

Outdoor Air Quality Survey

Spring, 2002 Report:

City of Fort Collins



The purpose of this survey and report was to provide the City of Fort Collins with their bi-yearly assessment of the knowledge, attitudes, perceptions and behavior of a representative sample of residents concerning outdoor air quality. For the 2002 survey, special emphasis was placed on wood burning and wood smoke.



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BACKGROUND

The City of Fort Collins' Air Quality Policy Plan AQPP identifies air quality in Fort Collins to be an issue of significant importance to the city. The City of Fort Collins performs a survey of the general population to assess (1) the appropriateness of the priorities listed in the City's current Air Quality Action Plan (AQAP) and the AQPP; (2) to help define the questions that will give direction to policy, planning, outreach and marketing; (3) to help staff assess current programs and to plan future actions; and (4) to address any other temporary and current air quality issues.

In February of 2000, the four Fort Collins air quality surveys underwent a rigorous reliability and validity evaluation. The result was an Indoor Air Quality Survey (IAQ) and an Outdoor Air Quality Survey (OAQ) to be performed on alternating years. The first revised OAQ survey was performed in the fall of 2001. To get both surveys on the schedule of being administered in the spring on alternating years, the OAQ survey was again administered in the spring of 2002 and the report is on the following pages. In addition, a wood smoke management effort that had been ongoing in the City needed data immediately.

One can always make changes in the home that will not have major effects on lifestyle, and WILL be effective, but outside of the home, the major source of pollution, the automobile, cannot easily be forfeited without some major lifestyle changes, nor may an individual's efforts be perceived to be effective. In other words, indoor air quality is much easier to control by an individual than is outdoor air quality. A person's sense of perceived control is a powerful factor in the likelihood of both attitude and behavior change. Outdoor air quality is in the control of many, not just the respondent. Therefore, a community survey could ask what actions the respondent takes, but these are better addressed using objective monitoring techniques. However, a perception and attitude survey can tell the policy makers and planners where their actions and programs might be most effective by measuring the respondent's individual (beliefs, knowledge), social (attitudes), cultural (community norms) and situational (amount of perceived control) variables that go into predicting the intent to act in either pro- or non pro-environmental ways in their community.

EXECUTIVE SUMMARY

Executive Summary

The Outdoor Air Quality Survey was conducted in May of 2002. Of the 1,500 surveys sent to a random sample of residents of Fort Collins by mail, a very good response occurred for a total of 818 returned and completed, or 55%. The summary of survey objectives is listed in the previous section of the Executive Summary.

To determine the effectiveness of the City's Air Quality information programs and events, respondents were asked if they recalled "hearing about" or "participating in" some of the current and recent programs. In response, residents said they were most familiar with the *Emission Sticker Law*, *Earthday*, and *Carbon Monoxide in the Home* through participation in the programs. *Earthday*, *Carbon Monoxide in the Home*, and the *Clean Air Logo* were substantial in the "heard of it" category.

Next, residents were asked if they recalled seeing or hearing information about air quality issues in Fort Collins. Residents responded the most to *Local Newspaper* (63%), and the *City Utility Bill Insert* (63%). The least effective measures of getting information were *City Line* (0.7%), *Presentations* (2%), *Children* (2%), and *Internet* (2%).

Residents perceive *Gasoline Vehicles* (62%) and *Diesel Vehicles* (56%) to be the major sources of air pollution in Fort Collins.

Sixty two per cent (62%) of residents state that air pollution in Fort Collins affects them in some negative way (allergies, respiratory, visually, indoor air). The biggest concern is visibility, which *Causes a "Brown Cloud"* (76%) and *Obscures Mountain Views* (70%).

