



2015 Air Quality Survey Results Report

Published:
July 31st, 2015

Authored by:
Amy Fuller, KCPHD Assessment Coordinator
Daniel Hinz, KCPHD Air Quality Project Specialist

Contents

List of Figures and Tables.....	2
Introduction.....	3
Background.....	3
Project purpose.....	4
Survey objective.....	4
Survey redesign.....	5
Survey questionnaire.....	5
Limitations.....	5
Methods.....	6
Survey distribution and collection.....	6
Data treatment and statistics.....	6
Results and Discussion.....	7
General public knowledge.....	7
Home heating practices.....	9
Indoor burning practices.....	10
<i>Wood treatment and storage.....</i>	<i>10</i>
<i>Fuels burned.....</i>	<i>11</i>
<i>Quantities of wood burned.....</i>	<i>12</i>
<i>Indoor burning appliances.....</i>	<i>13</i>
Burn ban information.....	16
Outdoor burning.....	19
Public opinion.....	21
Education and outreach effectiveness.....	23
Conclusion.....	27
Key findings.....	27
Implications.....	27
Appendices.....	28
Appendix A: 2015 Kittitas County Air Quality Survey.....	28
Appendix B: Survey Data Tables.....	33
Appendix C: Demographics.....	50
Appendix D: Calculations.....	51
Appendix E: Survey Distribution.....	52
Appendix F: Outreach & Education Impact Targets.....	53
Appendix G: Brochure Tracking.....	55

List of Figures and Tables

FIGURES

Figure 1. Understanding the phrase “PM 2.5”. (n=589)	7
Figure 2. Checking air quality conditions in Kittitas County. (n=611)	7
Figure 3. Identifying items that are legal to burn. (n=604)	8
Figure 4. Main sources of heat for Kittitas County residents. (n=613)	9
Figure 5. Backup or supplementary sources of heat. (n=612)	9
Figure 6. Indoor fuel burners. (n=603)	10
Figure 7. Firewood storage practices. (n=139)	10
Figure 8. Species of wood being burned. (n=143)	11
Figure 9. Number of cords burned per year (1 cord=128 ft3). (n=137)	11
Figure 10. Season and time of day wood is burned. (n=146)	12
Figure 11. Solid fuel burning devices currently in use. (n=147)	12
Figure 12. Wood burning device as sole (only) source of heat. (n=153)	13
Figure 13. Burning device certification. (n=148)	13
Figure 14. Approximate age of woodstoves. (n=152)	13
Figure 15. Type of door on wood burning device. (n=156)	13
Figure 16. Device maintenance practices. (n=141)	14
Figure 17. Firewood burning practices. (n=141)	14
Figure 18. How respondents get information on home heating burn bans (2015). (n=155)	15
Figure 19. How respondents get information on home heating burn bans (2014). (n=103)	15
Figure 20. Preferred communication medium for home heating burn bans. (n=155)	16
Figure 21. Residents that burn piles of yard debris. (n = 612)	17
Figure 22. Number of piles burned in a year. (n=156)	17
Figure 23. Size of yard debris burn piles. (n=158)	17
Figure 24. Yard debris is dry before burning. (n=154)	18
Figure 25. Yard debris components. (n=157)	18
Figure 26. Community agreement with air quality related statements. (n=589)	19
Figure 27. Community support for air quality related items. (n=588)	20

TABLES

Table 1. Comparison of PM2.5 Education/Outreach Survey Results	21
Table 2. Comparison of Certified Stove Education/Outreach Survey Results	22
Table 3. Comparison of Legal Burning Materials Education/Outreach Survey Results	22
Table 4. Comparison of Seasoned Wood Education/Outreach Survey Results	23

Introduction

Background

Located in the center of Washington State, Kittitas County is a rural area that lies along the eastern slopes of the Cascade Mountain Range. The county's 2,297 square miles stretch from the top of Snoqualmie Pass down to its eastern border along the Columbia River. The unique geography of the Kittitas valley creates optimal conditions for long periods of high pressure during the winter months that result in lengthy air inversions. This is especially concerning during home heating season, when any smoke emitted into the lower atmosphere becomes trapped until changing conditions allow for the cleaner air to pass through, exposing residents to unhealthy air often for weeks at a time.

According to the Environmental Protection Agency's National Ambient Air Quality Standards Review, Kittitas County is a high risk community that is in danger of violating the federal air quality standards. For the past several years, air quality meters in Ellensburg have shown that the number of days with unhealthy fine particle pollution is steadily increasing. During the winter home heating season, air quality readings from the Washington State Department of Ecology (Ecology) monitoring station in Ellensburg reports one of the highest levels of PM2.5 air pollution in the state. In addition, particulate matter pollution created by large area wildfires has increased over the past four years, adding to public health risks associated with ongoing PM2.5 pollution. If this trend continues, it is likely that Kittitas County could become an area of "non-attainment", requiring costly measures that will be administered by the Environmental Protection Agency (EPA).

While all the contributors to PM2.5 in our community have yet to be identified, there is data to support that winter wood smoke is a major source. This raises concerns regarding respiratory impacts and potential health risks related to the increase in poor air quality days. Ecology partnered with Kittitas County Public Health Department (KCPHD) to investigate factors that could contribute to this steady increase in PM2.5 and to explore behaviors that may be modifiable through public health education and outreach. In 2014, KPCHD conducted a community wide survey to examine behaviors, beliefs and attitudes around air quality and burning behavior in Kittitas County. The results of this survey were used to create an education and outreach campaign focused on increasing public knowledge of air quality issues and proper burning practices. In 2015, a second survey was conducted to validate initial findings and to analyze the impact of the initial outreach and education attempts. Both of the surveys and the education and outreach campaign were funded by Ecology.

Project Purpose

This survey was created as a follow up to an air quality survey conducted in the spring of 2014. In 2014, KCPHD conducted a county wide survey to look at county-wide burning practices as well as perceptions and knowledge regarding burning related air quality issues. Key findings from this survey identified significant gaps in knowledge around important air quality related issues:

- 1) There is a general lack of knowledge and awareness about PM2.5 and air quality issues in Kittitas County, including a disconnection between individual behaviors and how they contribute to community PM2.5 and overall poor air quality.
- 2) There is a gap in knowledge about what is legal to burn, especially around cardboard, lumber, and paper.
- 3) While a significant number of people seem to understand how to properly season wood and the importance of using dry, seasoned wood, they also report that they witness other people in the community not engaging in this practice.
- 4) Many people either have uncertified wood stoves, or aren't sure if their stoves are certified.

During the winter of 2014, KCPHD conducted an education and outreach campaign to address these knowledge gaps. The purpose of the 2015 KCPHD survey was to gauge the impact of these outreach efforts as well as do further inventories of community burning practices and possible emission sources. The information gathered from this survey will offer valuable information about activities that contribute to particulate matter pollution and the types and rates of material being burned. Additionally, other communities with air quality concerns can use information from our efforts to assist in improving air quality in their region.

Survey Objectives

The survey has four main objectives:

1. Take another “snapshot” of community knowledge, beliefs, and behaviors regarding air quality in order to identify gaps in knowledge and behavior.
2. Gather preliminary data that can be used for an emissions inventory of activities that contribute to particulate matter pollution.
3. Identify important trends that can be used to reduce PM2.5 emissions.
4. Analyze response data to determine if there are any statistically significant changes in the areas that were covered by the education and outreach campaign.

These objectives are intended to help KCPHD, Washington ECOLOGY, and other interested parties obtain useful information that can be used in future work to prevent non-attainment and improve air quality in rural, at-risk communities with similar demographic profiles.

Survey Redesign

The 2015 survey was redesigned with the purpose of gathering supplemental information not obtained in the 2014 air quality survey. Nineteen new questions were added regarding burning practices, certified equipment and public opinion. In addition, certain questions from the original survey were slightly modified in order to streamline data collection. Attempts were made to ensure that repeated questions would be comparable to the 2014 survey even if the options or wording had been modified. The number of survey questions increased from 25 to 33 in an attempt to gain the maximum amount of supplemental information with the minimum amount of questioning. Also, the survey structure was changed to allow respondents who did not engage in indoor and outdoor burning to skip up to 15 questions, reducing survey time by half. A list of all survey modifications can be seen in Appendix A.

Survey Questionnaire

The survey contained four pages of self-report multiple choice questions. It was available in one of two modalities: paper or electronic form. The electronic survey was administered through SurveyMonkey® online survey software. There were a variety of questions pertaining to wood burning practices, general knowledge about air quality, and opinions about air quality issues. Individual survey takers were asked how they got information about air quality, wood storage, wood burning, and burn bans. They were assessed on their ability to identify what is illegal to burn. Survey takers self-reported their ability to identify a certified wood stove, the significance of PM 2.5, and why it is important burn dry seasoned wood. A series of questions relating to emissions inventory were asked including the volume and frequency of use of indoor and outdoor burning, fuel type, and behaviors. The penultimate questions pertained to public opinion and support for pollution reduction. Finally demographic questions were asked. Survey takers that do not do indoor or outdoor burning were able to skip over questions. The questionnaire itself was relatively easy to fill out, taking only a few minutes for survey participants. Please see Appendix A for the questionnaire.

Methods

Survey Distribution and Collection

The survey was launched March 25th, 2015 with a goal of 629 surveys, or approximately 1.5% of the Kittitas County population. Paper surveys were accessible by mail, or at strategic polling locations outlined in figure 36 in Appendix E. To encourage participation in the survey, 8000 fliers were mailed to Ellensburg residents through utility billing. Three hundred handouts were distributed at the Ellensburg transfer station and another 200 were distributed at the Cle Elum transfer station. Five days of radio ads were placed on KXLE and KCPQ. Mass e-mails containing the Survey Monkey® link were sent out to top Kittitas Employers, local government agencies and non-profit list-servs. Fliers were placed at local businesses as shown on Figure 36, and the survey was advertised at booths for both Earth day and at the Ellensburg Farmers' Market. A Spanish translation of the survey was available by paper and by interview through outreach with a translator for 3 hours. To encourage participation survey takers, could enter for a chance to win a \$25.00 gift certificate. The survey was closed May 31st, 2015, with a response rate of 613 surveys, including both paper and electronic surveys. Survey distribution methods and locations are outlined in Appendix E.

Data Treatment and Statistics

Power analysis (see Appendix D) was used to determine that 384 surveys were required to obtain a 5% confidence interval at the 95% confidence level. Confidence level is a percentage, (typically 95% or 99%) that reflects how confident you are that the value of your data falls within a certain range of possible variance in a population (confidence intervals). Ideally, you would like to have a very short confidence interval, but you would also like to be very confident. The larger the sample size, the smaller the standard error and the smaller the interval. The survey had 613 responses, which put the confidence interval at 3.93 % at the 95% confidence level. This means we can be 95% certain that if we polled the population again, the answers given would fall within 4 percentage points of what we are reporting now.

Data was collected both electronically and on paper. Paper surveys were entered in to the SurveyMonkey® online survey tool. SurveyMonkey® software was used to perform simple cross tabulations, and generate response rate percentages. Raw and processed data was downloaded to excel. The raw data was used to do more rigorous cross tabulations and to correct contradiction in responses. All statistical tests were performed using excel, and all graphs were generated using excel. The confidence interval for each response was calculated at the 95% confidence level, the majority of responses had a confidence interval below 5%. To determine whether or not there was a statistically significant difference between responses, from the 2014 survey to the 2015 survey, a chi-squared statistical test was used. This statistical test tells you the likelihood that responses are significantly different at the 95% confidence level. See Appendix C for responses and confidence intervals and Appendix D for example calculations and further explanations.

Results and Discussion

General Public Knowledge

The following questions were used in the previous survey to gauge the community’s awareness level in regards to poor air quality issues in Kittitas County. A little over half of the respondents claim to understand the concept of PM2.5 and fine particulate matter pollution, however only 12.4% understand them well.

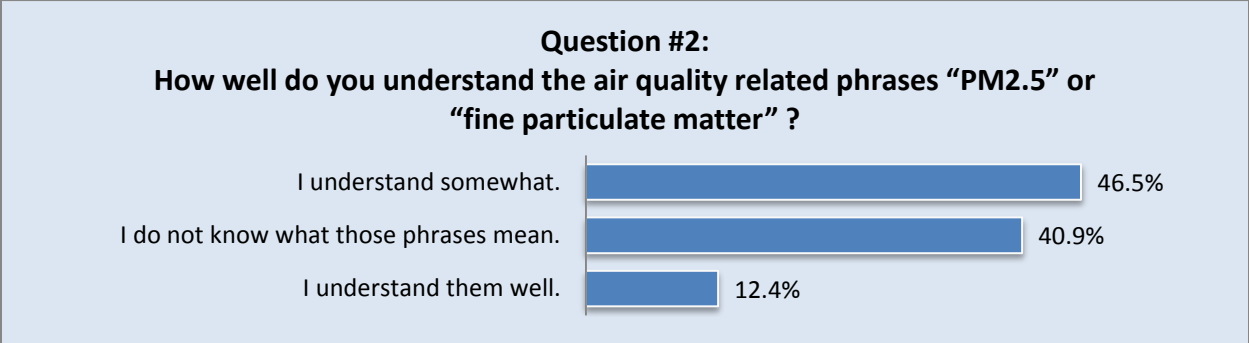


Figure 1. Understanding the phrase “PM 2.5” . (n=589)

A skill associated with air quality awareness is the ability to check air quality levels in the community. At the time of this survey, roughly half of respondents know how to check air quality levels in Kittitas County.

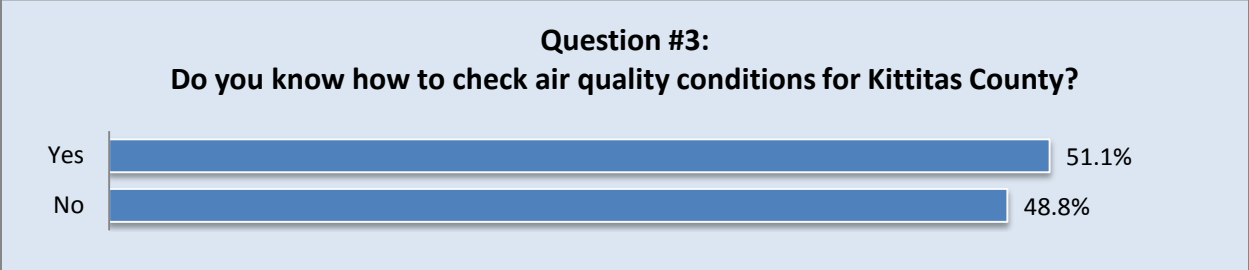


Figure 2. Checking air quality conditions in Kittitas County. (n=611)

Approximately one third of survey respondents misidentified paper, lumber, and cardboard as legal to burn in an outdoor fire as shown in the Figure 4. These items are illegal to burn and were targeted during the education and outreach campaign, and should continue to receive focus in the future.

