2g.**

Approximately how much kerosene did you use during the past heating season?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Gallons _____
- 2 Dollar Amount _____

- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF A1=10] **A2h.**

Approximately how much coal did you use during the past heating season?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Pounds _____
- 2 bags _____
- 3 tons _____
- 4 Dollar Amount
- 5 DON'T KNOW
- 6 REFUSED

[ONLY ASKED IF A2H=4] **A2hdollar.**

How much: \$ _____

[ONLY ASKED IF A1=12] **A2j.**

Approximately how much of that Other did you use during the past heating season?

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Amount _____
- 2 Dollar Amount _____
- 3 DON'T KNOW
- 4 REFUSED

A3.

How old is your primary heating system?

[INTERVIEWER: DO NOT READ LIST UNLESS RESPONDENT NEEDS PROMPTING.]

- 1 LESS THAN ONE-YEAR-OLD
- 2 1 to 4 years old
- 3 5 to 9 years old
- 4 10 to 14 years old
- 5 15 to 19 years old
- 6 20 years older
- 7 DON'T KNOW
- 8 REFUSED

BIntro.

Now, I'll ask you a few questions about any secondary fuel you may have used during the past heating season which includes any time between October 1st, 2014 and April 30th, 2015. This would include any heating fuel you used as secondary or supplemental fuel to your primary heating fuel, which we have already discussed.

B1.

Were any other fuels used to heat your home during the past heating season besides your primary heating fuel which we have already discussed? These would include fuels that you used to supplement your primary heating fuel for your home during the past heating season.

- 1 Yes
- 2 No [GO TO B3]
- 3 DON'T KNOW [GO TO B3]
- 4 REFUSED [GO TO B3]

B2.

What other fuels were used during the past heating season as supplemental fuel to heat your home? [CHECK ALL THAT APPLY]

[INTERVIEWER: ONLY READ IF NEEDED.]

- 1 FUEL OIL
- 2 BIO-HEAT
- 3 WOOD
- 4 WOOD PELLETS
- 5 PROPANE
- 6 NATURAL GAS
- 7 ELECTRICITY-BASEBOARD
- 8 ELECTRICITY-HEAT PUMP
- 9 KEROSENE
- 10 COAL
- 11 SOLAR
- 12 OTHER (specify)
- 13 DON'T KNOW
- 14 REFUSED

[ONLY ASKED IF B2=2] B2a.

What is the percentage of "Bio" in the Bio-heat blend (for example, a 2% addition of Bio mixed with regular fuel oil would be "2%")?

[FOR "DON'T KNOW" ENTER 8888]

[FOR "REFUSED TO ANSWER" ENTER 9999]

B2b.

Was [SECONDARY FUEL] used during the last heating season to fuel any of the following appliances in addition to heating?

[PROMPT IF NEEDED: "Domestic water means water that is used for a respondent's hot water tank to heat the water for their faucets and showers. This does not include water used for any space heating purposes."]

B2B_1. Domestic Water Heater

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

B2B_2. Kitchen Range/Cook Stove

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

B2B_3. Clothes Dryer

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

B2B_4. Other (specify)

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

[IF A1=3 OR B2=3 OR A1=4 OR B2=4 GO TO B4] **B3.**

During the past heating season, did you burn any wood for space heating?

[IF NEEDED: THIS INCLUDES WOOD PELLETS.]

[IF NEEDED, SPACE HEATING IS USING A FUEL DEVICE TO HEAT A SPACE (USUALLY AN ENCLOSED SPACE) WITHIN YOUR HOME.]

- 1 Yes
- 2 No [GO TO EINTRO]
- 3 DON'T KNOW [GO TO EINTRO]
- 4 REFUSED [GO TO EINTRO]

[ONLY ASKED IF A1=3 OR B2=3 OR B3=1] B4.

During the past heating season, did you burn cordwood, wood pellets or some of each?

[INTERVIEWER: if needed, cordwood is also known as firewood and is measured and sold in units called cords. A "full" cord measures 4x4x8 ft. and is the official, standard firewood measure.]

