

**Washoe County, Nevada**  
**Residential Wood Use Survey**  
**2005-2006**

**DISTRICT HEALTH**



**DEPARTMENT**

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## EXECUTIVE SUMMARY

Residential wood combustion (RWC) is a significant source of air pollution in Washoe County. RWC emissions have been directly linked to monitored violations of particulate matters less than 10 microns in size (PM<sub>10</sub>) and carbon monoxide (CO) of the national ambient air quality standards. It is therefore important that we quantify and characterize this emission source to the best of our abilities in order to develop appropriate preventative and mitigative measures.

The RWC report represents the seventh in a series of professionally administered surveys conducted once every two to three years. The establishment of a consistent survey instrument and the comparison of socioeconomic data with other agency surveys have allowed the Washoe County Air Quality Management Division (AQMD) staff to achieve a high degree of confidence in the results. The following are some highlights of the 2005-2006 survey:

- In Washoe County, approximately 21,000 fireplaces, 10,000 certified woodstoves/inserts, 400 non-certified woodstoves/inserts, and 4,100 pellet stoves were used this past winter.
- Approximately 57% of the certified woodstoves/inserts were described as 15 or more years old and 41% were described as less than 15 years old. These devices are certified as EPA's Phase I and Phase II stoves/inserts, respectively.
- The number of wood burning devices has remained relatively flat over the sixteen-year survey period, despite an over 25% increase in population. The exception has been pellet stoves -- their number has doubled over the same period. Natural gas-fired appliances are not accounted for in this survey because they do not contribute significantly to CO or PM<sub>10</sub> air pollution.
- The winter of 2005-2006 was a relatively mild winter as compared to the 2003-2004 winter, according to the number of heating degree days (2,927 vs. 3,210 days, respectively). However, the number of days solid fuel heating devices were used had increased three times for fireplace and pellet stove users and two times for woodstove users.
- The Green/Yellow/Red curtailment program maintains a high level of public awareness (78%) and compliance (57%); however, these numbers are down slightly from previous surveys despite a public awareness media campaign addressing this program performed in late October of 2004. This campaign will most likely be performed again before the next survey is conducted. This will help to ensure a continuously high awareness and compliance rate.

The 2005-2006 survey indicated an increase in firewood consumption as compared to the 2003-2004 survey. This increase is caused primarily by the higher cost of heating fuel other than firewood. However, the overall surveys from 1992 through 2005 indicate a declining trend in residential wood stove emissions in Washoe County. This reduction has been reflected in the improved ambient air quality monitored in Washoe County over the last decade. Staff will contract another survey in 2007-2008 to continue determining the trends in solid fuel burning.

## I. INTRODUCTION

The Truckee Meadows Air Basin is designated non-attainment for PM<sub>10</sub> and CO. This means that the Truckee Meadows violates, or has violated, the federal health standards for PM<sub>10</sub> and CO. Residential wood combustion (RWC) is a significant contributor to air pollution in the Truckee Meadows. In order to estimate RWC's contribution to PM<sub>10</sub> and CO concentrations, several surveys of the region's wood use patterns have been conducted. The Desert Research Institute (DRI) conducted the first major study in 1983-1984. Since then, the Washoe County Air Quality Management Division (AQMD) has conducted surveys every two to three years. The most recent survey took place between April 11 and April 30 of 2006, when calls were made to 1,241 respondents. The next RWC survey will be conducted for the winter of 2007-2008. The continuation of future surveys will provide a trend of wood and pellet use in Washoe County and to alert AQMD staff of potential concerns regarding air quality in the Truckee Meadows.

This report analyzes the RWC activity for the winter of 2005-2006. The data for the report were gathered from a telephone survey of area residents. MarkeTec, Inc., a locally owned and operated marketing and surveying firm conducted the survey. MarkeTec, Inc. has been contracted to perform this survey since the 1992-1993 survey. The survey instrument used to gather data for this report has remained unchanged except for minor procedural changes over the survey years. AQMD plans to conduct this same survey again in future years to validate data and perhaps indicate trends.

## II. RESIDENTIAL WOOD COMBUSTION SURVEY

### SURVEY PART A – SCREENING QUESTIONS

#### *Question A. Type of Fuel Used to Heat Residence*

The first question was a screening question that concerned general energy use. The results from this question were compared with the Home Energy Survey (HES) conducted by Sierra Pacific Power Company (SPPCo) in 1991, the last survey performed by SPPCo, and the results from all past RWC surveys conducted by AQMD. The comparisons are shown in Table I. Please note that the categories may add up to more than 100% because more than one answer was given to the survey question asked.

**TABLE I**  
**GENERAL ENERGY USAGE**

	SPPCo 1991 HES	AQMD 1992-93	AQMD 1994-95	AQMD 1995-96	AQMD 1999-00	AQMD 2001-02	AQMD 2003-04	AQMD 2005-06
Natural Gas	58%	64%	65%	67%	75%	75%	67%	75%
Propane	10.7%	3%	3%	5%	5%	6%	6%	7%
Electric	10.8%	9%	11%	15%	18%	18%	24%	18%
Wood	7.4%	7%	2%	8%	6%	4%	6%	6%
Oil	8.2%	16%	7%	7%	2%	4%	3%	4%
Heating Degree Days*	3,533	3,869	3,142	2,958	2,962	3,094	3,210	2,927

\* Based on data for November, December, following year January and February.