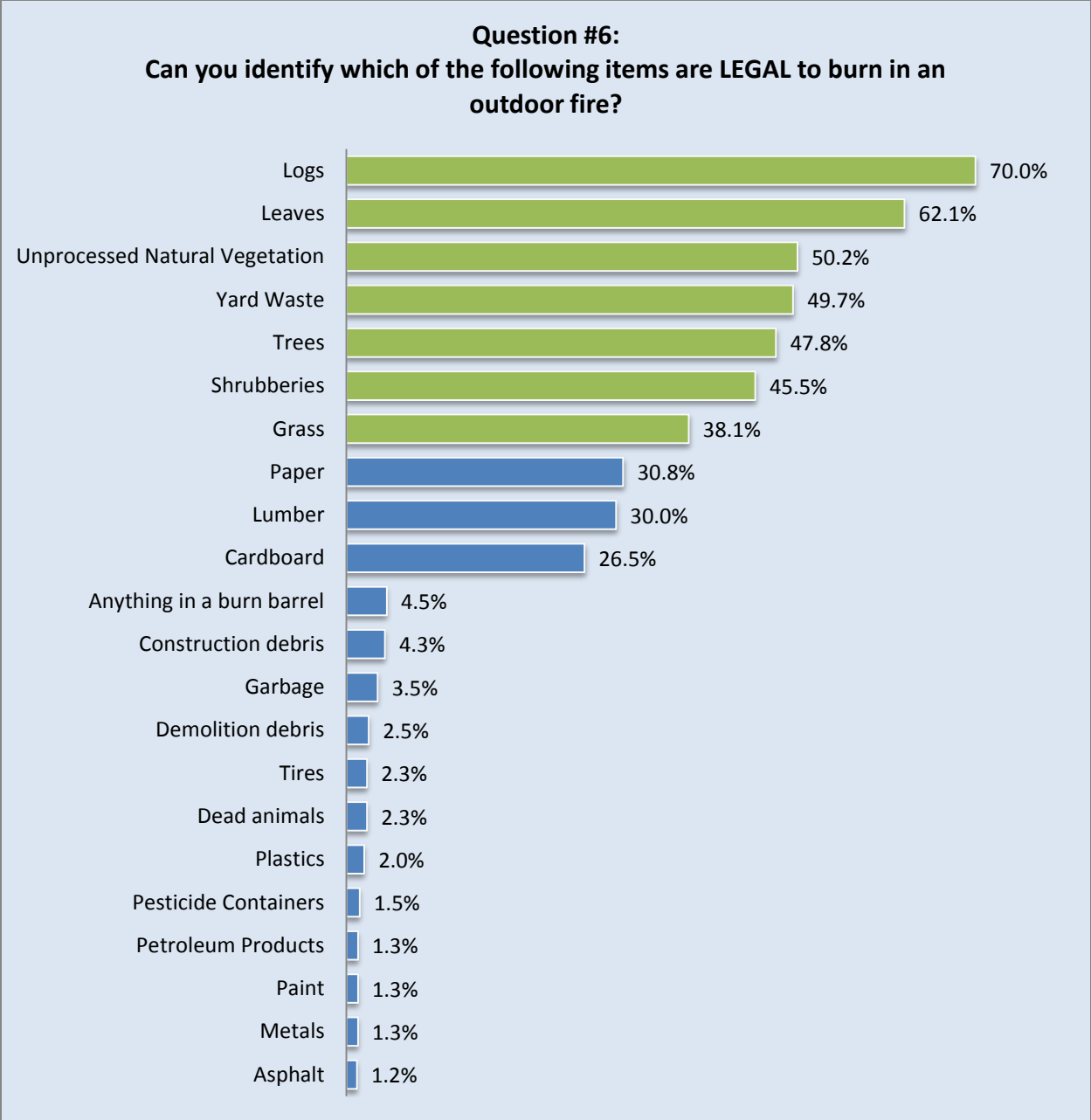


Figure 3. Identifying items that are legal to burn. (n=604)

Home Heating Practices

Several questions on the survey discussed the sources of heat used by Kittitas County residents. The majority of survey respondents use either electricity or natural gas as their primary source of heat (48.0% and 30.7% respectively). Wood or wood pellets are the primary (sole) heat source for 10.9% of respondents. Almost half (48.2%) report that they do not have a supplementary heat source. One quarter (25.2%) use electricity as a backup, and 15.2% use wood or wood pellets.

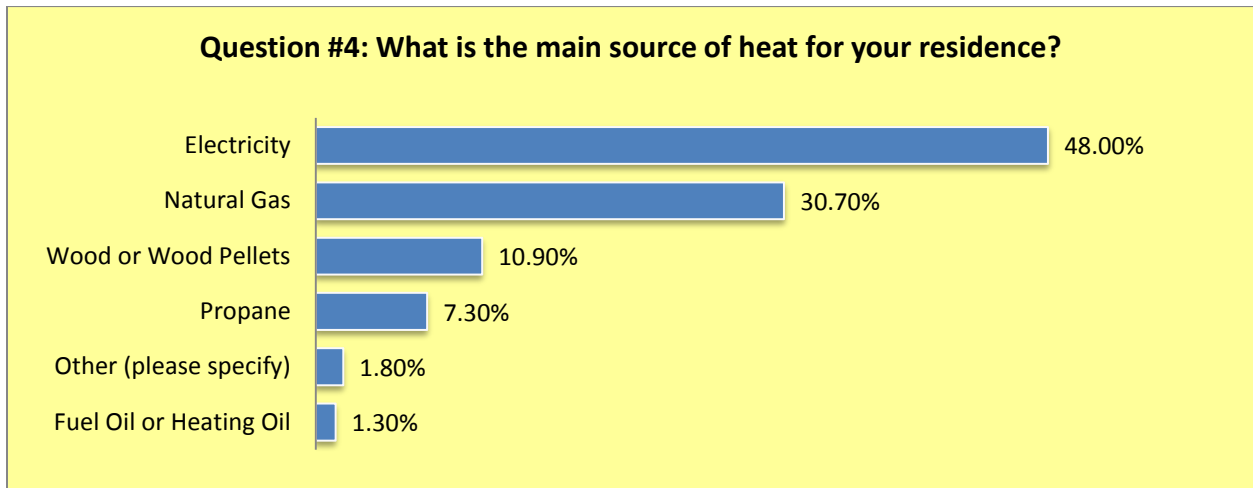


Figure 4. Main source of heat for Kittitas County residents. (n=613)

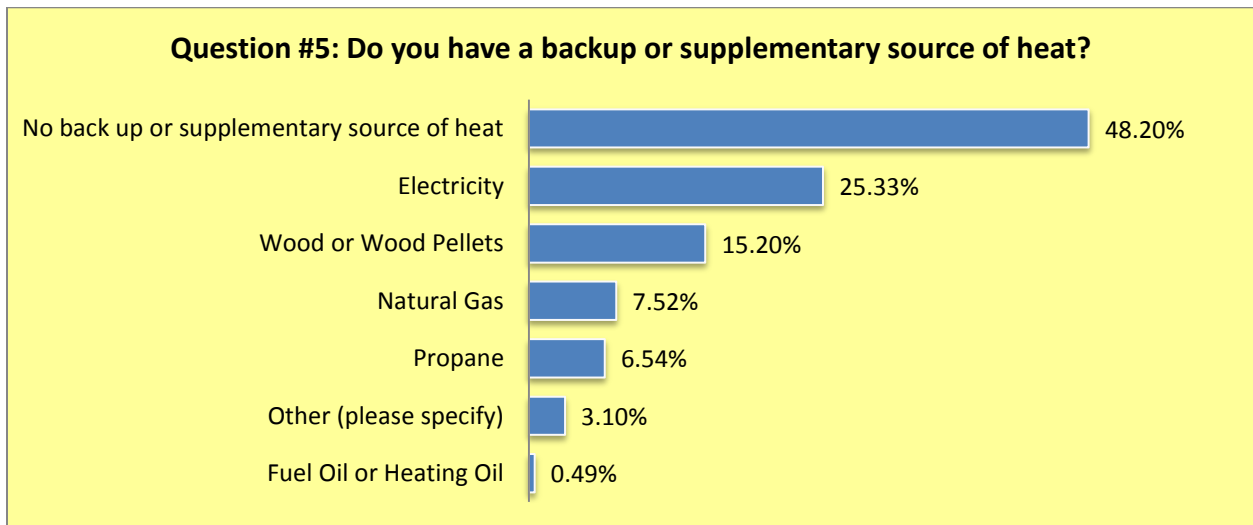


Figure 5. Backup or supplementary sources of heat. (n=612)

Indoor Burning Practices

Several questions on the survey asked about respondents' indoor wood burning practices. Only respondents that do indoor wood burning were asked to answer these questions. The following data is from this subset of the population. Approximately 25% (see Figure 6) of the Kittitas County population burns fuel indoors. The questions addressed the type of fuel burned, the appliance in which the fuel is burned, how the wood is treated, and the frequency in which they are burned. In addition, respondents were asked how they acquire information about burn bans in Kittitas County as it specifically applies to indoor wood burning households.

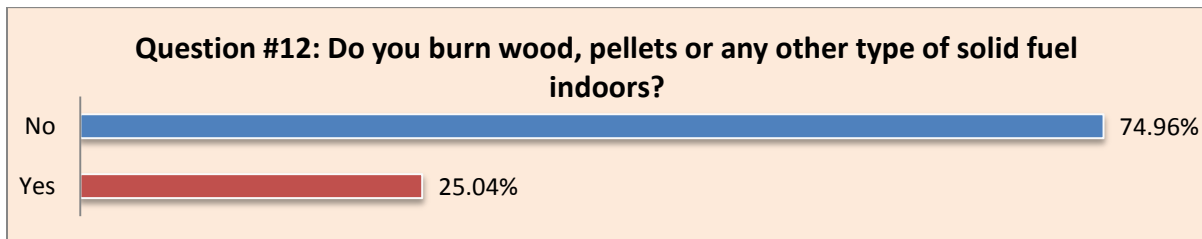


Figure 6. Indoor fuel burners. (n=603)

Wood Treatment and Storage

Respondents were asked about five different wood preparation and storage practices. These practices, when followed, reduce the amount of soot produced and help wood to burn more efficiently. Figure 7 shows that the majority of respondents try to use dry, aged wood that has been stored off the ground, kept dry and split. However, it also shows that on average, roughly one third of these individuals are engaging in these practices only some of the time or not at all.

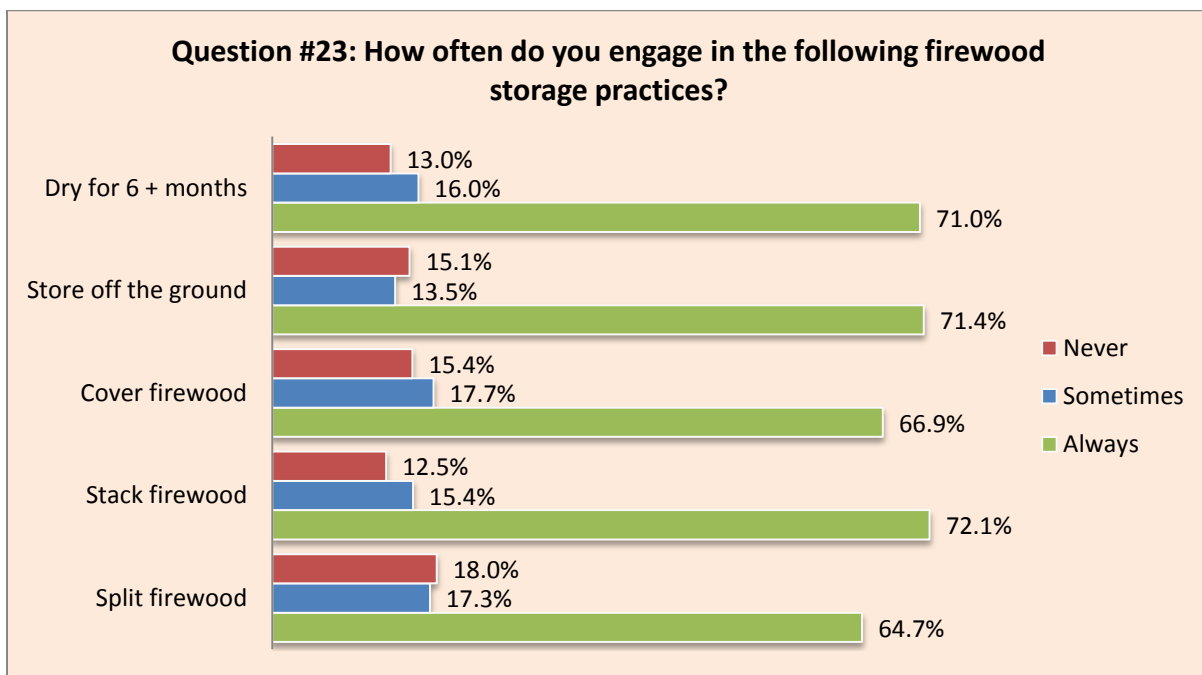


Figure 7. Firewood storage practices. (n=139)

Fuels Burned

Survey respondents reported burning soft forest wood most frequently at 37.8%, followed closely by a combination of soft and hard woods at 32.2%. Less popular options are the hard forest wood only at 9.1% and fruit wood at 2.8%. Differentiating between types of wood burned is important because when burned, different species emit different amounts of soot (pollution). Soft woods do not burn as cleanly as hard woods, however, best practices recommend starting fires with hard wood kindling and then burning soft woods as heating fuel. It appears as if roughly one third of the population may adhere to this practice. Further exploration would need to be done in order to determine factors that affect choice of wood and what species are being burned that contribute to the emissions ratings in Kittitas County.

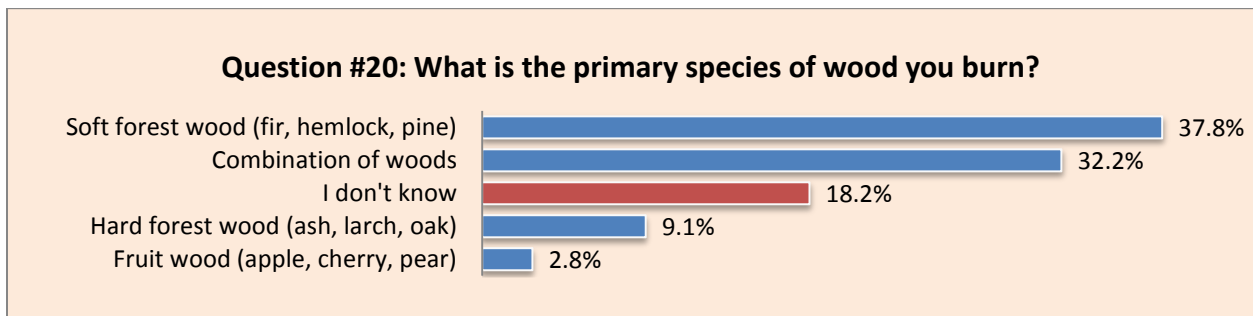


Figure 8. Species of wood being burned. (n=143)

Quantities of Wood Burned

The amount most frequently burned was 1 to 1.5 cords of wood each year, although this number was not significantly greater than other amounts burned. The data suggests that a wide range of wood amounts were used. It is also important to note that half of these individuals are burning upwards of two cords annually. This information is useful for modeling the emissions inventory for Kittitas County.

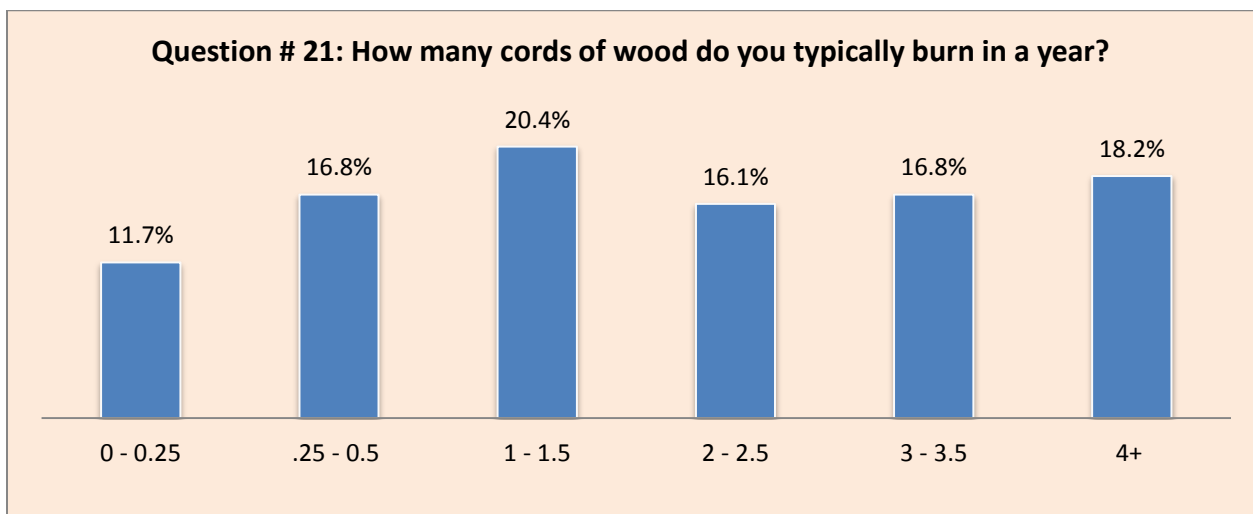


Figure 9. Number of cords burned per year (1 cord=128 ft³). (n=137)

Respondents were asked about their burning practices by time of day and season. This data shows that the winter home heating season has the highest amount of burning and that indoor burning hardly occurs during summer. In the high home heating season of winter, the rate of evening fires is substantially higher than the other times of day, including overnight burning.