- 1 Cordwood
- 2 Pellets
- 3 Some of each
- 4 DON'T KNOW
- 5 REFUSED

[ASKED ONLY IF B2=3 OR B4=1 OR B4=3 AND A1 ≠ 3] B4CWD.

The next questions pertain to the amount of cord wood burned during the past heating season for heat as a supplement to the primary heating fuel that you used to heat your home. Overall, how many standard cords of wood did you burn during the past heating season for heat as a supplement to the primary heating fuel that you used to heat your home? This would include any wood you may have burned in your fireplace for heating purposes. The unit of measure for wood use is a standard cord, which is 4 feet x 4 feet x 8 feet.

[INTERVIEWER: IF RESPONDENT SAYS THEY USED WOOD "RUNS," ASK RESPONDENT WHAT THAT WOULD BE IN CORDS.]

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Cords _____
- 2 Runs _____
- 3 Dollar amount _____
- 4 OTHER (SPECIFY)
- 5 DON'T KNOW
- 6 REFUSED

[ONLY IF B4CWD=4] B4CWDOther.

Please Specify:

[ASKED ONLY IF B2=4 OR B4=2 OR B4=3 AND A1 ≠ 4] B4Pel.

Last heating season, how many bags or tons of wood pellets did you burn for heat as a supplement to the primary heating fuel that you used to heat your home?

[INTERVIEWER: IF NEEDED, RESIDENTIAL USERS TYPICALLY PURCHASE PELLETS BY THE BAG (STANDARD 40 POUND BAGS) OR BY THE TON (2000 POUNDS OR 50 BAGS).

[INTERVIEWER: FOR THIS SECTION, ONLY RECORD A DOLLAR AMOUNT IF THE RESPONDENT CANNOT GIVE YOU A UNIT AMOUNT.]

- 1 Bags _____
- 2 Tons _____
- 3 Dollar amount _____
- 4 Other
- 5 DON'T KNOW

6 REFUSED

[ONLY ASKED IF B4PEL=4] **B4PELOTHER.**

Please specify:

[ONLY ASKED IF A1=3 OR A1=4 OR B2=3 OR B2=4 OR B4=1 OR B4=2 OR B4=3, OTHERWISE GO TO EINTRO] **CIntro.**

Now, I'll ask you about the types of wood burning appliances you may have used during the past heating season which includes any time between October 1, 2014 and April 30, 2015. Please tell me which of the following wood burning appliances you burned wood in last winter.

[IF B4=2 GO TO C1_2] **C1_1.**

Last heating season, did you burn wood in a wood stove?

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

[IF B4=1 GO TO C1_3] **C1_2.**

Last heating season, did you burn wood pellets in a pellet stove?

[INTERVIEWER: IF NEEDED, A PELLETT STOVE IS A SPACE HEATER INTENDED TO HEAT A SPACE DIRECTLY.]

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

[IF B4=1 GO TO C1_4] **C1_3.**

Last winter, did you burn wood pellets in a pellet furnace or boiler?

[INTERVIEWER: IF NEEDED, A PELLETT FURNACE OR BOILER IS A CENTRAL HEATING SYSTEM WHICH USES A NETWORK OF AIR DUCTS OR WATER PIPES TO DISTRIBUTE HEAT TO ALL ROOMS OF A HOUSE.]

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

[IF B4=2 GO TO C1_8] **C1_4.**

Last heating season, did you burn wood in a wood stove insert in a fire place?

[INTERVIEWER: IF NEEDED, INSERTS ARE USED TO CONVERT MASONRY FIREPLACES INTO EFFECTIVE HEATING SYSTEMS. AN INSERT CONSISTS OF A FIREBOX SURROUNDED BY A STEEL SHELL.]

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

C1_5.

Last heating season, did you burn wood in a wood furnace or boiler?