The next set of questions gives two pieces of information. One is the most frequently chosen response. The other information this set of questions reveals are the most frequently chosen responses (best predictors) by those residents who believe the City should be doing more. This set of questions focused on *where* residents believe the City should focus efforts to best address air quality issues in Fort Collins. The most frequently chosen response was to *Improve Traffic Light Timing to Reduce Vehicle Idling at Lights* (76% "Strongly Agree"). Another response that was chosen often as "Strongly Agree" was to *Increase Enforcement of Exhaust Regulations for Both Gas and Diesel Vehicles* (55%). Overall, residents agreed (97%-60%) with the current or planned programs or plans. When the items in this question were statistically analyzed to determine which were the stronger predictors of whether the residents believe the City should be doing more to control air pollution, the best predictors were to reduce the "brown cloud" and local greenhouse gas emissions; increase enforcement of exhaust regulations and the emissions law; and decrease wood burning.

When asked the question of what residents would be willing to do to help reduce air pollution in Fort Collins, most residents agreed they would be willing to do something (average of 55.3%) compared to residents who disagreed that they would be willing to do something (average of 36.4%). The top action residents would be willing to take is to *keep their vehicles tuned up*. An action the residents would very much oppose (69%) is to *contribute \$10 when registering vehicle to subsidize repair of high-polluting vehicles*.

The next scale, or set of questions, can tell planners an overall "intent to act/behavior" on the resident's part to help reduce air pollution in Fort Collins. Overall, most residents agreed, (70%) that they would be more likely to act pro-environmentally (or at least be open to accepting pro-environmental programs or plans).

Even though residents believe that something can be done to improve or maintain the air quality in Fort Collins (70%), only 21% believe something *will* be done.

The main source of heat used in the homes of respondents was natural gas (79%). Hot water (37%), and electric (15%) were the next most frequently checked sources.

The most common additional source of heat used in homes was electric (16%), followed closely by wood (14%) and passive solar (9%).

From a list of fireplaces, inserts or stoves that burn wood, coal, electricity, gas or pellets, the most often chosen *other source* of heat for residents was gas fireplaces (38%) followed very closely by wood burning fireplaces (33%) and electric fireplaces (15%). Gas fireplaces and inserts show that about half are certified, but all other sources are only ¼ to 1/3 certified. From this list, gas fireplaces (19.4%) followed by wood heat sources (14.5%) are used by residents to provide the highest percentage of heat for the homes in the survey.

There were 271 homes with wood burning appliances (fireplace, insert or stove). Of these, most burned no wood or less than ¼ of a cord last winter and used it either not at all, or 1-2 times per month. The wood smoke management option most preferred was a voluntary “no burn” restriction on high pollution days.

The number of respondents who stated they have experienced unacceptable air quality dropped sharply from 46% in 2001 to 38% in 2002.

Most respondents (62%) believe that Fort Collins’ air quality will be worse in five years, while 31% believe it will not change, and only 6% believe it will be better than it is now.

Very few people (16%) warm their cars up on cold mornings for longer than two minutes, and half (50%) do not warm it up at all.

The numbers of people who allow guests to smoke in their homes has substantially increased from 1% in 2000 to 6.6% in 2002, while the number of people actually smoking in their own homes has dramatically decreased from 17.1% in 2000 to 7.1% in 2002.

Respondents to this survey were equally represented by males and females. The majority fall between 40 and 60 years of age, were part of two-member households, and were not pregnant. 31.8% stated that there was a member of the household suffering from asthma, emphysema, heart disease, or other respiratory ailments. Of this 31.8%, 58.8% believe that outdoor air negatively impacts their respiratory problems. Most have lived here more than 10 years (62%), 60% have both a Bachelor’s degree or higher and a median family income in the \$40,000-\$59,000 range. Most respondents are employed outside the home (47%), with an increasing number of self-employed (12%) and retired (28%) represented in the survey. Homeowners were the majority (81.2%), 48.3% live in a home that is more than one-story, 44.1% live in a single story home, with the number of respondents living in apartments or condominiums decreasing steadily since the 2001 survey.