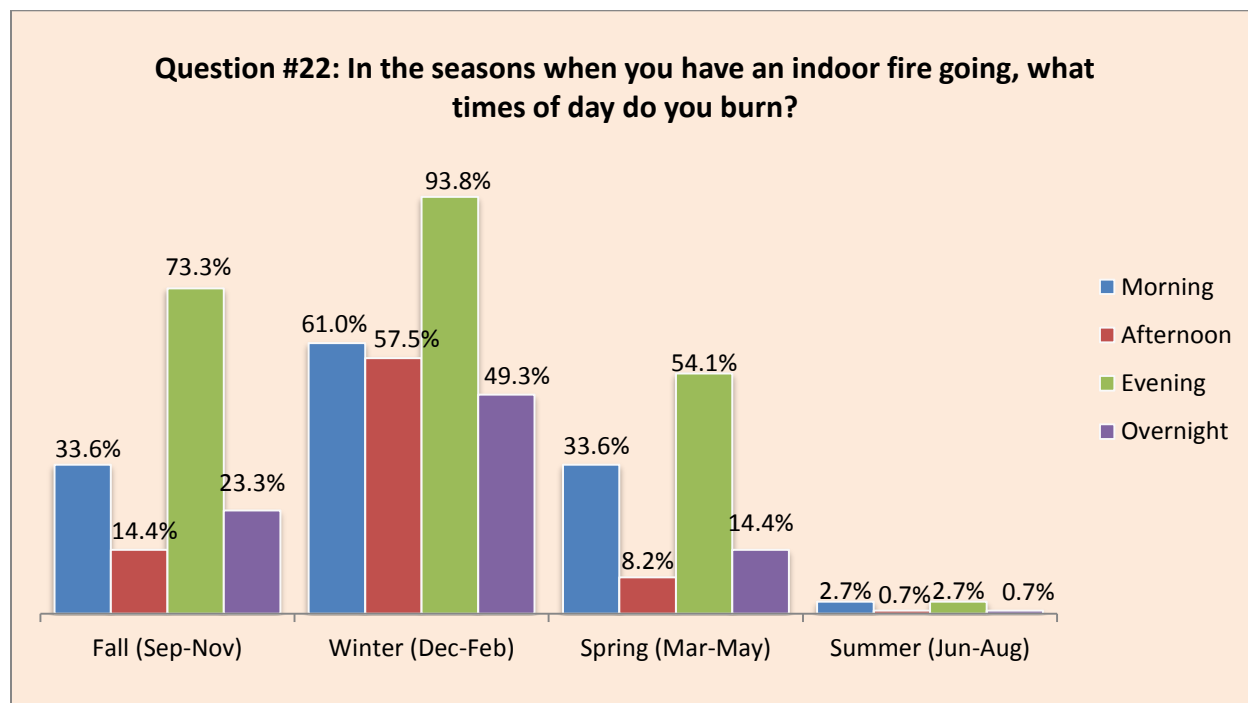


Figure 10. Season and time of day wood is burned. (n=146)

Indoor Burning Appliances

Respondents who identified themselves as indoor burners were asked several questions about their indoor burning appliances as a primary source of heat, its age, and physical characteristics. They were also asked to identify if the device was certified. About half the respondents use a free standing wood stove, and 25.2% use a wood insert. The majority of people use wood burning in combination with another source of heat (89.5%).

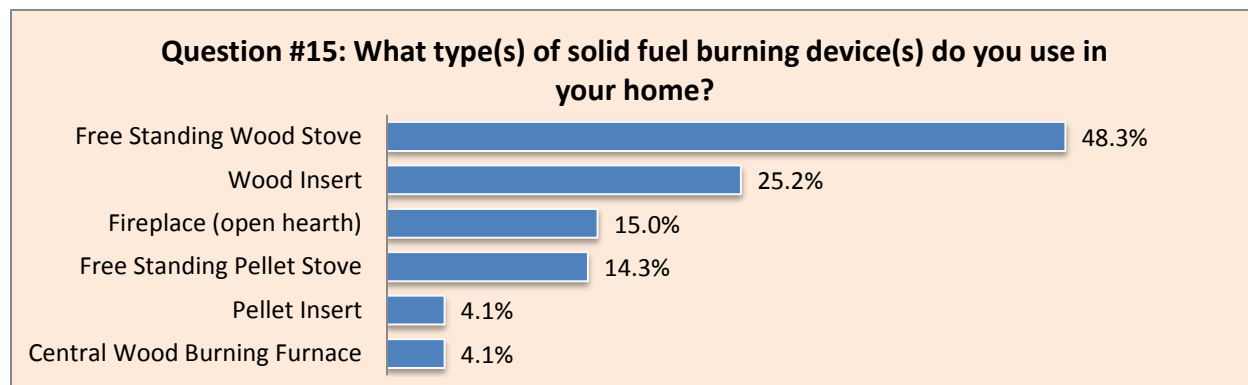


Figure 11. Solid fuel burning devices currently in use. (n=147)

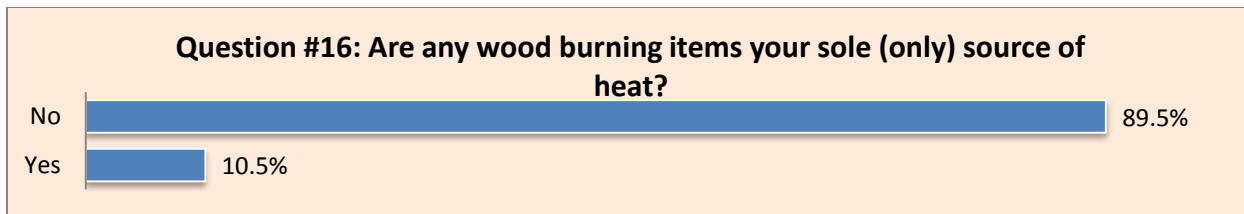


Figure 12. Wood burning device as sole (only) source of heat. (n=153)

A large number of respondents (67%) believe they use a certified device, but 26.4% are unsure and 6.8% claim their device is uncertified. The number of those reporting wood burning devices 20 years old or less is almost identical to those reporting certified equipment, which strongly supports the theory that people who are identifying their device as certified are doing it correctly. This is also supported by the 61% of respondents who reported devices with glass doors and metal frames that hinge on the side as this feature means they are most likely certified. This also supports 2014 survey data on self-reported certified equipment numbers.

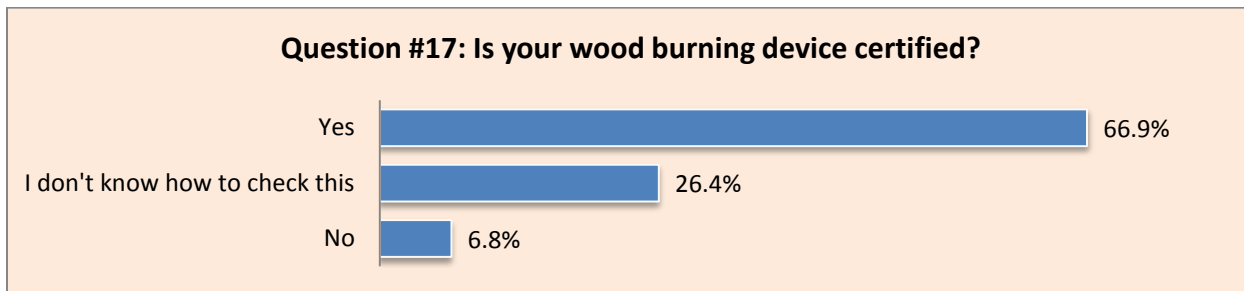


Figure 13. Burning device certification. (n=148)

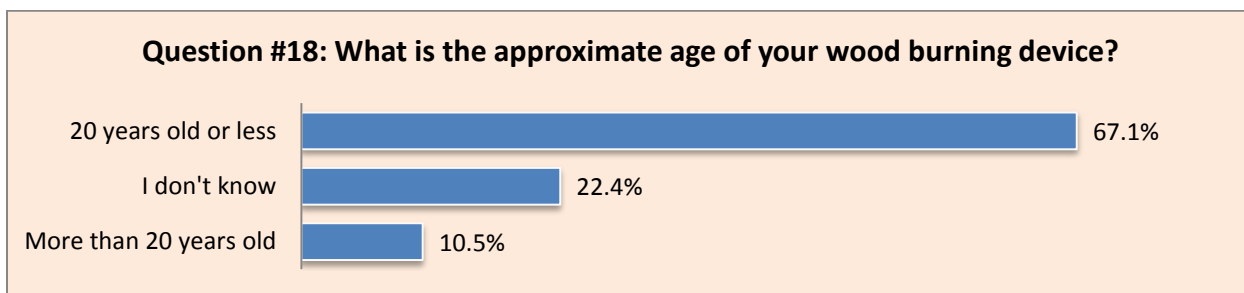


Figure 14. Approximate age of woodstoves. (n=152)

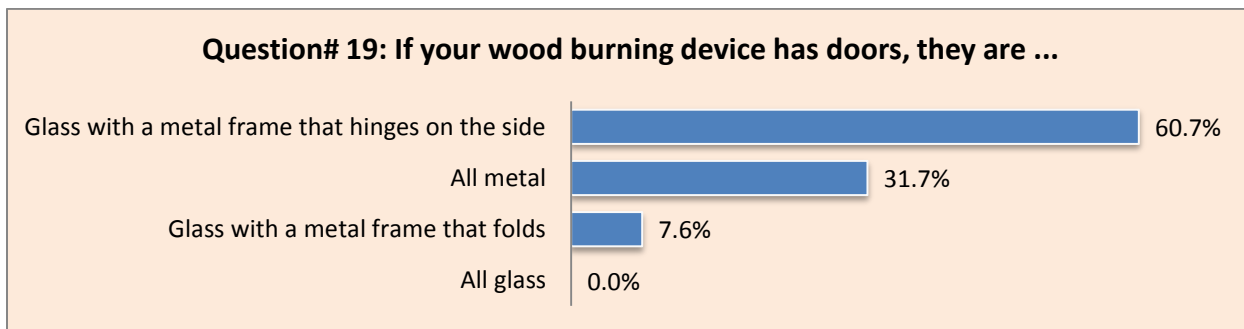


Figure 15. Type of door on wood burning device. (n=156)

Maintenance and Operation of Indoor Burning Appliances

Respondents were asked whether or not they had professional chimney inspection and professional chimney cleaning performed, and if they had performed self-chimney inspection and self-chimney cleaning. Figure 17 below shows that a large percentage of respondents clean and inspect their own devices. A small percentage follows the best practice recommendation of annual cleaning and inspection by a professional.

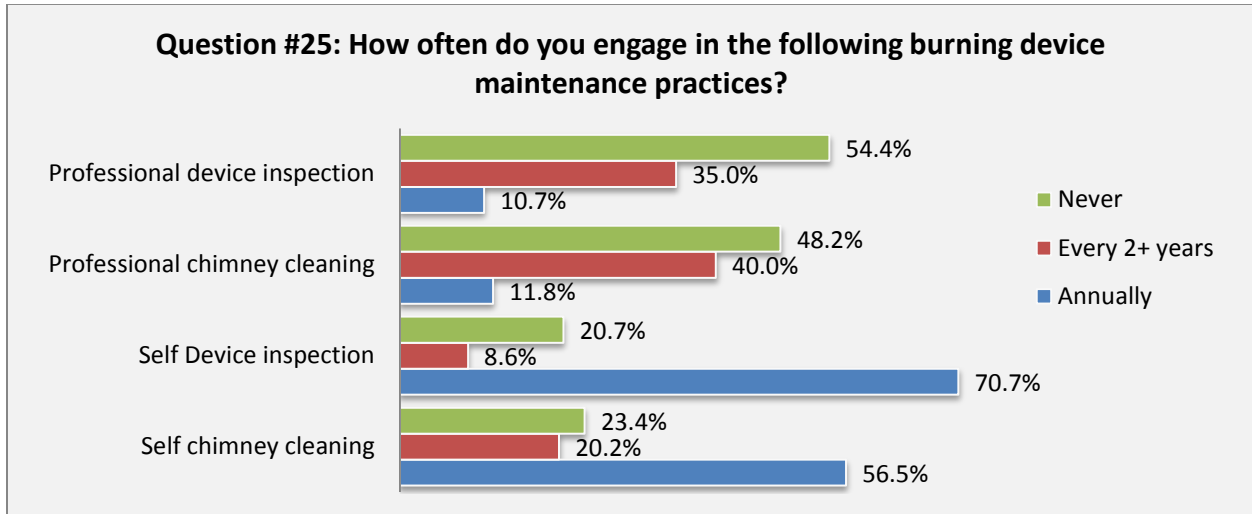


Figure 16. Device maintenance practices. (n=141)

Respondents were asked about six different woodstove operation practices. These practices, when followed, reduce the amount of soot produced and help wood to burn more efficiently. Figure 16 shows that the majority of respondents keep doors closed, burn small hot fires, and remove ashes, while only about half report keeping the damper open and checking burn bans.

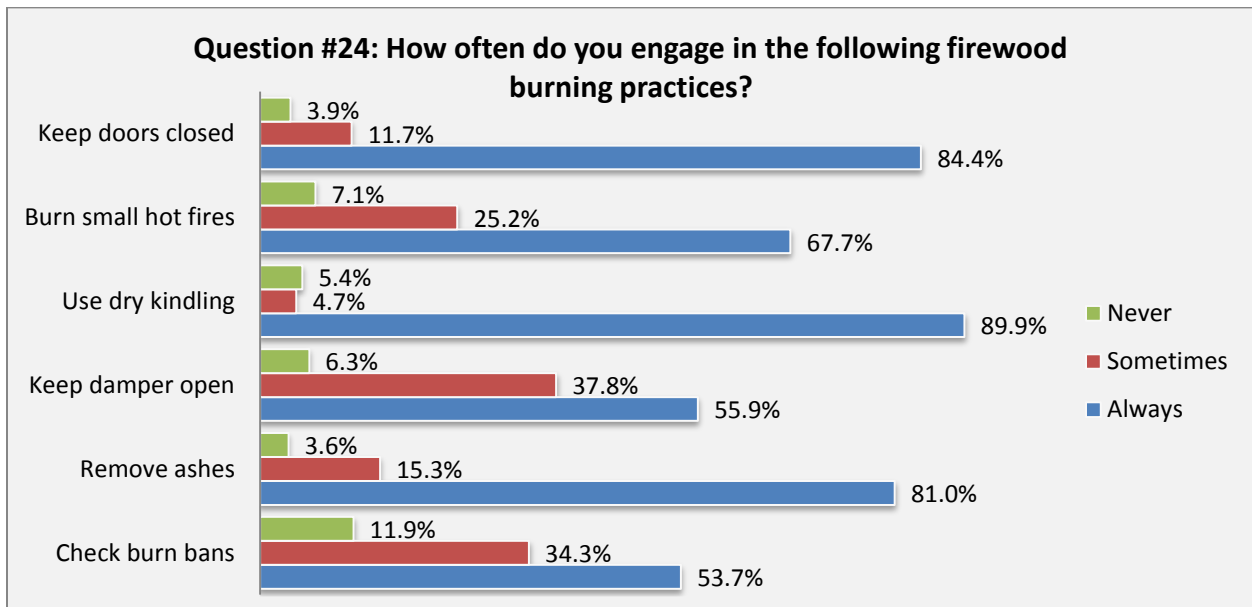


Figure 17. Firewood burning practices. (n=141)

Burn Ban Information

It is important to know how residents currently get their burn ban information in order to determine if current modes of communication are effective at getting the message to those who need it. In 2014 and 2015, respondents were asked how they learned about burn bans. In 2014, the slightly more than half of respondents (54.4%) learned about them from the newspaper and 49.5% by word of mouth (2014 responses were filtered for respondents who use wood as a heat source). In 2015, the survey asked respondents who burn indoors to identify how they get information on home heating bans. Almost half (46.5%) of all respondents learned about them from the newspaper and 41.9% reported the internet as their primary source. In 2015, respondents who burn indoors were asked how they would *prefer* to get the information and almost half (49%) would prefer to learn about burn bans through the internet. The second most popular preference was radio followed by the newspaper.