[INTERVIEWER: IF NEEDED, WOOD FURNACE OR BOILER IS A CENTRAL HEATING SYSTEM WHICH USES A NETWORK OF AIR DUCTS OR WATER PIPES TO DISTRIBUTE HEAT TO ALL ROOMS OF THE HOUSE. WOOD IS USED AS THE FUEL, AND HEATING AIR IS FORCED THROUGH DUCTS WITH A FAN FOR THE FURNACE AND THROUGH WATER PIPE FOR THE BOILER.]

- 1 Yes
- 2 No [GO TO C1_6]
- 3 DON'T KNOW [GO TO C1_6]

4 REFUSED [GO TO C1_6]

C1_5a.

Was the wood furnace or boiler you used during the past heating season used inside or outside of your house?

- 1 Inside the house
- 2 Outside the house
- 3 Both inside and outside the house
- 4 DON'T KNOW
- 5 REFUSED

C1_6.

Last heating season, did you burn wood in an open fireplace, that is a fireplace without a wood stove insert?

[IF NEEDED: A FIREPLACE WITHOUT A STOVE INSERT IS USED MOSTLY FOR VIEWING RATHER THAN HEATING. IT HAS NOT BEEN MODIFIED BY ITS MANUFACTURER TO INCLUDE AN INSERT CONSISTING OF A FIREBOX SURROUNDED BY A STEEL SHELL TO IMPROVE THE HEATING PROCESS.]

- 1 Yes
- 2 No [GO TO C1_7]
- 3 DON'T KNOW [GO TO C1_7]
- 4 REFUSED

C1_6a.

Now, thinking only about wood burned in your open fireplace for pleasure burning, not for heating purposes: How many standard cords of wood did you burn in that fireplace during the last heating season?

- 1 Cords _____
- 2 Runs _____
- 3 Dollar Amount _____
- 4 OTHER
- 5 DON'T KNOW
- 6 REFUSED

[ONLY IF C1_6A=4] **C1_6AOTHER.**

Please specify:

C1_7.

Last heating season, did you burn wood in a combination furnace or boiler that can burn wood or other fuels?

[INTERVIEWER: IF NEEDED, A COMBINATION FURNACE OR BOILER IS NORMALLY DESIGNED TO BURN EITHER WOOD OR OIL IN THE SAME UNIT.]

- 1 Yes
- 2 No [GO TO C1_8]
- 3 DON'T KNOW [GO TO C1_8]
- 4 REFUSED [GO TO C1_8]

C1_7a.

Was the combination furnace or boiler you used during the past heating season used inside or outside of your house?

- 1 Inside the house
- 2 Outside the house
- 3 Both inside and outside the house
- 4 DON'T KNOW
- 5 REFUSED

[ONLY ASKED IF B4 <> 1] **C1_8.**

During the past heating season, did you burn wood pellets in another appliance that I have not mentioned?

- 1 Yes (specify) _____
- 2 No

- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF C1_7A=2 OR C1_5A=2] C1_9.

When was the wood furnace/boiler or combination furnace/boiler that you used during the past heating season purchased and installed?

- 1 Before October, 2009
- 2 Between October 1, 2009 and March 31, 2010
- 3 After March 31, 2010
- 4 DON'T KNOW
- 5 REFUSED

[ONLY ASKED IF C1_1=1 OR C1_4=1 ALL OTHERS GO TO C_BUY] C2.

Was the stove or fireplace insert you used during the past heating season purchased new from a store or manufacturer after July 1, 1990?

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

C3.

Was the stove or fireplace insert you used last heating season a catalytic wood stove?

[INTERVIEWER: IF NEEDED, IN CATALYTIC STOVES, THE SMOKY EXHAUST IS PASSED THROUGH A COATED CERAMIC HONEYCOMB INSIDE THE STOVE WHERE THE SMOKE AND GASES AND PARTICLES IGNITE AND BURN.

- 1 Yes
- 2 No [GO TO C_BUY]
- 3 DON'T KNOW [GO TO C_BUY]
- 4 REFUSED [GO TO C_BUY]

C3a.

Has the catalyst in the stove ever been replaced?