As indicated in Table I, good agreement was shown between the AQMD's earlier RWC surveys and the SPPCo 1991 HES. However, natural gas usage had fluctuated over the AQMD survey years as compared with the SPPCo 1991 HES, whereas electric usage has steadily increased and now almost doubled by the last survey as compared with the SPPCo 1991 HES. This percentage (18%) is in line with previous AQMD survey, except the 2003-04 figure (24%). Therefore, the 2003-2004 electric usage is highly suspect. Propane and wood usage had remained more or less constant during the survey period between the AQMD RWC surveys and the SPPCo 1991 HES. Oil usage for home heating has seen a decrease over the years.

If the respondents did not mention wood as a fuel to heat their homes, they were questioned directly about the presence of a wood-burning device in their homes. If they did not have a solid fuel-burning device, the respondents were not asked the Wood-Use Survey questions (19 questions), but were asked only questions B and C of the remaining screening survey. If they did have a wood-burning device, the actual Wood-Use Survey questions, beginning with question one, were asked.

**Question B. Type of Dwelling**

To validate if our sample population was a true representation of Washoe County households, the second screening question asked in what type of dwelling the respondents resided. There was concern that perhaps a survey of this type would over estimate the amount of wood used when the ratios from this sample group were applied to the whole household population. It was hypothesized that because calls were made randomly, primarily in the evenings and on the weekends, until the surveyor got enough respondents that happened to be home, the surveyor would probably get more people who lived in single-family residences. Since more single-family residences have wood-burning devices than multi-family units, we would get an inflated wood use figure.

According to this survey, that hypothesis might be correct. In Table II, the ratio of percent type of dwelling units as determined by the AQMD survey compared to the Washoe County Department of Community Development's (WCDCD) figures for the entire county are shown (see App. B for actual household estimates from WCDCD). The percentages are slightly higher for single family and slightly lower for multi-family. This result may be biased due to survey sampling method. Revised procedures will be employed for future survey to eliminate or reduce sampling bias.

**TABLE II**  
**PERCENTAGE OF DWELLING TYPE FOR WASHOE COUNTY**

	Single Family	Multi-Family	Mobile Home
WCDCP Statistics*	57%	37%	6%
AQMD Survey**	73%	20%	7%

\* July 1, 2005 data

\*\* All respondents

In addition, when only the respondents who utilized wood combustion devices were used to get the device percentage and subsequent wood use estimate, the bias towards single-family residents became more pronounced. Out of just the wood use respondents, 89% lived in single-family homes, 8% lived in multi-family homes, and 3% lived in mobile homes. The study conducted in April 2006 and this report both use the device percentage obtained from the total number of respondents.

### ***Question C. Home Zip Code***

The last screening question obtained residential zip code from the respondents. This information was collected to ensure that the respondents lived in Washoe County.

## **SURVEY PART B – WOOD USE SURVEY**

The following questions were only asked of the 403 respondents, out of a total of 1,241, who indicated they had a wood-burning device:

### ***Question 1. Used Burning Device This Past Winter***

If the respondent did not use burning device this past winter, questions 2 through 13 were skipped, and they were asked questions 14 through 19. Of the 403 respondents who had a wood-burning device, 252 (62.5%) used their device this past winter.

### ***Question 2. Type of Wood-Burning Device(s)***

The answers were categorized into four basic device types: fireplaces, certified woodstoves or inserts, non-certified woodstoves or inserts, and pellet devices. Of the 252 respondents reported using their wood-burning device, 62% had a fireplace, 29% had a certified woodstove/insert, 1% had an uncertified woodstove/insert, and 14% had a pellet device.

### ***Question 3. Name of Device(s)***

For each device used in question 2, the respondents were asked to indicate the total number of devices in their household. They were also asked to identify the specific type of device (fireplace, woodstove, pellet stove) if more than one device was present at the dwelling as well as the primary device used in the household. 3.2% of the respondents reported having more than one heating device.

### ***Question 4. Age of Device***

This question was asked to verify the respondent's classification of the woodstove/insert as certified or uncertified. An EPA Phase II certified stove should be less than 15 years old (July 1, 1990 or newer) as of the April 2006 survey. An EPA Phase I certified stove should be between 15 and 17 years old (July 1, 1988 – July 1, 1990). An uncertified woodstove/insert should be 17 years of age or older.

Seventy-six (76) woodstoves/inserts were reported, with 73 certified and 3 uncertified. This equates to a 97% certified stoves versus a 3% uncertified stoves. Of the 73 stoves that were deemed certified, 41% were Phase II and 57% were Phase I.

### ***Question 5. Quantity of Wood/Pellets used in 2005-2006***

MarkeTec was provided with a copy of an EPA guidance document that described a cord of wood in recognizable units, such as, 4'x4'x8', or a full size pickup truck bed holds 0.5 cord of wood, etc. This was provided to assist respondents who did not know their wood consumption

in exact cords. There were respondents who reported having a wood-burning device but did not use it. To determine the average amount of wood used, staff looked only at the respondents who reported burning wood countywide. For respondents who reported using their fireplaces, the average amount of wood used was 0.88 cord per season. Respondents who reported using their certified woodstoves/inserts had an average wood consumption rate of 1.74 cords of wood per season. Those who had uncertified woodstove/insert reported an average wood consumption rate of 0.6 cord per season. Respondents who reported using a pellet device consumed on the average 2.14 tons of pellets each for the 2005-2006 winter season.

**Question 6. Species of Wood**

Total emissions from RWC are calculated using the EPA AP-42 emission factors and the total weight, by species, of all wood consumed. Different species of wood have different weights, so the survey was used to estimate the species of wood consumed by the respondents. The weight of the different wood species was derived from the “Fuel Wood Facts” handbook published by Oregon State University. Table III lists the most common types of wood used. The table also lists the percentage of wood used, and the corresponding weight per cord.