One recommendation is to closely examine the marketing efforts that citizens consistently recognize and expand on them. Through additional analyses (regression) it is also apparent that citizens want the City to improve the visibility and reduce the negative health impacts of outdoor air in Fort Collins. They also need to better understand the positive impacts they can make as individuals. The growing discrepancy between what residents believe can be done, and what will be done should be addressed.

✦ Executive Summary of the 2002 Outdoor Air Quality Survey Objectives

When the survey was analyzed and piloted for reliability and validity in 2000, it was designed to assess (1) the appropriateness of the priorities listed in the City’s current Air Quality Action Plan (AQAP) and the AQPP; (2) to help define the questions that will give direction to policy, planning, outreach and marketing; (3) to help staff assess current programs and to plan future actions; and (4) to address any other temporary and current air quality issues. The result was a survey that addresses the following objectives:

- Provide knowledge of which programs or events have reached the public;
- Be a measure of which marketing techniques were most effective;
- Measure residents’ perceptions of the major source of pollution in Fort Collins;
- Determine residents’ beliefs in “who” is responsible for maintaining and improving air quality in Fort Collins;
- Tell planners where to focus programmatic efforts that will be most readily accepted;
- Use attitudes to predict residents’ intent to “reduce the daily miles traveled with his of her vehicle” and some factors that are more likely than others to predict this;
- A measure of apathy due to loss of perceived control over the situation;
- Measure current “pleasantness” rating of the air in Fort Collins to compare over time;
- Determine the major source of heat used in Fort Collins homes; and
- Determine the number and kind of “other” types of heat, especially wood stoves or wood-burning fireplaces; are they certified; how often these are used; what percentage of heating they are used for; and, (in the case of wood) how much wood is burned.
- Determine preferences for wood smoke management options currently under consideration.

The most often chosen responses to the questions on the survey that address each objective are listed here under the objective they were designed to address.

Knowledge of which programs or events have reached the public and how many have participated in them;

| | | |
|--------------------------|-----|-----------------------------|
| Emissions stickers | 77% | Participated |
| Earth-day | 94% | Participated or Heard of it |
| CO2 in the Home | 75% | Participated or Heard of it |
| Clean Air logo | 30% | Heard of it |
| Wood-Smoke Response Line | 22% | Heard of it |
| Lawn-Mower Rebate | 21% | Heard of it |

A measure of which marketing techniques were most effective;

Most Effective

| | |
|---------------------|-----|
| Local newspaper | 63% |
| Utility bill Insert | 63% |
| Radio | 24% |
| TV | 20% |
| Fliers/Brochures | 15% |
| Friends | 12% |
| Job | 12% |

Least Effective

| | |
|---------------|------|
| City Line | 0.7% |
| Presentations | 2% |
| Children | 4% |
| Internet | 4% |

Residents’ perceptions of the major sources of air pollution in Fort Collins;

Major

| | |
|--------------------|-----|
| Gasoline Vehicles: | 62% |
| Diesel Vehicles: | 56% |

Minor

| | |
|-----------------------------------|-----|
| Wood-Burning(Fort Collins) | 47% |
| Wood-Burning(“Your neighborhood”) | 47% |
| Industry | 42% |
| Transfort Buses | 30% |

The residents’ belief in “who” is most responsible for maintaining and improving air quality in Fort Collins;

This question was dropped this year (only) to provide room for additional wood smoke questions.

Where to focus programmatic efforts that will be most readily accepted; (Listed from the highest “1” to the lowest “8” ranked.)

1. Improve traffic light timing to reduce vehicle idling at lights.
2. Increase enforcement of exhaust regulations for gas/diesel vehicles.
3. Prohibit wood-burning on high pollution days.
4. Increase enforcement of emissions law.
5. Do more to reduce the "Brown Cloud" and improve visibility.
7. Promote the use of alternative fuel vehicles.
8. Improve safety and access for bikes, skates, and pedestrians.