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED OF THOSE WHO BURN CORD WOOD OR PELLETS OTHERWISE GO TO EINTRO] C_Buy.

Now, I'll ask you some questions about the cord wood that you burned during the past heating season regardless of when you actually purchased or got the wood.

C_Buy1.

How did you get the wood you burned during the previous heating season?

- 1 Cut by yourself or a member inside your immediate family
- 2 Cut by friend
- 3 Purchased (by respondent) [GO TO C_BUY1B2]
- 4 Some of each
- 5 DON'T KNOW [GO TO EINTRO]
- 6 REFUSED [GO TO EINTRO]

C_Buy1a.

For wood cut by yourself, a family member or friend: what town was the wood cut in?

[ONLY ASKED IF C_BUY1=3 OR 4] C_Buy1b2.

For wood that you purchased: In what town and state is your firewood dealer's business located?

- Town:
- State:

C_Buy2.

In what form was the purchased wood bought? Was it...[CHECK ALL THAT APPLY]

- 1 Cut& Split
- 2 Unsplit blocks
- 3 Log Length
- 4 Some other form (specify)
- 5 DON'T KNOW
- 6 REFUSED

[ONLY ASKED IF C_BUY2=4] **C_BUY2OTHER.**

Please specify:

C_Buy2a.

How much did you pay per cord for the wood you burned during the previous heating?

[FOR "DON'T KNOW" ENTER 8888]

[FOR "REFUSED TO ANSWER" ENTER 9999]

[ONLY ASKED IF C_BUY1=3 OR C_BUY1=4] **C_Buy2b.**

Did you experience any of the following when purchasing the wood you burned during the previous heating season? [SELECT MULTIPLE RESPONSES]

- 1 Regular supplier was out of business
- 2 Regular supplier was unable to supply
- 3 Delays in delivery
- 4 Unable to get dry wood
- 5 Had to burn green wood
- 6 Other (specify)
- 7 DID NOT EXPERINCE ANY OF THESE
- 8 DON'T KNOW
- 9 REFUSED

C4a.

How do you store your wood prior to burning?

- 1 Woodshed or similar roofed structure
- 2 Basement
- 3 Outside covered
- 4 Outside uncovered
- 5 DON'T KNOW
- 6 REFUSED

C4b.

How long is your wood stored before being burned?

- 1 6 months or less
- 2 6 to 12 months
- 3 12 to 18 months
- 4 More than 18 months
- 5 DON'T KNOW
- 6 REFUSED

[ONLY ASKED IF BURN PELLETS OTHERWISE GO TO EINTRO 1] **C5a.**

On average, how much did you pay per ton or per bag for the wood pellets you burned during the previous heating season?

- 1 \$ PER TON _____
- 2 \$ PER STANDARD 40 POUND BAG _____
- 3 DON'T KNOW

4 REFUSED

C5b.

Did you experience any of the following when purchasing the wood pellets you burned during the previous heating season? [CHECK ALL THAT APPLY.]

- 1 Regular supplier was out or ran out of wood pellets
- 2 Rationing of wood pellets
- 3 Delays in delivery
- 4 Other (specify)
- 5 DID NOT EXPERIENCE ANY OF THESE
- 6 DON'T KNOW
- 7 REFUSED

C5c.

How do you store your supply of wood pellets?

- 1 Outside in bags (this would include sheds or garages)
- 2 Inside in bags (this would include the basement)
- 3 Bulk storage outside in a silo or similar structure
- 4 Bulk storage inside (most likely in the basement)
- 5 DON'T KNOW
- 6 REFUSED

EIntro.

Now, I will ask you a few questions about your experiences with your current heating systems and your plans for the future.

EIntro1.

How long have you been using [PRIMARY FUEL] for heating this residence?

- 1 Less than 1 year (# OF MONTHS)
- 2 1 year or more (# OF YEARS)
- 3 DON'T KNOW
- 4 REFUSED

[ONLY ASKED IF B1=1 OTHERWISE GO TO E1] **EIntro2.**

How long have you been using [SECONDARY FUEL] for heating this residence?