**TABLE III  
WOOD SPECIES BURNED**

<b>Type of Wood</b>	<b>Percentage Used</b>	<b>Weight per cord (lbs)</b>
Soft Wood (Fir/Pine)	7.4	2605
Hard Wood (Oak/Fruitwood/Tamarack )	15.1	3505
Mixed Wood	28.1	2543
Presto/Duraflame	5.0	3456
<b>Average Weight of Wood</b>		
Pellets	8.4	
Did not Use Device	36.2	
Others*	12.0	

\*This is in conjunction to burning firewood or manufactured logs.

**Question 7. Other Fuels**

To determine the extent that non-traditional fuels are used in wood-burning devices, question 6 asked the respondent if they burned “scrap” wood, pallets, or coal. Of the respondents who reported using their devices, 8.4% consumed some type of “scrap” wood, 3.1% reported burning pallets, while 0.5% reported burning coal, in addition to burning the traditional types of wood listed in Table III. Considering these numbers, staff assumes the total amount of wood consumed is adequately accounted for in the previous question under the “others” category.

**Question 8. When Device First Used This Past Winter**

Question 8 is a new question for the 2005-2006 wood use survey. The AQMD finds it useful to determine how early in the season the respondents started using their wood-burning devices. This will help with future public outreach time line concerning green/yellow/red burn notification. Most respondents started using their wood-burning devices in the month of October; this includes 61% pellet users, 53% certified woodstove users, and 41% fireplace users.

Uncertified woodstove users did not start using their devices until November, with a 69% usage rate.

**Question 9. Number of Days Burned**

Table IV compares average days used in the 2005-2006 season with that of the 2003-2004 season. The average heating degree days for residential wood combustion, calculated from the months of November, December, January, and February, is 3,331 per year. This is based on a 30-year average from 1976 to 2005. The 2005-2006 winter season had 2,927 heating degree days, which is less than the 30-year average. This indicates that 2005-2006 had a milder winter as compared to the 30-year average. However, as compared to the 2003-2004 burning season, the average number of days these devices were used had increased significantly. This might be due to increased heating cost for other fuel sources.

**TABLE IV**  
**AVERAGE DAYS OF SOLID FUEL USED**

	2003-2004 Season (3,210 Heating Degree Days*)	2005-2006 Season (2,927 Heating Degree Days*)
Fireplaces	17	58
Woodstoves/Inserts	45	94
Pellet Stoves	54	160

\* Based on data for November, December, following year January and February.

**Question 10. Time of Day Start Fire?**

The respondents were asked what time of day they usually start their fire. Forty-four point one percent (44.1%) started their fire between 5pm and midnight, 6.5% between midnight and 8am, 6.5% between 8am and noon, 6.2% between noon and 5pm, and 0.5% did not know when they started their fire. The remaining 36.2% of the respondents, who reported having a device, did not start a fire.

**Question 11. For Fireplace or Wood Burners - Cut or Buy Wood?**

Of the 214 respondents who used a fireplace or woodstove this past winter, they were asked if they bought their wood or if they cut it themselves. Fifty-seven percent (57%) reported buying their wood, 25.7% cutting the wood themselves, 5.1% both buying and cutting, and 12.1% getting it by some other means (such as scrap).

**Question 12. If Cut Wood, Where?**

Of the 66 respondents who reported cutting their own wood, 63.6% cut on private land, 33.3% on forest service land, and 3% on both types of land.

**Question 13. For Pellet Stove Users -- Where Purchased Pellets?**

Of the 36 respondents who used a pellet stove this past winter, they were asked where they purchased their pellets. Eighty-six point one percent (86.1%) reported buying their pellets from lumber store, 8.3% from supermarket, 5.6% from pellet stove dealers.

***Question 14. Have You Heard of The Green/Yellow/Red Burn Program?***

To determine the effectiveness of the AQMD's Green/Yellow/Red burn curtailment program, four questions were asked. Question 14 asked if the respondents had ever heard of the program: 315, or 78% replied they had heard of the program and 88, or 22% had not.

***Question 15. If Yes to Question 14, where from?***

Of the respondents who were aware of the Green/Yellow/Red burn curtailment program, they were asked where they heard of the program. Seventy-two percent (72%) reported they heard it from the television or radio stations, 22% from the newspaper, 1% from AQMD's web page, 4% from other means, and 1% does not know.

***Question 16. Reduce or Stop Burning in Yellow or Red Days?***

Of the respondents who were aware of the program, 57% said they followed the program, 43% said they did not follow the program or did not use the device. Of the 43% who did not follow the program, most do know about the program.

***Question 17. Would you support additional restrictions on wood burning as a means to reduce air pollution?***

Fifty-five percent (55%) of the respondents said they would support the restrictions. This percentage is similar to 55% in 2001-2002, and slight decrease from 57% in 2003-2004.

The percentages on questions 14 through 17 indicate that most of the community is aware of and follows the Green/Yellow/Red program. They would also support additional restrictions as a means to reduce air pollution. Although awareness of the Green/Yellow/Red program remains at a high level, the percentage of people who had heard of the program has declined over the years. Compliance of the program has fluctuated over the survey years, with the last survey year showing a 57% compliance rate, as shown in Table V. Staff assumes that the growth of the area and the reduction of recent public outreach is the cause of the slight decline in the compliance rate for the Green/Yellow/Red program in the last few years at the time of this survey. Public awareness campaign for the Green/Yellow/Red burn curtailment program has since been conducted in late October 2004 to ensure continuously high awareness and a consistent compliance rate.