An attitude scale that will (1) predict residents’ intent to behave in a pro-environmental way, and which factors are more important in their decision; and (2) predict the residents’ intent to “reduce the daily miles traveled with his/her vehicle”, and some factors that are more likely than others to predict this.

The response, “I feel a personal obligation to help improve the Air Quality in Fort Collins” was used as the predictor in a regression equation to measure the intent to behave pro-environmentally and which factors weigh heavier in that decision. The results are listed in the following table. The higher the R², the more important this factor is to whether or not they will make personal pro-environmental decisions. In other words, this table shows that when the respondent understands that “small changes” they make will improve the air quality, they are more likely to feel a personal obligation to make changes. This tells you where and how to address education programs. Other important indicators to whether the residents will behave in a way that would improve air quality include how they feel about emissions inspections, visibility, the environment, global warming, people with respiratory problems, and odor.

Table 1. Factors that Predict Intent to Behave in a Pro-Environmental Way

| Statement | R ² |
|--|----------------|
| I feel that small changes I make can affect the Air Quality in Fort Collins. | .51 |
| Even if no longer required, Fort Collins should retain the motor vehicle emissions inspection program. | .22 |
| Fort Collins has a problem with visibility due to air pollution. | .15 |
| Air pollution in Fort Collins is significant enough to hurt the environment. | .15 |
| Fort Collins residents will be negatively affected by global warming. | .15 |
| The City and residents (including myself) of Fort Collins are contributing to global warming. | .15 |
| People with respiratory problems have a right to breathe clean air. | .14 |
| Air pollution in Fort Collins makes the air smell bad | .12 |
| Air pollution in fort Collins hurts the local economy. | .09 |
| Air pollution in fort Collins is significant enough to cause human health problems, at least for some of the residents. | .09 |
| Many of the people I know in fort Collins will not be willing to change their day-to-day transportation habits to improve air quality. | .02 |

The next table shows which factors impact the respondent more in making decisions to reduce the daily miles driven in their vehicle. Results shows that tax break incentives, being able to ride a bike for work or errands, and taking the bus for errands and/or work, and using public transportation if it was more convenient are good predictors of whether or not a respondent would reduce the number of miles that they drive their vehicle each day. Keeping their vehicle tuned up, or contributing \$10 to subsidize the repair of high-polluting vehicles are not factors that predict individual behavior change in reducing daily miles driven.

Table 2. Factors that Predict Residents’ Intent to Reduce Daily Miles Driven in Vehicle

| Statement | R ² |
|---|----------------|
| Reduce the daily miles traveled in my car if there were tax break incentives. | .28 |
| Ride a bike for errands and/or work. | .25 |
| Take the bus for errands and/or work. | .18 |
| Use public transportation if it were more convenient for me. | .16 |
| Keep my vehicle tuned up. | .11 |
| Contribute \$10 when registering my vehicle to subsidize repair of high polluting vehicles. | .06 |

Measure the apathy of residents due to loss of perceived control over the quality of the air in Fort Collins:

Comparing the means of “*Will anything be done*” to “*Can anything be done*” shows they are significantly different ($p < .000$). This tells us people believe something can be done but won’t be done. Efforts to reverse the apathy, or belief that nothing will be done should be undertaken.

Current “pleasantness” rating of the air in Fort Collins to compare over time.

| | |
|-----------|------|
| Very Good | 18.7 |
| Good | 49.6 |
| Fair | 20.2 |
| Poor | 0 |

Major sources of heat used in Fort Collins homes.

| | |
|----------------------------|------|
| 1.Natural Gas | 80% |
| 2.Hot Water Heater/Furnace | 37% |
| 3.Electric | 15% |
| 4.Solar Passive | 4% |
| 5.Propane | 3% |
| 6. Wood | 3% |
| 7. Solar Active | 1.3% |
| 8. Other | 0.7% |
| 9. Coal | 0% |

Number and other types of heat sources, especially wood stoves or wood burning fireplaces.