- 1 Less than 1 year (# OF MONTHS)
- 2 1 year or more (# OF YEARS)
- 3 DON'T KNOW
- 4 REFUSED

E1.

During the coming heating season do you plan to burn any cord wood?

[INTERVIEWER: IF NEEDED, CORDWOOD IS ALSO KNOWN AS FIREWOOD AND IS MEASURED AND SOLD IN UNITS CALLED CORDS. A FULL CORD MEASURES 4ft. x 4ft. x 8ft. AND IS THE OFFICIAL STANDARD FIREWOOD MEASURE.]

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

E2.

During the coming heating season do you plan to burn any wood pellets?

[IF NEEDED, WOOD PELLETS ARE CYLINDRICAL PELLETS (ABOUT 1/4 INCH IN DIAMETER AND 1 INCH LONG) MADE FROM RECYCLED SAWDUST.]

- 1 Yes
- 2 No
- 3 DON'T KNOW

4 REFUSED

E3.

Do you plan to purchase or install a new wood burning appliance such as a wood stove, pellet stove or fireplace for use during the coming heating season (October 1, 2015 - April 30, 2016)?

[INTERVIEWER: IF NEEDED, NEW MEANS PURCHASED FROM A STORE OR MANUFACTURER.]

- 1 Yes
- 2 No [GO TO E4]
- 3 DON'T KNOW [GO TO E4]
- 4 REFUSED [GO TO E4]

E3_1.

Do you plan on purchasing a... [CHECK ALL THAT APPLY]

- 1 Wood Stove
- 2 Pellet Stove
- 3 Indoor Wood Furnace or Boiler
- 4 Outdoor Wood Furnace or Boiler
- 5 Pellet Furnace or Boiler
- 6 DON'T KNOW
- 7 REFUSED

E4.

Do you plan to purchase or install a used or previously owned wood burning appliance such as a wood stove, pellet stove or fireplace for use during the coming heating season?

- 1 Yes
- 2 No [GO TO E4A]
- 3 DON'T KNOW [GO TO E4A]
- 4 REFUSED [GO TO E4A]

E4_1.

Do you plan on purchasing a used or previously owned: [CHECK ALL THAT APPLY]

- 1 Wood Stove
- 2 Pellet Stove
- 3 Indoor Wood Furnace or Boiler
- 4 Outdoor Wood Furnace or Boiler
- 5 Pellet Furnace or Boiler
- 6 DON'T KNOW
- 7 REFUSED

E4a.

Do you plan to install any of the following heating systems or heating appliances for use during the coming heating season? [CHECK ALL THAT APPLY]

- 1 Cold Climate Heat Pump (electric)
- 2 Electric Baseboard Heat
- 3 Oil Fired Furnace (force hot air)
- 4 Oil Fired Boiler (hot water)
- 5 Propane Furnace
- 6 Natural Gas Furnace
- 7 Natural Gas Boiler
- 8 Natural Gas Stove
- 9 Coal Furnace
- 10 Coal Boiler
- 11 Coal Stove
- 12 I do not plan to install any of these

- 13 DON'T KNOW
- 14 REFUSED

E5.

Next, I have some questions about air conditioning appliances that you may have in your current home.

E5a.

Do you have whole house air conditioning such as central air?

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

E5b.

Do you have a window air conditioner?

- 1 Yes
- 2 No [GO TO E5D]
- 3 DON'T KNOW [GO TO E5D]
- 4 REFUSED [GO TO E5D]

E5c.

How many window air conditioners do you have?

- 1 1
- 2 2
- 3 3
- 4 4
- 5 5
- 6 6 or more
- 7 DON'T KNOW
- 8 REFUSED

E5d.

Do you have a year round ductless split heat pump or air conditioner?

- 1 Yes
- 2 No
- 3 DON'T KNOW
- 4 REFUSED

FIntro.

Now I have some questions about the home you lived in during the last heating season.

F1.

What type of building did you live in during the last heating season? Was it a...