**TABLE V**  
**GREEN/YELLOW/RED BURN CURTAILMENT PROGRAM**

Survey Year	1992-93	1994-95	1995-96	1999-00	2001-02	2003-04	2005-06
<b>Awareness of Program</b>							
<b>Yes, aware</b>	<b>97%</b>	<b>94%</b>	<b>93%</b>	<b>89%</b>	<b>87%</b>	<b>81%</b>	<b>78%</b>
<b>No, unaware</b>	<b>3%</b>	<b>5%</b>	<b>7%</b>	<b>11%</b>	<b>13%</b>	<b>19%</b>	<b>22%</b>
<b>Follow Program (of those aware)</b>							
<b>Yes, curtail burning</b>	<b>88%</b>	<b>61%</b>	<b>81%</b>	<b>91%</b>	<b>83%</b>	<b>66%</b>	<b>57%</b>
<b>No, do not/do not use wood</b>	<b>12%</b>	<b>9%</b>	<b>11%</b>	<b>8%</b>	<b>13%</b>	<b>34%</b>	<b>43%</b>
<b>Don't know</b>	<b>-</b>	<b>30%</b>	<b>8%</b>	<b>1%</b>	<b>8%</b>	<b>-</b>	<b>-</b>

***Question 18. Types of Dwelling***

Respondents who indicated using a wood-burning device were asked in what type of dwelling they resided. Although question 18 is similar to screening question “B,” the function used is different. Question 15 is asked of the respondents who actually use a wood-burning device, whereas screening question “B” was asked to validate sampling ratio/field. As stated in a previous paragraph of this report, the screening population indicates more single-family residences have wood-burning devices than those found in multi-family dwellings.

***Question 19. Home Zip Code***

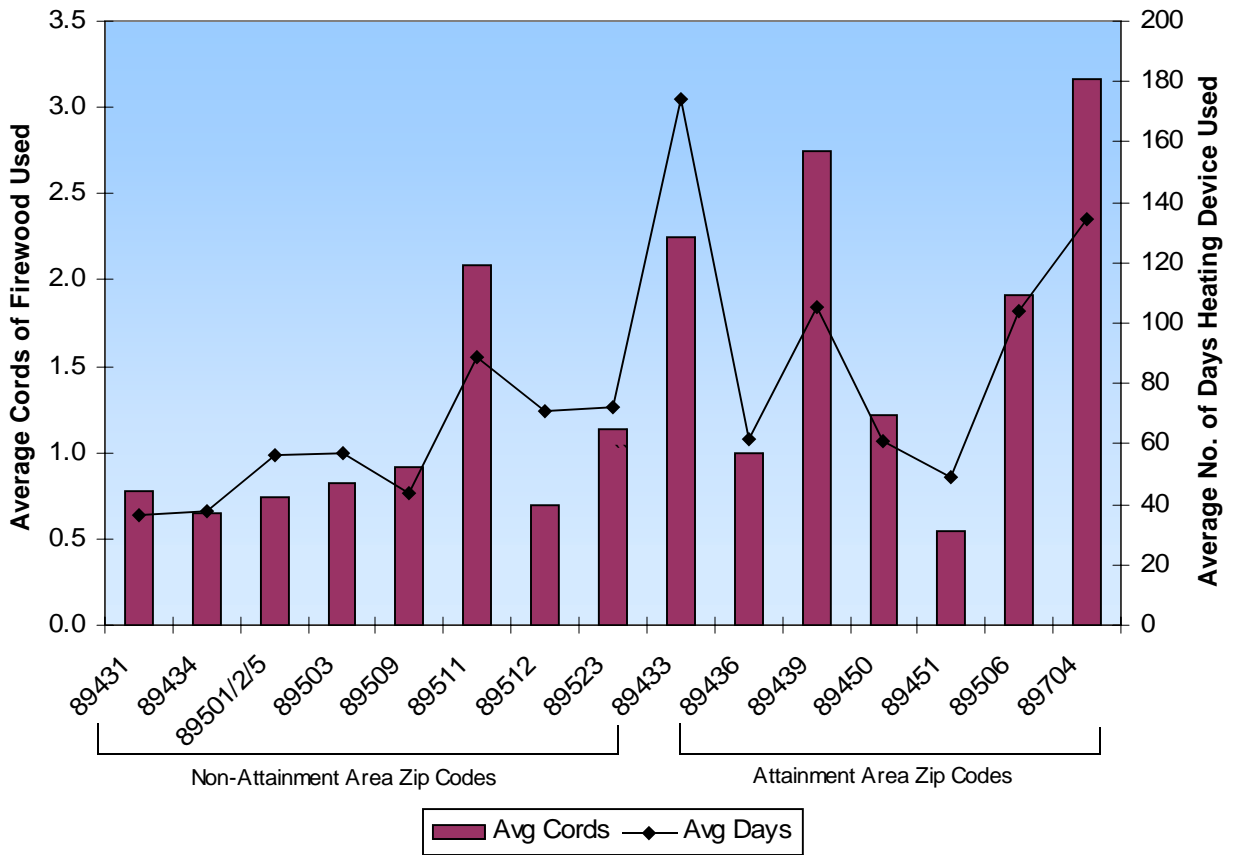
Zip code information was obtained from the wood-burning respondents to help estimate what percentage of wood used is within the Truckee Meadows PM<sub>10</sub> and CO non-attainment area (Truckee Meadows NAA). It could also help ascertain locations in the county where wood use may be more prevalent. The results of this survey indicate that 32% of the total households in Washoe County use some type of solid fuel-burning device. Forty-six percent (46%) of the households that burn some form of solid fuel (which were 32% of the total respondents) are located in zip codes that are primarily within the NAA. Based on this statistic alone, it is not apparent if there is more burning per capita inside or outside the NAA because this percentage is consistent with the population concentration that estimates that about 70% of the population of Washoe County lives in the NAA.