There were 271 homes with wood burning appliances (fireplace, insert or stove). Of these, most burned “no wood” or “less than ¼ of a cord” last winter and used it either “not at all”, or “1-2 times per month.” The wood smoke management option most preferred was a voluntary “no burn” restriction on high pollution days.

Survey Sample

✘ Response Rate

The Outdoor Air Quality Survey was conducted in May of 2002. The survey used a non-experimental design (survey) with a stratified (by zip code) random sampling of 1,500 residents of the city of Fort Collins. The survey was a mail survey using the Total Design Method (Dillman, 1978) of surveying in order to achieve a higher response rate. Data were read into a Scantron scanner for accuracy, and results were analyzed using SPSS for Windows. A total of 818 completed surveys were returned, for a response rate of 55%, which is considered very high.

✘ Selecting the Sample

The method used to select a sample for the surveys was stratified random sampling. In random stratified sampling, there is some sub-group in a population that is of interest and can be identified. The sub-groups in a community survey are frequently identified by zip codes. The zip codes in Fort Collins represent various regions of the city. If we had selected a simple random sample of 1,500 residents, we might not have obtained a representative sample from one or more of the zip codes, or regions of the City. Fort Collins has five zip codes and two post office box zip codes. Four of the zip codes (80521, 80524, 80525, 80526) are approximately equally represented in population numbers. Another is a relatively new zip code (80528) and has significantly fewer addresses than the first four. The two post office box zip codes are 80522 in the old post office building downtown, and 80527 in the newer post office building on the south end of town. There is another zip code in Fort Collins (80523) that is exclusive to Colorado State University. No surveys were mailed to 80523. This does not mean the survey excluded students. The only students excluded were ones living on campus in resident halls, dormitories or campus housing. Students living off campus had an equal chance to be included in the survey. Surveys were mailed proportionately to each zip code (excluding 80523).

Table 3. Stratified Random Sampling of 1,500 Surveys by City of Fort Collins' Zip Codes

| Zip Codes | Number of Surveys Mailed |
|-----------|--------------------------|
| 80521 | 350 |
| 80524 | 350 |
| 80525 | 350 |
| 80526 | 350 |
| 80528 | 100 |

An up-to-date, accurate “resident” mailing list was obtained through a reputable local mailing list company. The mailing list company was directed to randomly sample from the above zip codes. A computer based record system was used to generate the random list.

✘ Determining Sample Size

The following formula was used to determine the size of sample necessary to meet the above criteria:

$$n = (t)^2 (p)(q)/d^2$$

$$(1.96)^2 (.5)(1-.5)/.04^2 = \mathbf{600}$$

Where:

n = sample size needed

t = 1.960 for a 95% confidence limit

p = the proportion estimate (e.g., .50)

q = (1 - p)

d = margin of error (degree of precision, or 4%)

In other words, a sample of 600 returned surveys would be an adequate sample at a confidence level of 95%, a margin of error of 4%, and a probability of 0.5. In this example, the survey’s response rate was 48%.

The response rate for the 2002 Fort Collins Outdoor Air Quality survey, 818 responses, was well over the calculated 600 sample size.

METHOD

Survey Procedure

The framework for implementing the 2002 Outdoor Air Quality survey followed the Total Design Method (TDM) developed by Don Dillman (1978). Among other techniques, this method makes use of mailings that both inform potential respondents of forth-coming surveys and remind them to answer and return the survey materials. Typical response rates using this method range from 60% to 99%, depending on the perceived importance to the respondent, and the length of the questionnaire. These rates meet established standards of “very good” (Babbie, 1973; as cited in Edwards, Thomas, Rosenfeld & Booth-Kewley, 1997).