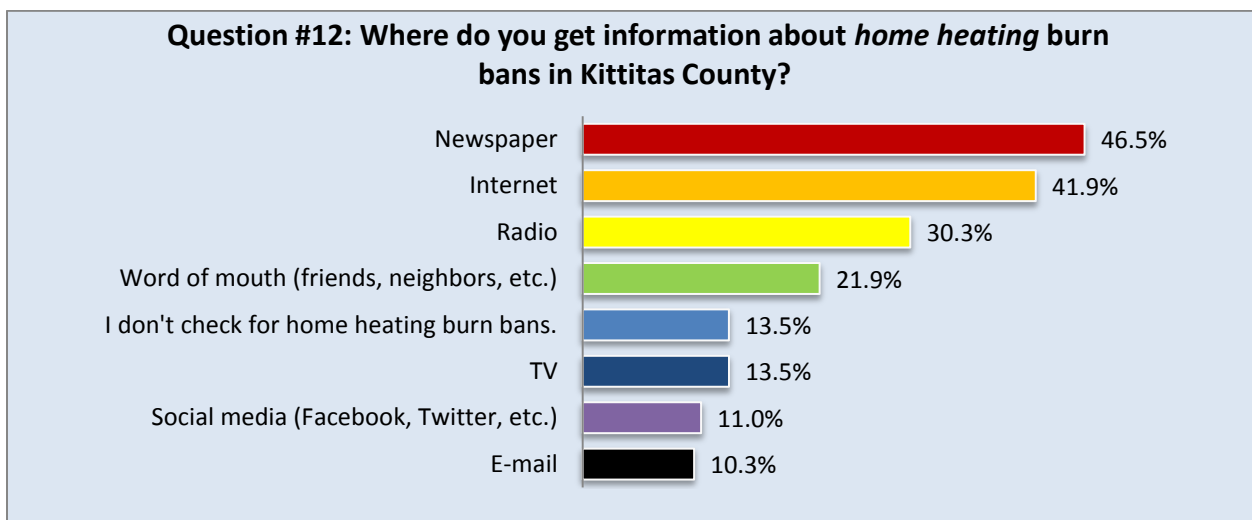


Figure 18. How respondents get information on home heating burn bans (2015). (n=155)

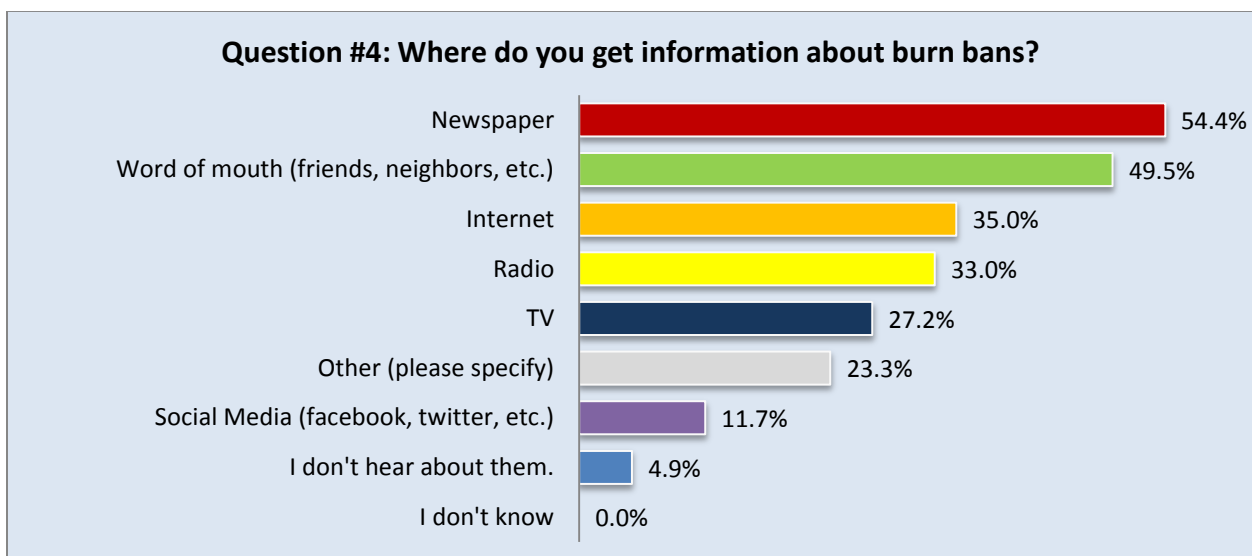


Figure 19. How respondents get information on home heating burn bans (2014). (n=103)

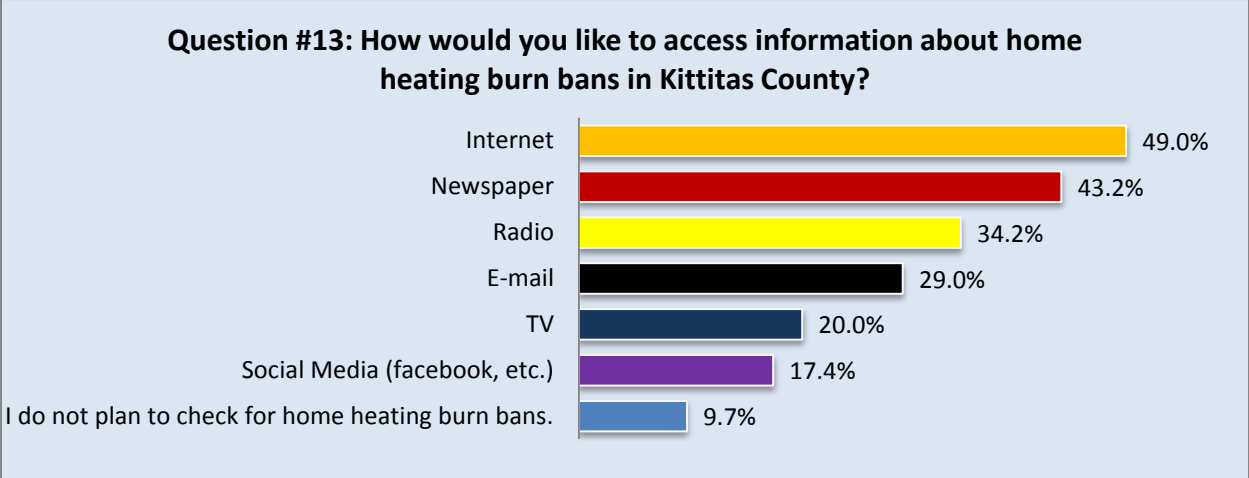


Figure 20. Preferred communication medium for home heating burn bans. (n=155)

Outdoor Burning

In the KCPHD survey, respondents were asked about burning yard debris at home, the size of the piles and the number of piles they burn each year. Approximately one quarter (25.8%) of survey takers reported burning yard debris. Of the people who reported burning yard debris, the majority reported burning one to four piles a year. The piles consist mostly of branches and remnants from pruning trees and bushes. On average, almost half of the piles burned are 48 cubic feet in diameter. A large majority (85.7%) of debris burners report making sure the debris is dry before burning it.

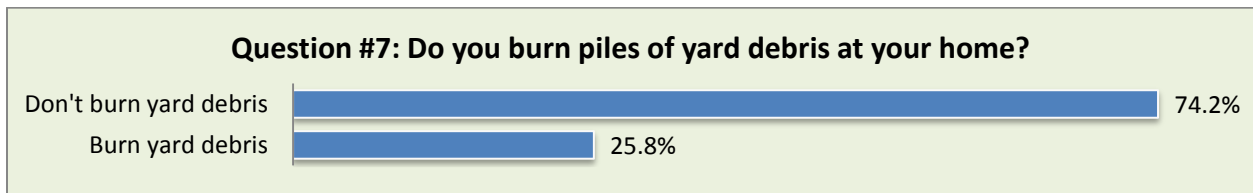


Figure 21. Residents that burn piles of yard debris. (n = 612)

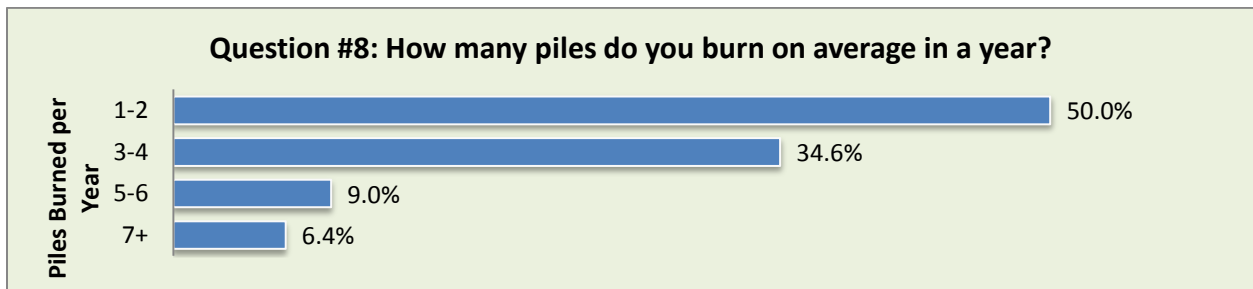


Figure 22. Number of piles burned in a year. (n=156)

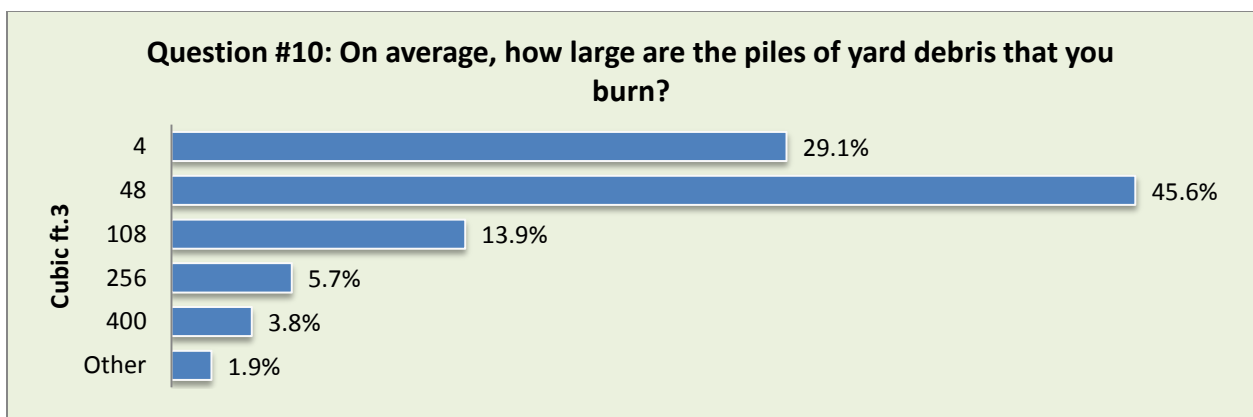


Figure 23. Size of yard debris burn piles. (n=158)

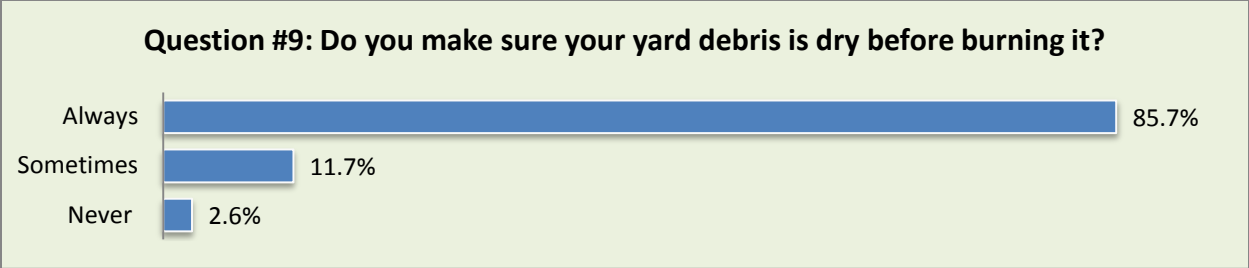


Figure 24. Yard debris is dry before burning. (n=154)

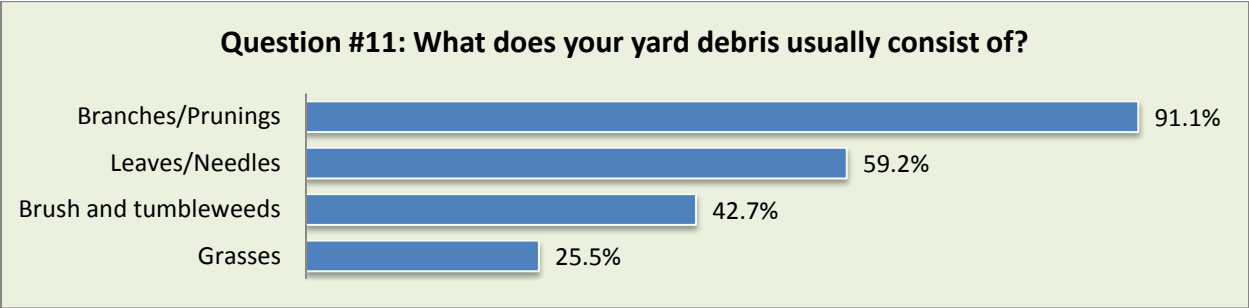


Figure 25. Yard debris components. (n=157)

Public Opinion

Respondents were asked about their opinions regarding air quality issues in Kittitas County. As Figure 26 indicates, 61% of respondents think poor air quality is a significant environmental issue whereas 22% of respondents do not. A little over half (53%) of survey respondents agree that wood stoves and fireplaces are significant contributors to poor air quality whereas 25% of respondents do not. It is possible that people reporting certified stoves may not identify themselves as being significant contributors and therefore may not agree with the statement that woodstoves are a major contributor to poor air quality. In the future, it would be interesting to see how a change in wording would impact response rates. For example, changing the statement to read “*Uncertified, older* fireplaces and woodstoves are a major contributor to poor air quality” may garner more agreement.