A review based on zip code indicates the figures for average cords burned and days used are higher in outlying areas. Table VI below gives the average cords and average days used for sample zip codes inside and outside the NAA.

**TABLE VI**  
**COMPARISON OF WOOD USED BY ZIP CODE**

<b>NAA</b>	<b>Zip Code</b>	<b>Average Cords Burned</b>	<b>Average Days Used</b>	<b>Avg Cords Burned/Avg Days Used</b>
Yes	89431 (W. Sparks)	0.8	36	
No	89433 (Sun Valley)	2.3	175	
Yes	89434 (Central Sparks)	0.6	38	
No	89436 (Spanish Springs)	1.0	62	
No	89451 (Incline Village)	0.5	49	
Yes	89501/2/5 (Central/E. Reno)	0.7	56	
Yes	89503 (N. Reno)	0.8	57	
No	89506 (NW Reno)	1.9	104	
Yes	89509 (SW Reno)	0.9	44	
Yes	89511 (S. Reno)	2.1	89	
Yes	89512 (NE Reno)	0.7	71	
Yes	89523 (W. Reno)	1.1	72	
No	89704 (Washoe Valley)	3.2	135	

**2005-2006 Season Comparison of Wood-Use by Zip Code**



**Figure 1**

### III. DATA ANALYSIS AND METHODOLOGY

The objectives of the survey were to determine the quantity of wood consumed and the activity levels of the Residential Wood Combustion (RWC) devices owned by the residents of Washoe County during the 2005-2006 winter season. There were 1,241 Washoe County residents questioned during the survey. Of the 1,241 people surveyed, 403 reported burning some type of solid fuel. For each category of RWC device, the corresponding percentage of the whole sample population was calculated. This percentage was then multiplied by the estimated total number of dwellings in Washoe County, which for July 1, 2005 was 166,998 dwellings, as provided by the Washoe County Department of Community Development, Advanced Planning Program. The number derived from this calculation was then considered the 2005 estimate of total number of a specific type of device in the area.

Estimates of the wood-burning devices and wood used in the PM<sub>10</sub>/CO NAA were also calculated. Based on zip code, approximately 804 of the total 1,241 respondents were determined to be within the NAA. Based on that it was determined that approximately 65% of the households would be within the NAA. Therefore, 65% of 166,998 are 108,549 households in the NAA.

#### A. FIREPLACES

##### 1. *Percentage of Fireplaces*

One hundred and fifty-five (155) respondents countywide reported using their fireplaces this past winter. Within the NAA, 138 respondents reported using fireplaces.

County Wide:

$$155 \text{ fireplaces} \div 1,241 \text{ respondents} \times 100\% = 12.5\% \text{ fireplaces}$$
$$12.5\% \times 166,998 \text{ households} = 20,858 \text{ fireplaces used}$$

NAA:

$$138 \text{ fireplaces} \div 804 \text{ respondents} \times 100\% = 16.3\% \text{ fireplaces}$$
$$16.3\% \times 108,549 \text{ households} = 18,631 \text{ fireplaces used}$$

##### 2. *Average Wood Consumption for Fireplaces*

Based on the raw data for fireplaces, the number of cords burned for each device on average was 0.88 cord/device countywide and 0.81 cord/device within the NAA.

#### B. CERTIFIED WOODSTOVES/INSERTS

##### 1. *Percentage of Certified Woodstoves/Inserts*

Seventy-three (73) respondents reported using their certified woodstoves or inserts this past winter. Within the NAA, 44 respondents reported using woodstoves or inserts.

County Wide:

$$73 \text{ woodstove/inserts} \div 1,241 \times \text{respondents} \times 100\% = 5.9\% \text{ woodstoves/inserts}$$

$5.9\% \times 166,998 \text{ households} = 9,823 \text{ woodstoves/inserts used}$

NAA:

$44 \text{ woodstove/inserts} \div 804 \text{ respondents} \times 100\% = 5.5\% \text{ woodstoves/inserts}$

$5.5\% \times 108,549 \text{ households} = 5,940 \text{ woodstoves/inserts used}$

## **2. Average Wood Consumption for Certified Woodstoves/Inserts**

Based on the raw data for woodstove/inserts, the number of cords burned for each device on average was 1.74 cords/device countywide and 1.41 cords/device within the NAA.

## **C. NON-CERTIFIED WOODSTOVES/INSERTS**

### **1. Percentage of Non-Certified Woodstoves/Inserts**

Three (3) respondents reported using non-certified woodstoves or inserts this past winter. Within the NAA, two (2) respondents reported using non-certified woodstoves or inserts.

County Wide:

$3 \text{ woodstoves/inserts} \div 1,241 \times \text{respondents} \times 100\% = 0.2\% \text{ woodstoves/inserts}$

$0.2\% \times 166,998 \text{ households} = 404 \text{ woodstoves/inserts used}$

NAA:

$2 \text{ woodstoves/inserts} \div 804 \text{ respondents} \times 100\% = 0.2\% \text{ woodstoves/inserts}$

$0.2\% \times 108,549 \text{ households} = 270 \text{ woodstoves/inserts used}$

### **2. Average Wood Consumption for Non-Certified Woodstoves/Inserts**

Based on the raw data for woodstove/inserts, the number of cords burned for each device on average was 0.60 cord/device countywide and 0.65 cords/device within the NAA.