- 1 Detached single-family home
- 2 Townhouse or duplex, with a wall separating the units from basement to roof, with separate utilities for each [GO TO F2]
- 3 Two, three or four family building with no basement wall separating units or with one water and sewer bill [GO TO F2]
- 4 Part of a building with 5 or more units [GO TO F2]
- 5 Other (specify) [GO TO F2]
- 6 DON'T KNOW
- 7 REFUSED

F1a.

What type of single-family home? Was it a...

- 1 Ranch Style home

- 2 1.5 story cape
- 3 Split level
- 4 A-Frame
- 5 Log-cabin
- 6 Salt box
- 7 Two story home (other than log cabin, salt box or split level)
- 8 Other (specify)
- 9 DON'T KNOW
- 10 REFUSED

[ASKED ONLY IF F1 < 4] F2.

How was your home built? Was it...

- 1 Constructed on-site using a foundation (these homes are usually built with wood framing but could also be from brick, metal or another material)
- 2 A modular home (built at a factory in separate units then assembled and set onto a foundation)
- 3 A mobile home (built at a factory and delivered as a single unit)
- 4 DON'T KNOW
- 5 REFUSED

[ASKED ONLY IF F2=3] F2a.

Is it a...

- 1 Single/regular mobile home
- 2 Double-wide mobile home
- 3 DON'T KNOW
- 4 REFUSED

F3.

Approximately what year was this home or building built?

[FOR "DON'T KNOW" ENTER 8888]

[FOR "REFUSED TO ANSWER" ENTER 9999]

F5.

Last heating season, was your home...

[INTERVIEWER: IF NEEDED, "OCCUPIED WITH PAYMENT OF CASH" COULD MEAN "OCCUPIED IN EXCHANGE FOR UPKEEP OF THE PROPERTY" OR A SIMILAR ARRANGEMENT.]

- 1 Owned by you or someone in the household
- 2 Rented by you
- 3 Occupied without payment of cash rent
- 4 DON'T KNOW
- 5 REFUSED

F6.

What electric utility supplied power to your home during the last heating season?

- 1 Barton
- 2 Burlington Electric Department
- 3 Village of Enosburg Falls
- 4 Green Mountain Power
- 5 Hardwick Electric Department
- 6 Village of Hyde Park
- 7 Village of Jacksonville
- 8 Village of Johnson
- 9 Ludlow Electric Department
- 10 Lyndonville Electric Department

- 11 Morrisville Water & Light Department
- 12 Town of Northfield
- 13 Village of Orleans
- 15 Stowe Electric Department
- 16 Swanton Electric Department
- 17 Vermont Electric Co-op
- 18 Washington Electric Co-op
- 19 No utility power. Electricity generated at the home from solar or wind power.
- 20 No utility power and no electricity generated at the home.
- 21 Other (specify)
- 22 DON'T KNOW
- 99 REFUSED

F7.

Finally, I have some questions about the size of your home and the number of people who live in it. Including yourself, how many people lived in your household last heating season?

- 1 ONE
- 2 TWO
- 3 THREE
- 4 FOUR
- 5 FIVE
- 6 SIX
- 7 SEVEN
- 8 EIGHT OR MORE
- 9 DON'T KNOW
- 10 REFUSED

F8.

What is the approximate square footage of the living space of your home? Please do not include unheated garages, attics or basement space. Is it...

- 1 Less than 800 square feet
- 2 800 to 1,199 square feet
- 3 1,200 to 1,599 square feet
- 4 1,600 to 1,999 square feet
- 5 2,000 to 2,499 square feet
- 6 2,500 to 2,999 square feet
- 7 3,000 to 3,999 square feet
- 8 4,000 to 4,999 square feet
- 9 5,000 or more square feet
- 10 DON'T KNOW
- 11 REFUSED

F8.

How many rooms are in your home, not counting bathrooms, halls, garages, porches or unfinished rooms?