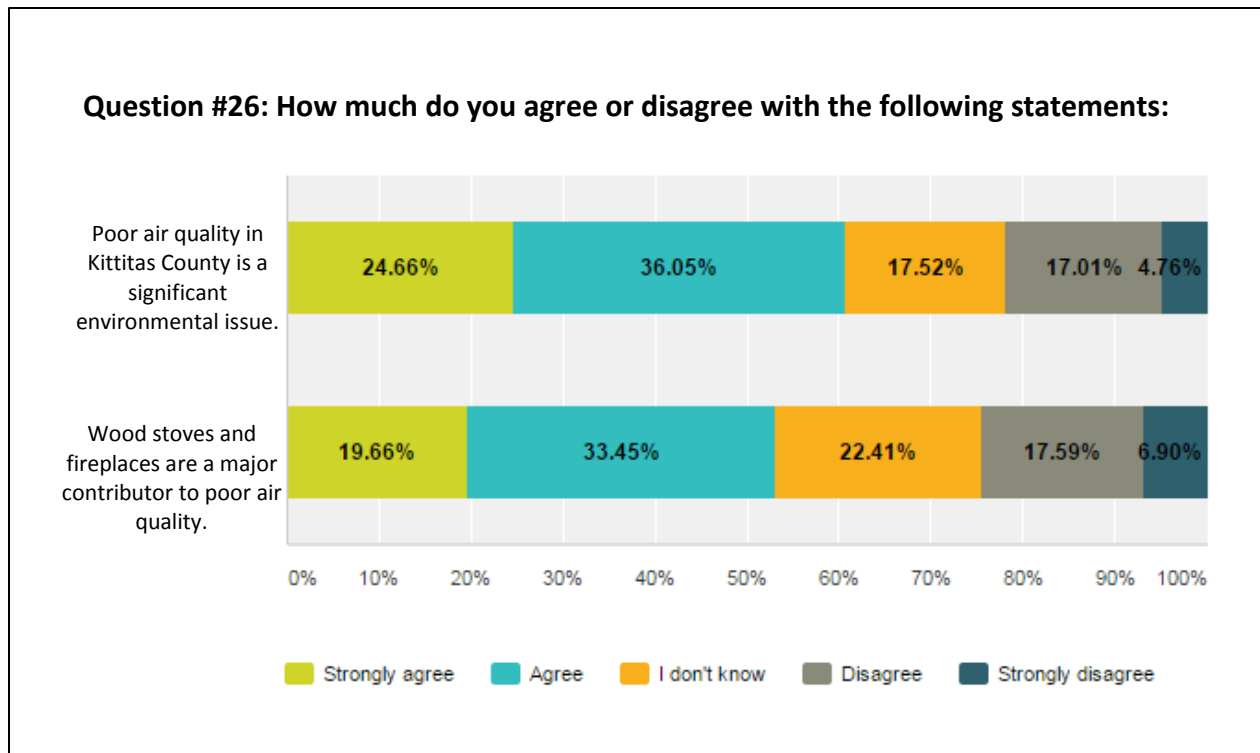


Figure 26. Community agreement with air quality related statements. (n=589)

As Figure 27 shows, a large portion of the respondents (87%) support educating the community on efficient wood stove and insert operations. An almost equally significant number (84%) of respondents support programs for upgrading old equipment to newer, certified (less-polluting) devices. Two thirds (67%) of respondents support restricting wood burning on poor air quality days. Over half (58%) of respondents support administering fines for excess smoke and roughly the same amount (60%) support requiring households to update or remove older, higher polluting appliances when a house is sold. Almost half (48%) of the respondents support by-laws to reduce smoke emissions. These responses indicate that there would be significant community support behind continued education and outreach efforts as well as federal or state funded programs to assist with upgrading old equipment. It should be noted that there is also considerable community support for all items listed below, which is useful information for future program or policy development.

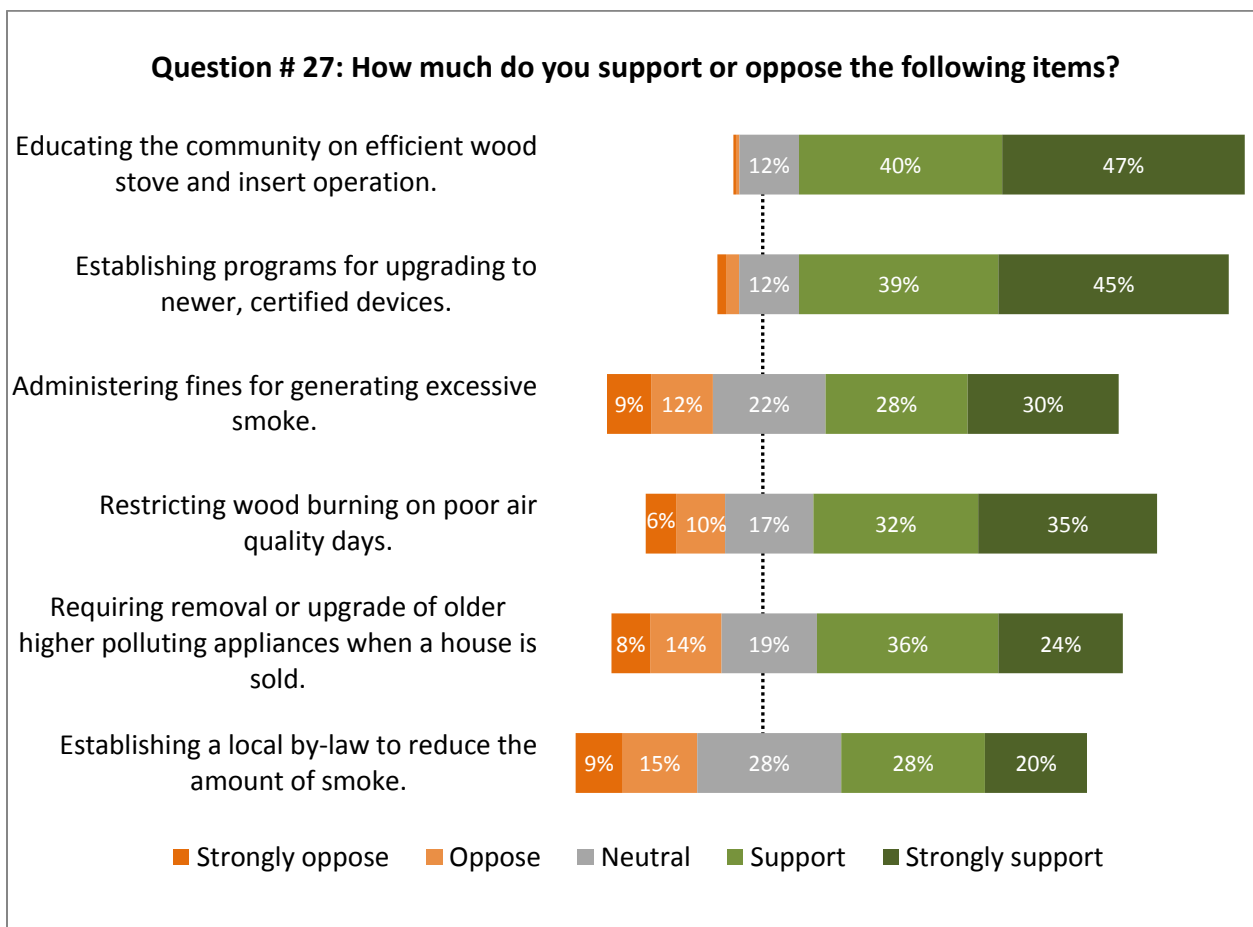


Figure 27. Community support for air quality related items. (n=588)

Education and Outreach Effectiveness

In order to measure the effectiveness of the education and outreach campaign, the 2014 survey results were compared to the 2015 results. A chi-squared statistical test was performed for all of the following questions to determine if there was a statistically significant difference in the population’s responses from the first and second survey. The statistical test is done to eliminate the probability that the difference in a population’s response rate is due to chance alone. The chi test results showed that the 2015 responses were actual reflections of change in community response rates from last year. The measurable targets for change set forth by KCPHD are outlined in Appendix F.

Knowledge of PM2.5 and Air Quality Issues

Key findings from our 2014 study indicated that there is a general lack of knowledge and awareness about PM2.5 and the air quality issues in Kittitas County, including a disconnect between individual behaviors and how they contribute to poor air quality. Educational targets for the outreach campaign were to increase the percentage of people reporting that they understand PM2.5, know how to check local air quality, and identify fireplaces and woodstoves as contributors to poor air quality. KCPHD employed two primary outreach strategies to address these knowledge gaps. Responses from the 2014 survey identified the local newspaper as being a primary source of news and information for the county. KCPHD initiated a series of newspaper articles in the Daily Record addressing air quality issues and impacts of burning practices on local air quality. A daily air quality status bar was also added to the weather section of the Daily Record. The second activity was to coordinate with local libraries and set up air quality related displays regarding PM2.5 and the impacts of indoor burning. In addition, table top displays with similar information were done at day long community events such as an Earth Day and other public venues such as the Ellensburg Farmer’s Market. All displays had education and outreach brochures on clean burning practices that could be taken by community members (see Appendix G). All targeted areas saw statistically significant increases except for the identification of fireplaces and woodstoves as contributors to poor air quality in Kittitas County.







PM2.5 Education/Outreach Targets:	2014	2015	Met  Not Met 
Increase the percentage of those who report understanding the concept of PM2.5	44%	53%	
Increase the percentage of those who report knowing how to check air quality conditions	45%	51%	
Increase percentage of individuals who agree that poor air quality is a significant issue in Kittitas County	47%	61%	
Increase the percentage of people who identify fireplaces & woodstoves as a major PM2.5 source	55%	53%	

Table 1: Comparison of PM2.5 Education/Outreach Survey Results

Ability to Identify a Certified Stove

A key finding in the 2014 survey data was the large amount of people reporting uncertified stoves and those that were unsure of their stove’s certification status. The education targets were to increase the percentage of those able to clearly identify whether or not they have a certified stove (thereby decreasing the percentage of those reporting “I don’t know”). The education and outreach activities included sharing information on wood stoves via published articles in the Daily Record and brochure distribution through the various display sites (see Appendix G). Responses from 2015 show an increase in people reporting certified wood stoves and a decrease in uncertified stoves. There was no significant change in the amount of people who reported not knowing how to identify if their stove was certified. This would indicate that there is still a need for education; however, current methods may need to be altered or enhanced in order to reach this group of individuals.






PM2.5 Education/Outreach Targets:	2014	2015	Met  Not Met 
Decrease the percentage of indoor wood burners reporting “I don’t know” or “I don’t know how to check this” when asked if they have a certified stove.	24%	26%	
Increase percentage of indoor wood burners reporting that they have a certified stove	54%	67%	
Decrease the percentage of indoor wood burners reporting they have uncertified stoves.	22%	7%	

Table 2: Comparison of Certified Stove Education/Outreach Survey Results

Knowledge of Illegal Burning Materials

The 2014 survey data showed that there were gaps in knowledge about what is legal to burn, especially cardboard, lumber, and paper. The KCPHD education and outreach campaign set out to decrease the amount of people who misidentify paper, cardboard and lumber as items that are legal to burn. Outreach included distributing brochures targeting wood burners with messages and information about clean burning, equipment use and certified equipment, and what is legal to burn. Educational advertising targeting cardboard, paper, and lumber was broadcast on local radio stations and displayed in local newspapers.






Illegal Burning Materials Education/Outreach Impact:	2014	2015	Met  Not Met 
Decrease the percentage of people who report that paper is legal to burn	41%	26%	
Decrease the percentage of people who report that cardboard is legal to burn	47%	31%	
Decrease the percentage of people who report that lumber is legal to burn	36%	30%	

Table 3: Comparison of Legal Burning Materials Education/Outreach Survey Results

Importance of Seasoned Wood

Data from the 2014 survey indicated that most people who burn wood indoors seem to be using dry, seasoned wood. However, there was still a large percentage of people that did not indicate understanding why this was an important practice. The 2014 Key Informant interviews also revealed a perception of frequent indoor burners that others in the community don't know how to season wood and burn efficiently. Two activities were designed to target this knowledge gap. Activity one was to circulate a brochure targeting wood burners with messages about clean burning, equipment use and certified equipment (see Appendix G). Activity two was to include information about the importance of seasoned wood in the article series done by the local newspaper. Both targets were met as shown by an increased percentage of individuals who were able to report understanding the importance of seasoning firewood.





Seasoned Wood Education/Outreach Impact:	2014	2015	Met  Not Met 
Increase the percentage of people who understanding the concept of seasoning wood	67%	86%	
Decrease the percentage of people who report only understanding seasoning wood <i>somewhat</i>	31%	10%	

Table 4: Comparison of Seasoned Wood Education/Outreach Survey Results

Education and Outreach Mediums

The following questions on the survey asked people if they came into contact with any of the items from the clean burning education and outreach campaign that was conducted over the winter of 2014-2015. It is important to note that the answer options for this question included all of the outreach materials and activities done by both KCPHD and Ecology's Air Quality Division Program from the Central Regional Office. The survey results indicate that the Daily Record article series appears to have reached the most individuals in the community. Figure 27 shows that almost half of the respondents (48%) reported seeing the newspaper articles published in the Daily Record. This is quite a bit more than the next highest reported item, KXLE radio ads, at a rate of 20%. Even though 33% of survey takers reported not seeing any informational materials at all, it is significant to note that this means 67% of the population came into contact with outreach materials of some sort. Whether or not the materials they came into contact with actually influenced their behavior is a question that warrants further investigation.

Question #1: KCPHD recently initiated an education and outreach campaign on air quality (AQ) and efficient burning practices. Since November 1st of last year, have you seen or heard any of the following?

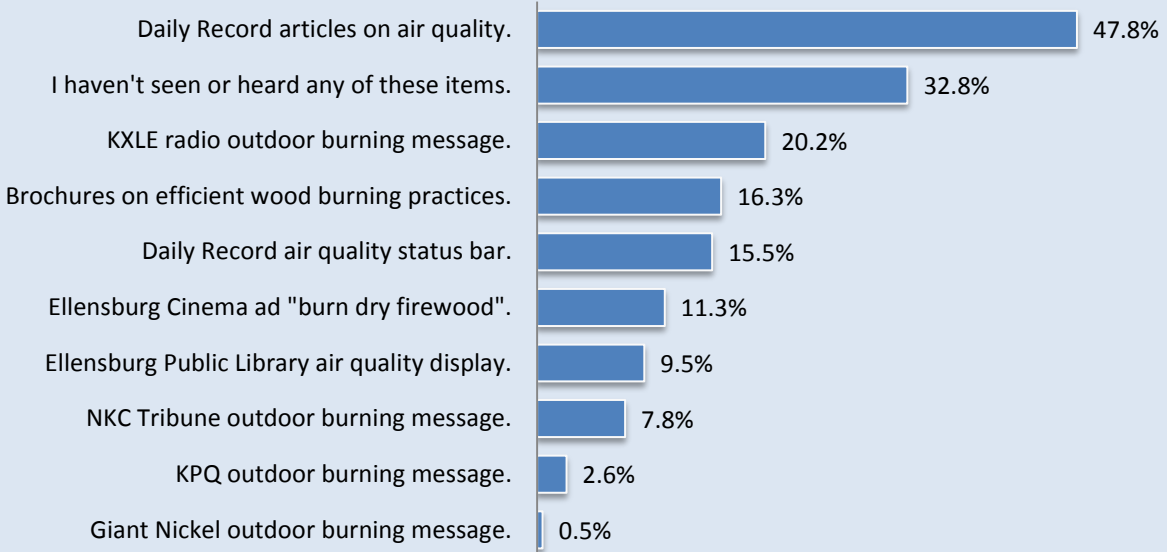


Figure 27. Contact with air quality and wood burning messages. (n=613)

Conclusion

Key Findings

There are still many Kittitas County residents who do not agree that air quality is an important environmental issue or that wood stoves are a significant contributor to PM2.5 pollution. However, even with the lack of agreement on the air quality issue, there is a significant amount of community support for engaging in activities that would attempt to reduce PM2.5 pollution. Most respondents would support measures to reduce PM2.5 pollution in Kittitas County through further education regarding efficient wood stove operation and programs to replace or upgrade current equipment. The amount of people who reported heating their homes solely with wood matched the most recent census report on households that heat with wood. We were also able to distinguish primary and secondary heat source burners from sole sources, which decreased our initial findings by almost half. The number of people who self-report having certified stoves aligns with the data on reported certified characteristics, meaning they are accurately identifying their equipment as certified. The 2015 survey findings validated the high numbers of certified stoves reported by Kittitas County last year. However, many people who use wood to heat their home report that they are not engaging in all of the behaviors that will result in the cleanest and most efficient burn possible. Indoor burners are burning wood primarily in the fall and winter which corresponds with data from Ecology regarding PM2.5 emissions data from previous home heating seasons. In all four seasons, the time of day when the most burning occurs is in the evening. Findings from 2014 and 2015 data show that respondents primarily receive information about indoor heating burn bans from Newspaper and word of mouth. However, 2015 data indicates that they would prefer to receive it by internet, which means there may be a need for better web based communications regarding home heating burn bans. A quarter of our population engages in frequent small pile burning outdoors, most of which is used for disposing of brush and yard debris clearing. There are also a large number of outdoor burners who are still misidentifying paper, cardboard and lumber as being legal to burn. Response data was analyzed to determine if there were statistically significant changes in the areas that were covered by the education and outreach campaign. There were increases in the amount of general community knowledge reported in target areas of air quality related items (including PM2.5) from the time of the last survey. The most effective outreach and education medium used by KCPHD-in terms of the number of community members reached- was the newspaper article series in the Daily Record. The radio ads issued by Ecology also had a significant reach. While it is difficult to determine if the change in public knowledge and perception is a direct impact from outreach and education, the amount of people reached by materials is encouraging.