## **D. PELLET STOVES**

### **1. Percentage of Pellet Stoves**

Thirty-five (35) respondents reported using their pellet stoves this past winter. Within the NAA, 13 respondents reported using pellet stoves.

County Wide:

$35 \text{ pellet stoves} \div 1,241 \text{ respondents} \times 100\% = 2.8\% \text{ pellet stoves}$

$2.8\% \times 166,998 \text{ households} = 4,710 \text{ pellet stoves used}$

NAA:

$13 \text{ pellet stoves} \div 804 \text{ respondents} \times 100\% = 1.6\% \text{ pellet stoves}$

$1.6\% \times 108,549 \text{ households} = 1,755 \text{ pellet stoves used}$

The number of pellet stoves sold since 1988 as estimated from WCDHD-AQMD Dealer Affidavits of Sale (DAS) is 2,361. The 2005-2006 survey calculated number of 4,710 pellet stoves was more than the DAS count.

**2. Average Pellet Consumption for Pellet Stoves**

Based on the raw data for pellet stoves, the tons of pellets burned for each device on average was 2.14 tons/device countywide and 2.15 tons/device within the NAA.

**E. ESTIMATED EMISSIONS BASED ON THE 2005-2006 SURVEY**

Tables VII and VIII list the activity data based on the 2005-2006 Survey for the NAA and the entire County, respectively.

**TABLE VII  
2005-2006 TRUCKEE MEADOWS NAA ACTIVITY DATA**

Type of Device	Average cords or tons used per Device	# of Units Used	Total # of Cords or Tons Used	Average Weight of Wood (lbs./cord)	Total Lbs. of Wood/Yr.
<b>Fireplaces</b>	0.88	18,631	16,395	2,896	47,480,731
<b>Woodstoves/Inserts</b>					
<b>Certified</b>	1.49	5,940	8,851	2,896	25,631,338
<b>Uncertified</b>	0.65	270	176	2,896	508,248
<b>Wood Totals</b>			25,421		73,620,316
<b>Pellet Stoves</b>	2.15	1,755	3,773	-	-

Note: Correction made to average cords of wood used per device for certified woodstove/inserts from 1.41 to 1.49 – typo. (3/14/07)

**TABLE VIII  
2005-2006 COUNTYWIDE ACTIVITY DATA**

Type of Device	Average cords or tons used per Device	# of Units Used	Total # of Cords or Tons Used	Average Weight of Wood (lbs./cord)	Total Lbs. of Wood/Yr.
<b>Fireplaces</b>	0.88	20,858	18,355	2,896	53,156,196
<b>Woodstoves/Inserts</b>					
<b>Certified</b>	1.74	9,823	17,092	2,896	49,498,490
<b>Uncertified</b>	0.60	404	242	2,896	701,990
<b>Wood Totals</b>			35,689		103,356,676
<b>Pellet Stoves</b>	2.14	4,710	10,079	-	-

The estimated emissions based on the 2005-2006 Survey data are calculated using emission factors from AP-42, Fifth Edition, Sections 1.9 and 1.10 for fireplaces and woodstoves/pellet stoves, respectively. Table IX gives the estimate for the NAA and Table X gives the estimate on the County Wide basis.

**TABLE IX**  
**2005-2006 TRUCKEE MEADOWS NAA ESTIMATED EMISSIONS**

Type of Device	Total tons of wood or pellets/yr.	Emission Factors (lbs./ton)					Emissions (tons/yr.)				
		PM <sub>10</sub>	PM <sub>2.5</sub>	CO	NO <sub>x</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO	NO <sub>x</sub>	VOC
<b>Fireplaces</b>	21,852	34.6	34.6	252.6	2.6	229	378	378	2,760	28	2,502
<b>Woodstoves/Inserts</b>											
<b>Certified</b>	12,128	19.6	19.6	104.4	2	15	119	119	633	12	91
<b>Uncertified</b>	254	30.6	30.6	230.8	2.8	53	4	4	29	0	7
<b>Total Woodstoves/Inserts</b>							501	501	3,422	41	2,600
<b>Pellet Stoves</b>	3,773	4.2	4.2	39.4	13.8	0*	8	8	74	26	0
<b>**Total Fireplaces + Woodstoves + Pellets (tons/yr.)</b>							509	509	3,497	67	2,600

\* No data

\*\* Rounded to fewer significant digits

Note: This is the corrected emissions -- the 10/06 version submitted to the BOH was mistakenly calculated using the # of cords of wood instead of tons of wood used. (3/13/07)

**TABLE X**  
**2005-2006 COUNTYWIDE ESTIMATED EMISSIONS**

Type of Device	Total tons of wood or pellets/yr.	Emission Factors (lbs./ton)					Emissions (tons/yr.)				
		PM <sub>10</sub>	PM <sub>2.5</sub>	CO	NO <sub>x</sub>	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	CO	NO <sub>x</sub>	VOC
<b>Fireplaces</b>	26,578	34.6	34.6	252.6	2.6	229	460	460	3,357	35	3,043
<b>Woodstoves/Inserts</b>											
<b>Certified</b>	24,749	19.6	19.6	104.4	2	15	243	243	1,292	25	186
<b>Uncertified</b>	351	30.6	30.6	230.8	2.8	53	5	5	41	0	9
<b>Total Woodstoves/Inserts</b>							708	708	4,689	60	3,238
<b>Pellet Stoves</b>	10,079	4.2	4.2	39.4	7	0*	21	21	199	35	0
<b>**Total Fireplaces + Woodstoves + Pellets (tons/yr.)</b>							729	729	4,888	95	3,238

\* No data

\*\* Rounded to fewer significant digits

Note: This is the corrected emissions -- the 10/06 version submitted to the BOH was mistakenly calculated using the # of cords of wood instead of tons of wood used. (3/13/07)

#### IV. SURVEY COMPARISONS

Tables XI and XII compares the seven recent surveys conducted by the WCDHD-AQMD and MarkeTec.