- 1 1
- 2 2
- 3 3
- 4 4
- 5 5
- 6 6
- 7 7
- 8 8
- 9 9
- 10 10 or more
- 11 DON'T KNOW

12 REFUSED

F10.

How many bedrooms are in your home?

[ENTER ZERO FOR A STUDIO APARTMENT WITH NO BEDROOMS.]

[FOR "DON'T KNOW" ENTER 88]

[FOR "REFUSED TO ANSWER" ENTER 99]

[ASKED ONLY OF THOSE CONTACTED ON A LANDLINE] **Cellphone.**

Do you have a cellphone that you use for personal use?

[INTERVIEWER: IF NEEDED, ASSURE THEM THAT WE WILL NOT BE ASKING FOR THEIR NUMBER OR CONTACTING THEM ON THEIR CELLPHONE. THIS IS FOR DEMOGRAPHIC PURPOSES ONLY.]

1 Yes

2 No

3 DON'T KNOW

4 REFUSED

[ASKED ONLY OF THOSE CONTACTED ON A CELLPHONE] **Landline.**

Do you have also have a landline telephone?

[INTERVIEWER: IF NEEDED, ASSURE THEM THAT WE WILL NOT BE ASKING FOR THEIR NUMBER OR CONTACTING THEM ON THEIR LANDLINE. THIS IS FOR DEMOGRAPHIC PURPOSES ONLY.]

1 Yes

2 No

3 DON'T KNOW

4 REFUSED

Income.

Is your annual household income from all sources...

[INTERVIEWER: READ LIST UNTIL RESPONDENT GIVES YOU AN ANSWER.]

INTERVIEWER: IF NEEDED, REMIND RESPONDENT THAT ALL THEIR RESPONSES ARE KEPT COMPLETELY CONFIDENTIAL.

1 Less than \$15,000

2 \$15,000 to \$25,000

2 \$25,001 to \$35,000

3 \$35,001 to \$50,000

4 \$50,001 to \$75,000

5 \$75,001 to \$100,000

6 More than \$100,000

7 DON'T KNOW

8 REFUSED

DEM_TOWN.

What town do you live in?

ZIPCODE.

What is your ZIP Code?

Outro.

Those were all the questions I had for you. Thank you very much for your time, and have a good evening.

NonQual.

Thank you very much, but we are only interviewing people who spent the last heating season in a private Vermont residence. Thank you very much for your time, and have a good evening.

Appendix IV: ASDE Survey Sampler, Inc. Sampling Description Details

Details provided by ASDE (via email from Michel Durocher) to Castleton Polling Institute.

Landline sample general description:

The phone numbers are analyzed at the 100 block level: xxx - xxx - xnnn, each block is counted for residential and business numbers, the lowest and highest number allocated in each block is found. Business and residential numbers are the object of separate counts. For every geography chosen by the user, ASDE Survey Sampler assembles all blocks belonging to that geography and totals up the number of phones in service.

(N) for the required sample size (n) in each geography, ASDE Survey Sampler uses a systematic sampling procedure to select a starting block with probability proportional to the number of directory listed (DL) phone numbers. Within each such block, it then randomly generates phone numbers between the smallest and largest known numbers until exactly one number is found. The program then advances (N/n) to the next block (or if N/n < block size within the same block), and repeats the selection process. Each number generated is checked against a licensed database of directory listed phone numbers, and the number is flagged as DL or directory not listed (DNL) and marked as either business or residential.

For residential samples, business numbers are rejected and replaced from the same working block. The appropriate information (name, address and postal code) when the number has been found to be DL. For DNL numbers a proximate zip code is added. All numbers are then geo-coded for all pertinent census and electoral boundaries. The DL and DNL together constitute the RDD sample. Weights are applied to the DNL portion based on the density of the listed phones in the block where the DNL number has been generated.

For **cell sample**, the numbers are generated from list of existing dedicated cell phone exchanges, The geographical information available for each number is limited to the area code (which places it in a State) and the rate center name (which is the city/town where that phone exchange switching station resides), or combined to form a county. The sample is stratified based on the rate center.