Implications for Outreach and Education

The community is still divided on whether or not air quality is a real issue affecting Kittitas county and are not able clearly identify themselves as a source of PM2.5 pollution. While the increases in public knowledge and awareness were statistically significant, not all of the target areas were reached. This may be an indicator that the current methods of outreach and education may not be the most effective modes of communication with the public, especially when it comes to changing behavior. Increasing public knowledge about air quality issues and wood burning practices is important, however, the next step will be helping people to understand how their behaviors impact PM2.5 pollution. People who do not see a direct and immediate impact of their behaviors may not be motivated to change burning habits or beliefs about air quality (which may have an indirect effect on burning practices). Messaging to the public will need to show how certain practices can have a cumulative effect on PM2.5. Certain avenues of the education and outreach campaign, such as newspaper articles and other media, appear to be successful and these may be a good avenue for future education and outreach campaigns. Conducting studies of PM2.5 speciation would also be an effective way to show the community where there PM2.5 pollution is coming from. It would be beneficial for Kittitas County Public Health to continue educational programs in addition to gathering aggregate air quality data in order to monitor health impacts and risks.

Considerations for Future Evaluations

There are several items that should be considered for future evaluations. The initial survey time set forth in the contractual work plan was not enough for the chosen method of distribution. Survey time was extended an additional two weeks order to ensure the same amount of responses as the 2014 survey. We were unable to get the Spanish version of the survey out to the mono-lingual Spanish speaking population due to shortage of bi-lingual staff time. Future evaluators should budget for translation services. The gender demographic of survey takers shifted from 2014 to 2015 and may skew data if a weighted analysis were to be applied. The survey also did not allow for screening of individuals reporting for the same household. In terms of timing of the survey, the 2014—2015 winter was unseasonably warm and may have affected people's responses in regard to how much wood they use to heat their homes. It may be beneficial to schedule the next survey prior to the home heating season. Finally, the survey did not ask survey takers how (or if) the educational materials that they came into contact with influenced their behavior in regards to their current burning practices. This would be another item for future evaluation. The actual implementation time of the KCPHD outreach and education program being measured was only three months; further evaluation would be needed to determine longitudinal impacts of the campaign.

Appendices

Appendix A: 2015 Kittitas County Air Quality Survey



THANK YOU for taking a few minutes to fill out our **anonymous** 2015 Air Quality Survey!
Register below for a chance to win!!

Your input is extremely valuable! Last year, KCPHD conducted a community survey on beliefs and practices surrounding air quality in Kittitas County. This year, we are doing another survey to get a more in depth look at what people know and do in regards to efficient burning. Also, our community is currently being monitored by the Environmental Protection Agency (EPA) because of air quality concerns. We want to compare our wood burning survey data to the readings of the EPA and Department of Ecology monitors on top of Hal Holmes. In a nutshell, our new air quality survey goals:

- *Get more in depth information about 2014 air quality survey findings.*
- *Re-test our original findings to see if they hold true.*
- *Compare our data to Dept. of Ecology and EPA findings.*
- *Test the effectiveness of our outreach and education campaign.*

We need your valuable input! Please take our survey in one of three ways:

- 4) Online at: www.surveymonkey.com/s/2015KCPHDAQSURVEY
- 5) Fill out a paper survey at one of our polling stations.
- 6) Have the survey (with stamped return envelope) mailed to you.

For more information about the 2015 community air quality survey, or to have the survey e-mailed or mailed to you, please contact:

Amy Fuller at the health department: **509-962-7515**
 or e-mail: communityassessment@co.kittitas.wa.us

SURVEY DUE: 4/30/15

ENTER YOUR NAME AND CONTACT INFORMATION FOR
 A CHANCE TO WIN **\$25** GIFT CERTIFICATES TO THESE LOCAL BUSINESSES:

FRED MEYER • RANCH & HOME • ARMSTRONG STOVE & SPA • BI-MART • OLD MILL

NAME:	
ADDRESS:	
CITY:	STATE
PHONE:	EMAIL:
<input type="checkbox"/> I am interested in finding out how I can be more involved in air quality assessment efforts.	
<input type="checkbox"/> I am interested in getting some information about how to become a member of the Air Quality Committee for Kittitas County	

TEAR OFF AND PLACE IN BOX



2015 KITTITAS COUNTY AIR QUALITY SURVEY

1. KCPHD recently initiated an education and outreach campaign on air quality (AQ) and efficient burning practices. Since November 1st of last year, have you seen or heard any of the following? (Check all that apply)

- Brochures on efficient wood burning
- Daily Record articles on air quality
- NKC Tribune outdoor burning message
- Ellensburg Public Library AQ display
- I haven't seen or heard any of these items.
- Daily Record Air Quality Status bar
- KXLE Radio outdoor burning message
- KPQ Radio outdoor burning message
- Ellensburg Cinema ad "burn dry firewood"
- Giant Nickel – outdoor burning message

2. How well do you understand the air quality related phrases "PM2.5" or "fine particulate matter"? (Please check one)

- I understand them well and can explain them to others.
- I understand somewhat.
- I don't know what those phrases mean.

3. Do you know how to check air quality conditions for Kittitas County? Yes No

4. What is the main source of heat for your residence? (Please check one)

- Electricity
- Fuel Oil or Heating Oil
- Natural gas
- Propane
- Wood or Wood Pellets
- Other _____

5. Do you have a backup or supplementary source of heat? (Check all that apply)

- Electricity
- Fuel Oil or Heating Oil
- Natural gas
- Propane
- Wood or Wood Pellets
- Other _____
- No back up or supplementary source of heat

6. Please identify which of the following items are LEGAL to burn in an outdoor fire?

- | | | | |
|--|----------------------------------|---|---|
| <input type="checkbox"/> Anything in a burn barrel | <input type="checkbox"/> Garbage | <input type="checkbox"/> Paint | <input type="checkbox"/> Tires |
| <input type="checkbox"/> Asphalt | <input type="checkbox"/> Grass | <input type="checkbox"/> Paper | <input type="checkbox"/> Trees |
| <input type="checkbox"/> Cardboard | <input type="checkbox"/> Leaves | <input type="checkbox"/> Pesticide Containers | <input type="checkbox"/> Unprocessed natural vegetation |
| <input type="checkbox"/> Construction debris | <input type="checkbox"/> Logs | <input type="checkbox"/> Petroleum Products | <input type="checkbox"/> Yard Waste |
| <input type="checkbox"/> Dead animals | <input type="checkbox"/> Lumber | <input type="checkbox"/> Plastics | |
| <input type="checkbox"/> Demolition debris | <input type="checkbox"/> Metals | <input type="checkbox"/> Shrubberies | |

7. Do you burn piles of yard debris at your home? Yes No

IF "YES", PLEASE ANSWER QUESTIONS #8--#11. IF "NO", PLEASE SKIP TO NEXT PAGE.

8. How many piles do you burn on average in a year? 1-2 3-4 5-6 7+

9. Do you make sure your yard debris is dry before burning it? Yes No Sometimes

10. On average, how large are the piles of yard debris that you burn?

(Please check one)

- 2 ft. x 2 ft. x 1 ft.
- 4 ft. x 4 ft. x 3 ft.
- 6 ft. x 6 ft. x 3 ft.
- 8 ft. x 8 ft. x 4 ft.
- 10 ft. x 10 ft. x 4 ft.
- Other _____

11. What does your yard debris usually consist of? (Check all that apply)

- Leaves/needles
- Branches/Prunings
- Grasses
- Brush and tumbleweeds

THIS SECTION (PAGES 2-3) IS ABOUT INDOOR BURNING ONLY. IF YOU DON'T BURN WOOD...

12. Where do you get information about home heating burn bans in Kittitas County? (Check all that apply)

- Newspaper
- Radio
- Internet
- TV
- E-mail
- Word of mouth (friends, neighbors, etc.)
- Social media (Facebook, twitter, etc.)
- I don't check for home heating burn bans.

13. How would you like to access information about home heating burn bans in Kittitas County? (Check all that apply)

- Newspaper
- Radio
- Internet
- TV
- E-mail
- Social media (Facebook, twitter, etc.)
- I do not plan to check for home heating burn bans.

14. Do you understand why it is important to burn dry, seasoned firewood for home heating? Yes Somewhat No

15. What type(s) of solid fuel burning device(s) do you use in your home? (Check all that apply)

- Fireplace (open hearth)
- Central Wood Burning Furnace
- Free Standing Wood Stove
- Free Standing Pellet Stove
- Wood Insert
- Pellet Insert

16. Are any of the items above your sole (only) source of heat? Yes No

17. Is your wood burning device certified?

- Yes
- No
- I don't know how to check this

18. What is the approximate age of your wood burning device?

- 20 years old or less
- More than 20 years old
- Don't know

19. If your wood burning device has doors, they are ...

- All metal
- Glass with a metal frame that folds
- Glass with a metal frame that hinges on the side
- All glass

20. What is the primary species of wood you burn?

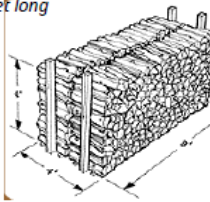
- Hard forest wood (ash, larch, oak)
- Soft forest wood (aspen, cedar, cottonwood, fir, hemlock, pine)
- Fruit wood (apple, cherry, pear)
- Combination of above
- I don't know

Page 2

WOOD OR WOOD PELLETS INDOORS, SKIP AHEAD TO QUESTION #26 ON BACK PAGE. →

21. How many cords of wood do you typically burn in a year?
 A full cord measures four feet high by four feet wide by eight feet long
 (4 ft. x 4 ft. x 8 ft.):

- Less than ¼ of a cord
- ¼ to ½ cord
- 1 to 1 ½ cords
- 2 to 2 ½ cords
- 3 to 3 ½ cords
- 4 or more cords



22. In the seasons when you have an indoor fire,
 what times of day do you burn? (Check all that apply)

Fall (Sep-Nov)	Winter (Dec-Feb)	Spring (Mar-May)	Summer (Jun-Aug)
<input type="checkbox"/> Morning	<input type="checkbox"/> Morning	<input type="checkbox"/> Morning	<input type="checkbox"/> Morning
<input type="checkbox"/> Afternoon	<input type="checkbox"/> Afternoon	<input type="checkbox"/> Afternoon	<input type="checkbox"/> Afternoon
<input type="checkbox"/> Evening	<input type="checkbox"/> Evening	<input type="checkbox"/> Evening	<input type="checkbox"/> Evening
<input type="checkbox"/> Overnight	<input type="checkbox"/> Overnight	<input type="checkbox"/> Overnight	<input type="checkbox"/> Overnight

23. How often do you engage in the following firewood storage practices?	Always	Sometimes	Never
Split firewood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stack firewood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cover firewood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Store off the ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dry for 6 + months	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. How often do you engage in the following firewood burning practices?	Always	Sometimes	Never
Check burn bans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remove ashes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keep damper open	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use dry kindling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Burn small hot fires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keep doors closed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. How often do you engage in the following burning device maintenance practices?	Annually	Every 2 + years	Never
Self Chimney Cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Self Device Inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional Chimney Cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional Device Inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

END OF INDOOR WOOD BURNING SECTION GO TO BACK PAGE (PAGE 4) Page 3

26. How much do you agree or disagree with the following statements:	Strongly Agree	Agree	I don't know	Disagree	Strongly Disagree
Poor air quality in Kittitas County is a significant environmental issue.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wood stoves and fireplaces are a major contributor to poor air quality.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. How much do you support or oppose the following items :	Strongly Support	Support	Neutral	Oppose	Strongly Oppose
Establishing a local regulation to reduce the amount of smoke.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Requiring removal or upgrade of older higher polluting appliances when a house is sold.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Restricting wood burning on poor air quality days.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Administering fines for generating excessive smoke.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establishing programs for upgrading to newer certified devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educating the community on efficient wood stove and insert operation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

QUESTIONS ABOUT YOU*					
28. What is your age?	<input type="checkbox"/> >19	<input type="checkbox"/> 20-24	<input type="checkbox"/> 25-29	<input type="checkbox"/> 30-34	<input type="checkbox"/> 35-39
	<input type="checkbox"/> 40-44	<input type="checkbox"/> 45-49	<input type="checkbox"/> 50-54	<input type="checkbox"/> 55-59	<input type="checkbox"/> 60-64
	<input type="checkbox"/> 65-69	<input type="checkbox"/> 70-74	<input type="checkbox"/> 75-79	<input type="checkbox"/> 80 +	
29. What is your gender?	<input type="checkbox"/> Male <input type="checkbox"/> Female				
30. How would you identify yourself?	<input type="checkbox"/> African American/Black		<input type="checkbox"/> Hispanic/Latino		
	<input type="checkbox"/> Asian/Pacific Islander		<input type="checkbox"/> Native American/Alaskan Native		
	<input type="checkbox"/> Caucasian/White		<input type="checkbox"/> Multiple Ethnicities		
31. Do you live in or out of the city limits?	<input type="checkbox"/> In <input type="checkbox"/> Out				
32. Do you rent or own your residence?	<input type="checkbox"/> Rent <input type="checkbox"/> Own <input type="checkbox"/> Other				
33. What is your zip code?	<input type="checkbox"/> 98950 (Vantage) <input type="checkbox"/> 98926 (Ellensburg) <input type="checkbox"/> 98941 (Roslyn) <input type="checkbox"/> 98946 (Thorp) <input type="checkbox"/> 98943 (South Cle Elum) <input type="checkbox"/> 98940 (Ronald) <input type="checkbox"/> 98934 (Kittitas) <input type="checkbox"/> 98922 (Cle Elum) <input type="checkbox"/> 98925 (Easton)				
*The information in this section is optional, but very helpful. It helps us to determine if we are representing all members of our community.					

Page 4

2015 Air Quality Survey

Questions kept the same from 2014

28, #29, #31, #32, #33

New Questions added

#1, #4, #7, #8, #9, #10, #11, #12, #13, #16, #19, #20, #21, #22, #23, #24, #25, #27

Questions re-worded/modified from 2014 survey

#2, #3, #5, #6, #14, #15, #16, #17, #18, #26, #30

Appendix B: Data

Table 1. Question #1: KCPHD recently initiated an education and outreach campaign on air quality (AQ) and efficient burning practices. Since November 1st of last year, have you seen or heard any of the following? (Please check all that apply)

Answer Options	Response Percent	Response Count	Confidence Interval
Brochures on efficient wood burning practices.	16.3%	100	2.9%
Daily Record articles on air quality.	47.8%	293	4.0%
NKC Tribune outdoor burning message.	7.8%	48	2.1%
Ellensburg Public Library air quality display.	9.5%	58	2.3%
Daily Record air quality status bar.	15.5%	95	2.9%
KXLE radio outdoor burning message.	20.2%	124	3.2%
KPQ outdoor burning message.	2.6%	16	1.3%
Ellensburg Cinema (Grand Meridian) ad "burn dry firewood".	11.3%	69	2.5%
Giant Nickel outdoor burning message.	0.5%	3	-
I haven't seen or heard any of these items.	32.8%	201	3.7%
answered question		613	
skipped question		0	

Table 2. Question #2: How well do you understand the air quality related phrases "PM2.5" or "fine particulate matter"? (Please check one answer)

Answer Options	Response Percent	Response Count	Confidence Interval
I understand them well and can explain them to others.	12.4%	76	2.6%
I understand somewhat.	46.5%	285	3.9%
I do not know what those phrases mean.	41.1%	252	3.9%
answered question		613	
skipped question		0	

Table 3. Question #3: Do you know how to check air quality conditions for Kittitas County?