**TABLE XI**  
**TRUCKEE MEADOWS NAA AVERAGE RWC ACTIVITY**

Device Type	Estimate of Total # of Devices		# of Devices Actually Used		# of Cords of Wood/Tons of Pellets Used per Device	
	Estimates	Average*	Estimates	Average*	Estimates	Average*
<b>Fireplaces:</b>						
<b>92-93 Survey</b>	33,054		17,684		Unknown	
<b>94-95 Survey</b>	33,336		18,142		0.61	
<b>95-96 Survey</b>	30,179		16,003		0.56	
<b>99-00 Survey</b>	35,205		16,968		0.58	
<b>01-02 Survey</b>	30,437		12,435		0.63	
<b>03-04 Survey</b>	28,878		14,546		0.90	
<b>05-06 Survey</b>	***		18,631		0.81	
<b>Woodstoves/Inserts**</b>						
<b>92-93 Survey</b>	9,692		6,784		Unknown	
<b>94-95 Survey</b>	7,564		5,128		1.64	
<b>95-96 Survey</b>	10,015		7,283		1.43	
<b>99-00 Survey</b>	9,056		6,249		1.24	
<b>01-02 Survey</b>	5,211		3,198		1.55	
<b>Certified Woodstoves/Inserts</b>						
<b>03-04 Survey</b>	4,492		3,619		1.64	
<b>05-06 Survey</b>	***		5,940		1.49	
<b>Non-Certified Woodstoves/Inserts</b>						
<b>03-04 Survey</b>	642		0		0.00	
<b>05-06 Survey</b>	***		270		0.65	
<b>Pellet Stoves</b>						
<b>92-93 Survey</b>	822		712		Unknown	
<b>94-95 Survey</b>	2,179		1,773		0.67	
<b>95-96 Survey</b>	1,560		1,431		1.2	
<b>99-00 Survey</b>	1,981		1,611		0.89	
<b>01-02 Survey</b>	2,013		1,776		0.61	
<b>03-04 Survey</b>	1,818		1,390		0.75	
<b>05-06 Survey</b>	***		1,755		2.15	

\*Rounded to fewer significant digits

\*\*Past reports combined certified and non-certified woodstoves/inserts

\*\*\*No data due to survey procedure change for 2005-2006, only respondents who used burning devices were surveyed

**TABLE XII**  
**COUNTY WIDE RWC ACTIVITY**

Device Type	Estimate of Total # of Devices		# of Devices Actually Used		# of Cords of Wood/Tons of Pellets Used per Device	
	Estimates	Average*	Estimates	Average*	Estimates	Average*
<b>Fireplaces:</b>						
<b>92-93 Survey</b>	34,431		17,695		0.84	
<b>94-95 Survey</b>	34,047		18,777		0.73	
<b>95-96 Survey</b>	31,701		18,008		0.73	
<b>99-00 Survey</b>	39,479		19,976		0.57	
<b>01-02 Survey</b>	35,292		14,419		0.73	
<b>03-04 Survey</b>	35,938		17,006		0.94	
<b>05-06 Survey</b>	***		20,858		0.88	
<b>Woodstoves/Inserts**</b>						
<b>92-93 Survey</b>	13,845		9,573		1.90	
<b>94-95 Survey</b>	10,972		8,031		1.72	
<b>95-96 Survey</b>	13,803		10,640		1.57	
<b>99-00 Survey</b>	11,886		8,380		1.33	
<b>01-02 Survey</b>	9,711		7,106		1.79	
<b>Certified Woodstoves/Inserts</b>						
<b>03-04 Survey</b>	7,273		5,883		1.90	
<b>05-06 Survey</b>	***		9,823		1.74	
<b>Non-Certified Woodstoves/Inserts</b>						
<b>03-04 Survey</b>	856		214		2.05	
<b>05-06 Survey</b>	***		404		0.60	
<b>Pellet Stoves</b>						
<b>92-93 Survey</b>	1,264		1,264		1.08	
<b>94-95 Survey</b>	3,053		2,939		1.29	
<b>95-96 Survey</b>	2,808		2,574		1.25	
<b>99-00 Survey</b>	1,981		1,611		0.85	
<b>01-02 Survey</b>	3,671		3,198		0.83	
<b>03-04 Survey</b>	3,102		2,567		0.72	
<b>05-06 Survey</b>	***		4,710		2.14	

\*Rounded to fewer significant digits

\*\*Past reports combined certified and non-certified woodstoves/inserts

\*\*\*No data due to survey procedure change for 2005-2006, only respondents who used burning devices were surveyed

Some results of the seven surveys compare well and some do not. Since there are minor variations because of the methodology used has changed slightly over the year, staff elected to use the average activity data from seven years' surveys to estimate emissions for emission inventory purposes.

Table XIII summarizes the estimates of average firewood consumption for Washoe County for the last eight woodstove surveys/reports. Table XIV summarizes the heating degree days versus the total firewood consumed for the last seven surveys, and Figure 2 depicts the data graphically.

**TABLE XIII**  
**AVERAGE FIREWOOD CONSUMPTION (CORDS)\* FOR WASHOE COUNTY**

	1984	1991	1992	1994	1995	1999	2001	2003	2005
<b>Fireplaces</b>	0.91	0.39	0.84	0.73	0.73	0.57	0.73	0.94	0.88
<b>Woodstoves/Inserts**</b>	2.25	1.24	1.90	1.72	1.57	1.33	1.79	-	-
<b>Certified</b>	-	-	-	-	-	-	-	1.90	1.74
<b>Woodstoves/Inserts</b>									
<b>Non-Certified</b>	-	-	-	-	-	-	-	2.05	0.60
<b>Woodstoves/Inserts</b>									
<b>Avg Days Device Used</b>	-	-	-	-	-	-	-	39	65
<b>Total cords</b>	38,593	20,305	34,673	27,521	29,851	22,530	23,246	27,603	35,689

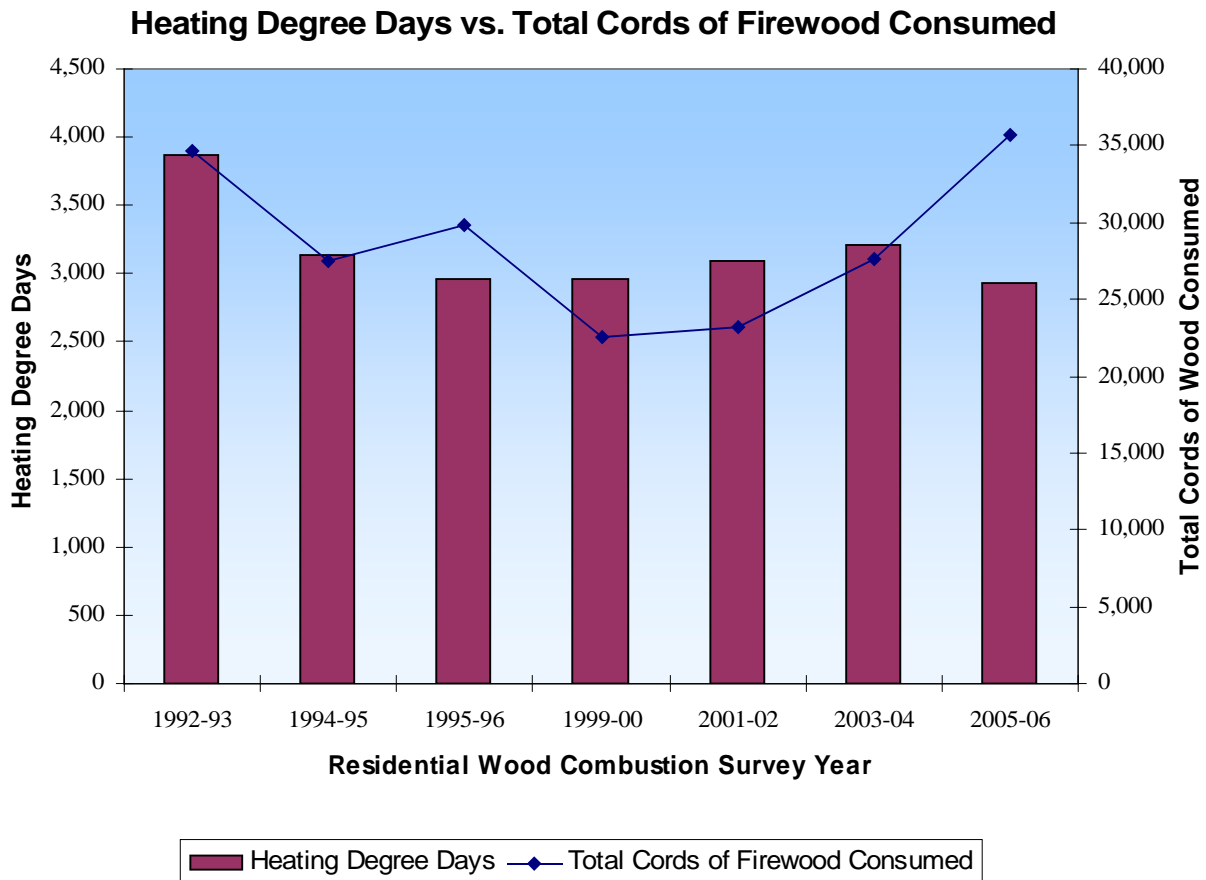
\*Based on devices reported used

\*\*Certified and non-certified combined

**TABLE XIV**  
**HEATING DEGREE DAYS VS. TOTAL CORDS OF FIREWOOD CONSUMED**

	1992-9	1994-9	1995-9	1999-0	2001-0	2003-0	2005-06
	3	5	6	0	2	4	
<b>Heating Degree Days*</b>	3,869	3,142	2,958	2,962	3,094	3,210	2,927
<b>Total Cords of Firewood Consumed</b>	34,673	27,521	29,851	22,530	23,246	27,603	35,689

\* Based on data for November, December, following year January and February.



## Figure 2



# **Appendix A**

**Washoe County District Health Department  
Air Quality Management Division  
2005 - 2006 Residential Wood Use Survey**

**Conducted by MarkeTec**

# **Appendix B**

## **2005 Washoe County Dwelling Units**

**Provided by Washoe County  
Department of Community Development**

# **Appendix C**

## **Local Climatological Data 30-Year Average Heating Degree Days**

**Published by NCDC Asheville, NC  
for the National Oceanic and Atmospheric  
Administration**