Answer Options	Response Percent	Response Count	Confidence Interval
Yes	51.1%	312	4.0%
No	48.9%	299	4.0%
answered question		611	

<i>skipped question</i>	2
-------------------------	----------

Table 4. Question 4: What is the main source of heat for your residence? (Please check one answer)

Answer Options	Response Percent	Response Count	Confidence Interval
Electricity	48.0%	294	4.0%
Fuel Oil or Heating Oil	1.3%	8	0.9%
Natural Gas	30.7%	188	3.7%
Propane	7.3%	45	2.1%
Wood or Wood Pellets	10.9%	67	2.5%
Other (please specify)	1.80%	11	1.1%
<i>answered question</i>		613	
<i>skipped question</i>		0	

Table 5. Question 5: Do you have a backup or supplementary source of heat? (Please check all answers that apply)

Answer Options	Response Percent	Response Count	Confidence Interval
Electricity	26.3%	161	3.5%
Fuel Oil or Heating Oil	0.5%	3	0.6%
Natural Gas	8.2%	50	2.2%
Propane	7.0%	43	2.0%
Wood or Wood Pellets	15.5%	95	2.9%
No back up or supplementary source of heat	45.4%	278	3.9%
Other (please specify)	3.1%	19	1.4%
<i>answered question</i>		612	
<i>skipped question</i>		1	

Table 6. Question 6: Do you burn piles of yard debris at your home?

Answer Options	Response Percent	Response Count	Confidence Interval
Yes	25.8%	158	3.5%
No	74.2%	454	3.5%
<i>answered question</i>		612	
<i>skipped question</i>		1	

Table7. Question 7: Please identify which of the following items are LEGAL to burn in an outdoor fire? (Please check all answers that apply)

Answer Options	Response Percent	Response Count	Confidence Interval
Anything in a burn barrel	4.5%	27	1.7%
Asphalt	1.2%	7	0.9%
Cardboard	26.5%	160	3.5%
Construction debris	4.3%	26	1.6%
Dead animals	2.3%	14	1.2%
Demolition debris	2.5%	15	1.2%
Garbage	3.5%	21	1.5%
Grass	38.1%	230	3.9%
Leaves	62.1%	375	3.9%
Logs	70.0%	423	3.7%
Lumber	30.0%	181	3.7%
Metals	1.3%	8	0.9%
Paint	1.3%	8	0.9%
Paper	30.8%	186	3.7%
Pesticide Containers	1.5%	9	1.0%
Petroleum Products	1.3%	8	0.9%
Plastics	2.0%	12	1.1%
Shrubberies	45.5%	275	4.0%
Tires	2.3%	14	1.2%
Trees	47.8%	289	4.0%
Unprocessed Natural Vegetation	50.2%	303	4.0%
Yard Waste	49.7%	300	4.0%
<i>answered question</i>		604	
<i>skipped question</i>		9	

Table 8. Question 8: Do you burn piles of yard debris at your home?

Answer Options	Response Percent	Response Count	Confidence Interval
Yes	25.8%	158	3.5%
No	74.2%	454	3.5%
<i>answered question</i>		612	
<i>skipped question</i>		1	

Table 9. Question 9: How many piles do you burn on average in a year?

Answer Options	Response Percent	Response Count	Confidence Interval
1-2	50.0%	78	7.8%
3-4	34.6%	54	7.5%
5-6	9.0%	14	4.5%
7+	6.4%	10	3.8%
<i>answered question</i>		156	
<i>skipped question</i>		457	

Table 10. Question 10: Do you make sure your yard debris is dry before burning it?

Answer Options	Response Percent	Response Count	Confidence Interval
Yes	85.7%	132	-
No	2.6%	4	2.5%
Sometimes	11.7%	18	5.1%
<i>answered question</i>		154	
<i>skipped question</i>		459	

Table 11. Question 11: On average, how large are the piles of yard debris that you burn?

Answer Options	Response Percent	Response Count	Confidence Interval
2 ft. x 2 ft. x 1ft.	29.1%	46	7.1%
4ft x 4 ft. x 3ft.	45.6%	72	7.8%
6ft, x 6ft, x 3ft	13.9%	22	5.4%
8 ft. x 8 ft. x 4 ft.	5.7%	9	3.6%
10 ft., x 10ft. x 4ft.	3.8%	6	3.0%
Other (please specify)	1.9%	3	-
answered question		158	
skipped question		455	

Table 12. Question 12: What does your yard debris usually consist of? (Please check all answers that apply)

Answer Options	Response Percent	Response Count	Confidence Interval
Leaves/Needles	59.2%	93	7.7%
Branches/Prunings	91.1%	143	4.5%
Grasses	25.5%	40	6.8%
Brush and tumbleweeds	42.7%	67	7.7%
answered question		157	
skipped question		456	

Table 13. Question 13: Where do you get information about home heating burn bans in Kittitas County? (Please check all answers that apply)

Answer Options	Response Percent	Response Count	Confidence Interval
Newspaper	46.5%	72	7.9%
Radio	30.3%	47	7.2%
Internet	41.9%	65	7.8%
TV	13.5%	21	5.4%
E-mail	10.3%	16	4.8%
Word of mouth (friends, neighbours, etc.)	21.9%	34	6.5%
Social media (Facebook, Twitter, etc.)	11.0%	17	4.9%
I don't check for home heating burn bans.	13.5%	21	5.4%
answered question		155	
skipped question		458	

Table 14. Question 14: How would you like to access information about home heating burn bans in Kittitas county? (Please check all answers that apply)

Answer Options	Response Percent	Response Count	Confidence Interval
Newspaper	43.2%	67	7.8%
Radio	34.2%	53	7.5%
Internet	49.0%	76	7.9%
E-mail	29.0%	45	7.1%
TV	20.0%	31	6.3%
Social Media (Facebook, etc.)	17.4%	27	6.0%
I do not plan to check for home heating burn bans.	9.7%	15	4.7%
answered question		155	
skipped question		458	

Table 15. Question 15: Do you understand why it is important to burn dry, seasoned firewood for home heating?

Answer Options	Response Percent	Response Count	Confidence Interval
Yes	86.4%	133	5.4%
Somewhat	9.7%	15	4.7%
No	3.9%	6	3.1%
answered question		154	
skipped question		459	

Table 16: Question 16: What type(s) of solid fuel burning device(s) do you use in your home? (Please check all answers that apply)

Answer Options	Response Percent	Response Count	Confidence Interval
Fireplace (open hearth)	15.0%	22	5.8%
Central Wood Burning Furnace	4.1%	6	3.2%
Free Standing Wood Stove	48.3%	71	8.1%
Free Standing Pellet Stove	14.3%	21	5.7%
Wood Insert	25.2%	37	7.0%
Pellet Insert	4.1%	6	3.2%
answered question		147	
skipped question		466	

Table 17. Question 17: Are any of the items above your sole (only) source of heat?

Answer Options	Response Percent	Response Count	Confidence Interval
Yes	10.5%	16	4.9%
No	89.5%	137	4.9%
<i>answered question</i>		153	
<i>skipped question</i>		460	

Table 18. Question 18: Is your wood burning device certified?

Answer Options	Response Percent	Response Count	Confidence Interval
Yes	66.9%	99	7.6%
No	6.8%	10	4.1%
I don't know how to check this	26.4%	39	7.1%
<i>answered question</i>		148	
<i>skipped question</i>		465	

Table 19: Question 19: What is the approximate age of your wood burning device?

Answer Options	Response Percent	Response Count	Confidence Interval
20 years old or less	67.1%	102	7.5%
More than 20 years old	10.5%	16	4.9%
I don't know	22.4%	34	6.6%
<i>answered question</i>		152	
<i>skipped question</i>		461	

Table 20. Question 20: If your wood burning device has doors, they are ...

Answer Options	Response Percent	Response Count	Confidence Interval
All metal	31.7%	46	7.6%
Glass with a metal frame that folds	7.6%	11	4.3%
Glass with a metal frame that hinges on the side	60.7%	88	7.9%
All glass	0.0%	0	-
<i>answered question</i>		145	
<i>skipped question</i>		468	

Table 21. Question 21: What is the primary species of wood you burn?

Answer Options	Response Percent	Response Count	Confidence Interval
Hard forest wood (ash, larch, oak)	9.1%	13	4.7%
Soft forest wood (aspen, cedar, cottonwood, fir, hemlock, pine)	37.8%	54	7.9%
Fruit wood (apple, cherry, pear)	2.8%	4	-
Combination of above	32.2%	46	7.7%
I don't know	18.2%	26	6.3%
<i>answered question</i>		143	
<i>skipped question</i>		470	

Table 22. Question 22: A full cord of wood measures four feet high by four feet wide by eight feet long (4 ft. x 4 ft. x 8 ft.) How many cords of wood do you typically burn in a year?

Answer Options	Response Percent	Response Count	Confidence Interval
Less than 1/4 of a cord	11.7%	16	5.4%
1/4 to 1/2 cords	16.8%	23	6.3%
1 to 1 1/2 cords	20.4%	28	6.7%
2 to 2 1/2 cords	16.1%	22	6.2%
3 to 3 1/2 cords	16.8%	23	6.3%
4 or more cords	18.2%	25	6.5%
<i>answered question</i>		137	
<i>skipped question</i>		476	

Table 23: Question 23: In the seasons when you have an indoor fire going, what times of day do you burn? (Please check all answers that apply)

	Response Count	Response Percent	Confidence Interval
Answer Options	Fall (Sep-Nov)		
Morning	49	34%	7.7%
Afternoon	21	14%	5.7%
Evening	107	73%	7.2%
Overnight	34	23%	6.9%
Answer Options	Winter (Dec-Feb)		
Morning	89	61%	7.9%
Afternoon	84	58%	8.0%
Evening	137	94%	3.9%
Overnight	72	49%	8.1%
Answer Options	Spring (Mar-May)		
Morning	49	34%	7.7%
Afternoon	12	8%	4.5%
Evening	79	54%	8.1%
Overnight	21	14%	5.7%
Answer Options	Summer (Jun-Aug)		
Morning	4	3%	2.6%
Afternoon	1	1%	-
Evening	4	3%	2.6%
Overnight	1	1%	-
	<i>answered question</i>	146	
	<i>skipped question</i>	467	

Table 24. Question 24: How often do you engage in the following firewood storage practices?

	Individual Response	Response Percent	Response Count	Confidence Interval
Answer Options	Always			
Split firewood	86	64.7%	133	8.1%
Stack firewood	98	72.1%	136	7.5%
Cover firewood	87	66.9%	130	8.1%
Store off the ground	90	71.4%	126	7.9%
Dry for 6 + months	93	71.0%	131	7.8%
	Sometimes			
Split firewood	23	17.3%	133	6.4%
Stack firewood	21	15.4%	136	6.1%
Cover firewood	23	17.7%	130	6.6%
Store off the ground	17	13.5%	126	6.0%
Dry for 6 + months	21	16.0%	131	6.3%
	Never			
Split firewood	24	18.0%	133	6.5%
Stack firewood	17	12.5%	136	5.6%
Cover firewood	20	15.4%	130	6.2%
Store off the ground	19	15.1%	126	6.2%
Dry for 6 + months	17	13.0%	131	5.8%
			answered question	139
			skipped question	474

Table 25. Question 25: How often do you engage in the following burning device maintenance practices?

Answer Options	Annually	Response Percent	Response Count	Confidence Interval
Self-chimney cleaning	70	56.5%	124	8.7%
Self-Device inspection	82	70.7%	116	8.3%
Professional chimney cleaning	13	11.8%	110	6.0%
Professional device inspection	11	10.7%	103	6.0%
	Every 2+ years			
Self-chimney cleaning	25	20.2%	124	7.1%
Self-Device inspection	10	8.6%	116	5.1%
Professional chimney cleaning	44	40%	110	9.2%
Professional device inspection	36	35.0%	103	9.2%
	Never			
Self-chimney cleaning	29	23.4%	124	7.5%
Self-Device inspection	24	20.7%	116	7.4%
Professional chimney cleaning	53	48.2%	110	9.3%
Professional device inspection	56	54.4%	103	9.6%
		Answered question	141	
		Skipped question	472	

Table 26. Question 26: How often do you engage in the following firewood burning practices?

Answer Options	Always		Response Count	
Check burn bans	72	53.7%	134	8.4%
Remove ashes	111	81.0%	137	6.6%
Keep damper open	71	55.9%	127	8.6%
Use dry kindling	116	89.9%	129	5.2%
Burn small hot fires	86	67.7%	127	8.1%
Keep doors closed	108	84.4%	128	6.3%
	Sometimes			
Check burn bans	46	34.3%	134	8.0%
Remove ashes	21	15.3%	137	6.0%
Keep damper open	48	37.8%	127	8.4%
Use dry kindling	6	4.7%	129	3.6%
Burn small hot fires	32	25.2%	127	7.6%
Keep doors closed	15	11.7%	128	5.6%
	Never			
Check burn bans	16	11.9%	134	5.5%
Remove ashes	5	3.6%	137	3.1%
Keep damper open	8	6.3%	127	4.2%
Use dry kindling	7	5.4%	129	3.9%
Burn small hot fires	9	7.1%	127	4.5%
Keep doors closed	5	3.9%	128	3.4%
			Answered question	141
			Skipped question	472

Table 27. Question 27: How much do you agree or disagree with the following statements:

Answer Options	Strongly agree	Agree	I don't know	Disagree	Strongly disagree	Response Count
Poor air quality in Kittitas County is a significant environmental issue.	145	212	103	100	28	588
Response Percent	25%	36%	18%	17%	5%	
Confidence Interval	3.5%	3.9%	3.1%	3.0%	1.7%	
Wood stoves and fireplaces are a major contributor to poor air quality.	114	194	130	102	40	580
Response Percent	20%	33%	22%	18%	7%	
Confidence Interval	3.2%	3.8%	3.4%	3.1%	2.1%	
<i>answered question</i>						589
<i>skipped question</i>						24

Table 28. Question 28: How much do you support or oppose the following items?

Answer Options	Strongly support	Support	Neutral	Oppose	Strongly oppose	Response Count
Establishing a local by-law to reduce the amount of smoke.	115	162	162	84	53	576
	20.0%	28.1%	28.1%	14.6%	9.2%	
	3.3%	3.7%	3.7%	2.9%	2.4%	
Requiring removal or upgrade of older higher polluting appliances when a house is sold.	141	206	108	81	44	580
	24.3%	35.5%	18.6%	14.0%	7.6%	
	3.5%	3.9%	3.2%	2.8%	2.2%	
Restricting wood burning on poor air quality days.	205	189	101	56	35	586
	35.0%	32.3%	17.2%	9.6%	6.0%	
	3.9%	3.8%	3.1%	2.4%	1.9%	
Administering fines for generating excessive smoke.	170	160	127	69	50	576
	29.5%	27.8%	22.0%	12.0%	8.7%	
	3.7%	3.7%	3.4%	2.7%	2.3%	
Establishing programs for upgrading to newer, certified devices.	262	227	68	15	10	582
	45.0%	39.0%	11.7%	2.6%	1.7%	
	4.0%	4.0%	2.6%	1.3%	1.1%	
Educating the community on efficient wood stove and insert operation.	278	233	68	4	3	586
	47.4%	39.8%	11.6%	0.7%	0.5%	
	4.0%	4.0%	2.6%	0.7%	0.6%	
<i>answered question</i>						588
<i>skipped question</i>						25

Table 29. Question 29: What is your age?

Answer Options	Response Percent	Response Count	
>19	0.5%	3	-
20-24	4.5%	26	1.7%
25-29	6.5%	38	2.0%
30-34	11.3%	66	2.6%
35-39	8.6%	50	2.3%
40-44	11.9%	69	2.6%
45-49	11.2%	65	2.6%
50-54	11.5%	67	2.6%
55-59	11.9%	69	2.6%
60-64	8.9%	52	2.3%
65-69	6.5%	38	2.0%
70-74	3.6%	21	1.5%
75-79	2.2%	13	1.2%
80+	0.9%	5	0.8%
<i>answered question</i>		582	
<i>skipped question</i>		31	

Table 30. Question 30: What is your gender?

Answer Options	Response Percent	Response Count	
Female	60.7%	352	4.0%
Male	39.3%	228	4.0%
<i>answered question</i>		580	
<i>skipped question</i>		33	

Table 31. Question 31: How would you identify yourself?

Answer Options	Response Percent	Response Count	Confidence Interval
African American/Black	0.4%	2	-
Asian/Pacific Islander	0.9%	5	0.8%
Caucasian/White	92.4%	523	2.2%
Hispanic/Latino	2.1%	12	1.2%
Native American/Alaskan Native	0.5%	3	-
Multiple Ethnicities	3.7%	21	1.6%
<i>answered question</i>		566	
<i>skipped question</i>		47	

Table 32. Question 32: Do you live in or out of the city limits?

Answer Options	Response Percent	Response Count	Confidence Interval
In	59.5%	341	4.0%
Out	40.5%	232	4.0%
<i>answered question</i>		573	
<i>skipped question</i>		40	

Table 33. Question 33: Do you rent or own the place where you live?

Answer Options	Response Percent	Response Count	Confidence Interval
Own	76.0%	439	3.5%
Rent	23.5%	136	3.5%
Neither (please specify)	0.5%	3	-
<i>answered question</i>		578	
<i>skipped question</i>		35	

Table 34. Question 34: What is your zip code?

Answer Options	Response Percent	Response Count	Confidence Interval
98950 (Vantage)	0.0%	0	-
98946 (Thorp)	0.9%	5	0.8%
98934 (Kittitas)	2.9%	17	1.4%
98926 (Ellensburg)	84.5%	492	2.9%
98943 (South Cle Elum)	1.4%	8	1.0%
98922 (Cle Elum)	6.5%	38	2.0%
98941 (Roslyn)	2.1%	12	1.2%
98940 (Ronald)	1.5%	9	1.0%
98925 (Easton)	0.2%	1	-
<i>answered question</i>		582	
<i>skipped question</i>		31	

Appendix C: Demographics

Table 36. Demographic Summary

Kittitas County Demographics	Population*	2014 Survey**	2015 Survey**
County Population Seats			
Upper County: Cle Elum, South Cle Elum, Roslyn, Ronald and Easton	20%	21%	12%
Lower County: Vantage, Kittitas, Ellensburg and Thorp	80%	79%	88%
Gender			
Male	50%	26%	39%
Female	50%	74%	61%
Age			
15-24 years	26%	4%	5%
25-34	12%	16%	18%
35-54	23%	42%	43%
55-64	12%	26%	21%
65 and over	13%	12%	13%
Race/Ethnicity			
African American/Black	1%	0%	0%
Asian/Pacific Islander	3%	1%	1%
Caucasian/White	90%	89%	92%
Hispanic/Latino	8%	2%	2%
Native American/Alaskan Native	1%	1%	1%
Multiple	2%	3%	4%
Housing			
Homeowners	58%	76%	76%
Renters	42%	23%	24%
Resides within city limits/urban areas	54%	52%	60%
Resides outside of city limits/rural areas	46%	48%	41%

**Based on 2013 Census estimate. **Percentages are*

Appendix D: Calculations

Sample Size and Power

Power analysis can be used to determine how many surveys need to be completed to at a pre-determined confidence level, margin of error, and a generally unknown population proportion. An expectable value for confidence level is 95%, and a reasonable margin of error is 5%, using those values we will find that 384 survey takers are required. We would be 95% confident that the true value of the population parameter lies within the confidence interval.

Equation 1: $n = P(1 - p) \left(\frac{Z}{E}\right)^2$, **n** = sample size, **p** = population proportion generally 0.5, **Z** is a value taken from the normal curve (95% = 1.96), **E** is the margin of error.

Example 1: $n = 0.5(1 - 0.5) \left(\frac{1.96}{0.05}\right)^2 = 384$

Confidence Intervals

Confidence Intervals (CI) reflect the range values that are likely to contain the unknown population parameter at a given confidence interval. This equation is only applicable to cases where there are at least 5 positive responses and 5 negative responses.

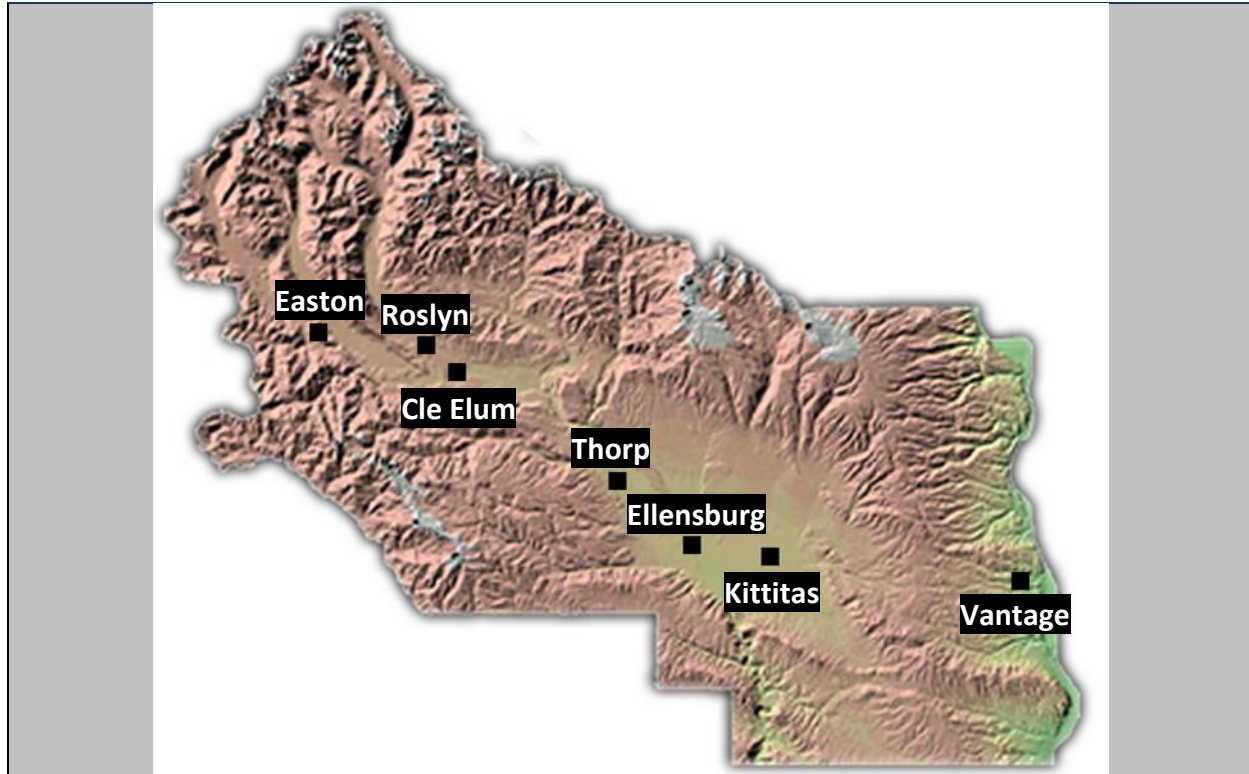
Equation 2: $\pm Z \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$, \hat{p} is the measured population proportion.

Chi Squared Test

Equation 3: $\chi^2 = \sum \frac{O-E}{E}$

Appendix E: Survey Distribution

Figure 35. Survey distribution.



City	Materials	Location
Easton	Survey Box, Flier	Easton Post Office
Roslyn	Survey Box, Flier	Roslyn Library, Roslyn Grocery
	Flier	Harper Lumber CO, Roslyn General Store
Cle Elum	Survey Box, Flier	Pioneer Coffee Roasting CO, Cle Elum Library
	Flier	Hopesource, Senior Center, Cle Elum Hardware, Shell Station, Cle Elem Farm & Home Supply
	Hand-outs	Cle Elum Transfer Station
Thorp	Flier	Red Sky Orchards
Ellensburg	Survey Box, Flier	Library, Public Health, Old Country Mill, Community Health, KVH, La Estrella Grocery, Armstrong Stove & SPA
	Flier	Super One, Fred Meyers, D&M Coffee, Grocery Outlet, Safeway, Bi-Mart
	Reader Board, Hand-outs	Transfer Station
Kittitas	Survey Box, Flier	Post Office
Vantage	Survey Box, Flier	Vantage Resort

Appendix F: Outreach & Education Impact Targets

KEY FINDING: There is a general lack of knowledge and awareness about PM2.5 and air quality issues in Kittitas County, including a disconnect between individual behaviors and how they contribute to poor air quality.

SUPPORTING DATA FROM ASSESSMENT RESULTS:

- 7% report understanding the concept of PM2.5 pollution well enough to explain to others.
- 45% reported that they do not know how to check current air quality conditions.
- 32% either disagree or strongly disagree that air quality is a significant issue.
- 20% don't know if it if air quality in Kittitas County is a significant issue or not.
- 54% agree or strongly agree that poor air quality is only an issue during wildfire season.
- 44% either disagree or don't know if wood stoves & fireplaces are major contributors.
- 49% feel that agricultural burning is a major source.
- 56% feel that diesel fuel exhaust/ highway traffic is a major source.
- Key informant interviews indicated that people who burn don't connect their behavior with poor air quality.

Strategies	Metrics	Targets
Activity #2: Publish regular air quality messages and information in local newspapers.	<ul style="list-style-type: none"> • Number of articles published • Frequency of article publications • Percent of survey respondents who read newspaper articles 	<ul style="list-style-type: none"> ❖ Increase the percentage of those who report understanding the concept of PM2.5 by 7%. ❖ Decrease the percentage of those who report not knowing how to check air quality conditions by 10%. ❖ Increase percentage of individuals who agree that air quality is a significant issue from by 10%
Activity #3: Coordinate air quality related displays in local libraries.	<ul style="list-style-type: none"> • Number of days display is up • Number of materials taken from display area • Number of libraries participating • Percent of survey respondents who viewed the library displays 	<ul style="list-style-type: none"> ❖ Increase the percentage of people who identify fireplaces & woodstoves as a major PM2.5 source by 10%.

KEY FINDING: Many people either have uncertified wood stoves, or aren't sure if their stoves are certified or not.

SUPPORTING DATA:

- 27% of survey respondents with freestanding wood stoves report having stoves that are uncertified or manufactured before 1995.
- 18% of survey respondents with freestanding wood stoves report not knowing if they have a certified stove or not.

Strategies	Metrics	Targets
Activity #1: Create a brochure targeting wood burners with messages and information about clean burning, equipment use and certified equipment, and what is legal to burn.	<ul style="list-style-type: none"> • Number of brochures distributed • Number of brochures taken • Number of locations • Percent of survey respondents who report taking a brochure 	<ul style="list-style-type: none"> ❖ Decrease the percentage of people reporting they have uncertified stoves by 7 %. ❖ Increase percentage of people reporting they are able to identify if they have a certified stove or not by 7%.
Activity #2: Publish regular air quality messages and information in local newspapers.	<ul style="list-style-type: none"> • Number of articles published • Frequency of article publications • Percent of survey respondents who read newspaper articles 	

KEY FINDING: There is a gap in knowledge about what is legal to burn, especially around cardboard, lumber, and paper.

SUPPORTING DATA FROM ASSESSMENT RESULTS:

- 47% percent of survey takers reported that it is legal to burn paper.
- 41% reported that it is legal to burn cardboard.
- 36% reported that it is legal to burn lumber.

Strategies	Metrics	Targets
Activity #1: Create a brochure targeting wood burners with messages and information about clean burning, equipment use and certified equipment, and what is legal to burn.	<ul style="list-style-type: none"> • Number of brochures distributed • Number of brochures taken • Number of locations • Percent of survey respondents who report taking a brochure 	<ul style="list-style-type: none"> ❖ Decrease the percentage of people who report that paper is legal to burn by 10 %. ❖ Decrease the percentage of people who report that cardboard is legal to burn by 10%. ❖ Decrease the percentage of people who report that lumber is legal to burn by 10 %.
Activity #2: Publish regular air quality messages and information in local newspapers.	<ul style="list-style-type: none"> • Number of articles published • Frequency of article publications • Percent of survey respondents who read newspaper articles 	

KEY FINDING: While most people seem to understand how to properly season wood and the importance of using dry, seasoned wood, many people don't indicate a deep understanding and complain that other people don't know how to season wood.

SUPPORTING DATA FROM ASSESSMENT RESULTS:

- 12% report not understanding the concept of 'seasoning' wood.
- 40% report only understanding somewhat.
- Key informant interviews indicate that there is at least a perception that many people don't know how to season wood and burn efficiently.

Strategies	Metrics	Targets
Activity #1: Create a brochure targeting wood burners with messages and information about clean burning, equipment use and certified equipment, and what is legal to burn.	<ul style="list-style-type: none"> • Number of brochures distributed • Number of brochures taken • Number of locations • Percent of survey respondents who report taking a brochure 	<ul style="list-style-type: none"> ❖ Increase the percentage of people who report not understanding the concept of seasoning wood by 5 %. ❖ Decrease the percentage of people who report only understanding seasoning wood somewhat by 5 %.
Activity #2: Publish regular air quality messages and information in local newspapers.	<ul style="list-style-type: none"> • Number of articles published • Frequency of article publications • Percent of survey respondents who read newspaper articles 	

Appendix G: Brochure Tracking

1	AIR QUALITY BROCHURE TRACKING			
2			<u>Totals</u>	
3	<u>Location</u>	<u>City</u>	<u>Wet Woo</u>	<u>Best burn</u>
4				
5	Kittitas Public Library	Kittitas	0	1
6	Ellensburg Public Library	Ellensburg	3	1
7	Cle Elum Public Library	Cle Elum	25	25
8	Roslyn Public Library	Roslyn	1	1
9			0	0
10	Coldwell Banker	Ellensburg	1	1
11	Kelley Realty	Ellensburg	0	1
12	Windermere	Ellensburg	0	0
13	John L. Scott	Ellensburg	0	0
14	John L. Scott	Cle Elum	1	1
15			0	0
16	DNR Office	Ellensburg		
17	Forest Service	Cle Elum	1	1
18	Armstrong Heating & Cooling	Ellensburg	10	11
19	Midstate Co-op	Ellensburg	0	20
20	Ranch & Home	Ellensburg	0	
21	Bimart (Pharmacy)	Ellensburg	0	13
22	Knudson's	Ellensburg	0	0
23	City of Ellensburg Utility Office	Ellensburg	0	16
24	Kittitas County PUD	Ellensburg	0	8
25	Old Mill	Ellensburg	0	0
26	Ellensburg Chamber of Commerce	Ellensburg		
27	Hopesource	Ellensburg	6	5
28	Hopesource	Cle Elum	6	12
29	Cle Elum Hardware	Cle Elum	3	12
30				
31	Lower County Total		20	77
32	Upper County Total		37	52
33	<u>Grand TOTAL:</u>		57	129

186



507 N. Nanum St. Ste. 102
Ellensburg, WA 98926
Phone: 509-962-7515
Fax: 509-962-7581

Email: communityassessment@co.kittitas.wa.us

Website: www.co.kittitas.wa.us/health/



For more information or extra copies of this report, please contact the Kittitas County Public Health Department. To view this report online visit:
<http://www.co.kittitas.wa.us/health/assessment.asp>.