Outline of Survey Procedure

- A. Tasks completed before sending out the survey:
 1. Obtained approval from Fort Collins Natural Resources Advisory Board
 2. Chose random sample and determined sample size
 3. Developed surveys, scanning software, and database to score surveys
 4. Ordered surveys and address labels
 5. Ordered envelopes, postcards, letters (cover, introductory, second and third letters)
 6. Generated address label database to keep track of respondents
 7. Developed database for survey responses
 8. Sent introductory letter April 15, 2002 (see Appendix A)
- B. Sending out the survey (see Appendices B, C and D):
 1. Prepared return envelopes
 2. Prepared survey packet
 3. Sent survey packet April 22, 2002
- C. Sending out reminder letters:
 1. Sent first reminder postcard April 29, 2002 (see Appendix E)
 2. Sent second copy of the survey with a follow-up cover letter on May 6, 2002 to non-respondents (see Appendix F)
 3. Sent a third, final reminder letter on May 13, 2002 to non-respondents (see Appendix G)
- D. Established a final date to accept completed surveys: May 25, 2002.

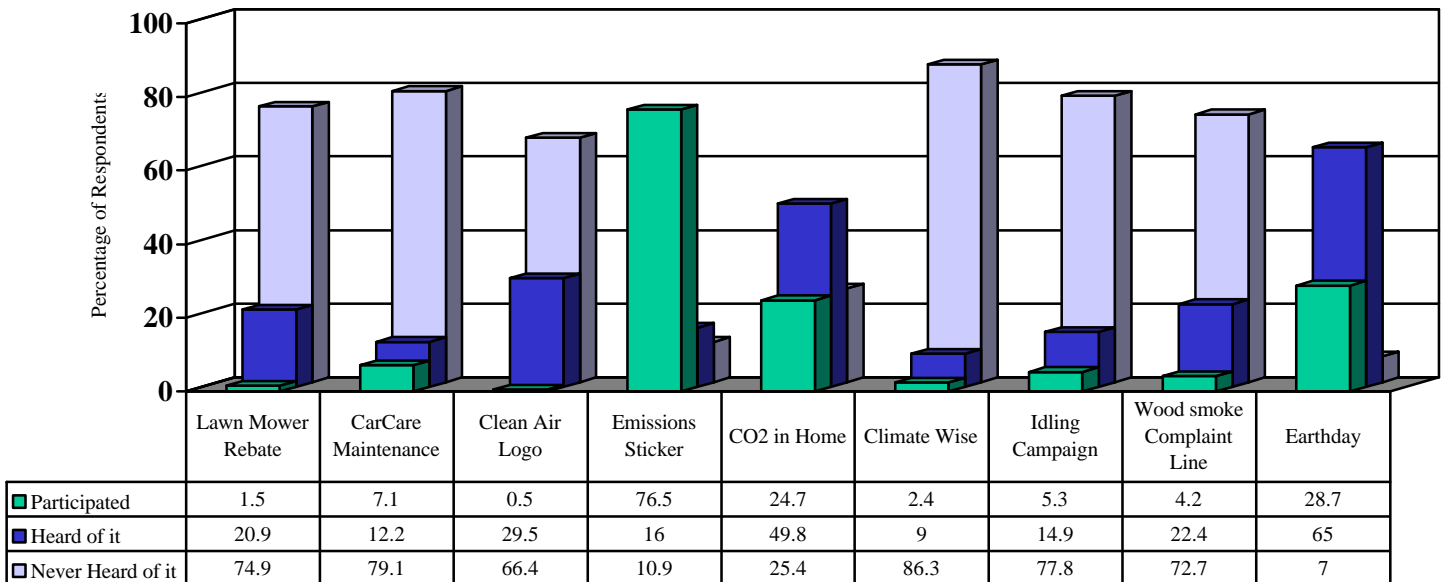
Detailed Results

Outdoor Air Quality Survey Results

Q1. In order to address air quality issues, the city focuses on a variety of specific programs and events. Do you recall hearing about, or participating in, any of the following?

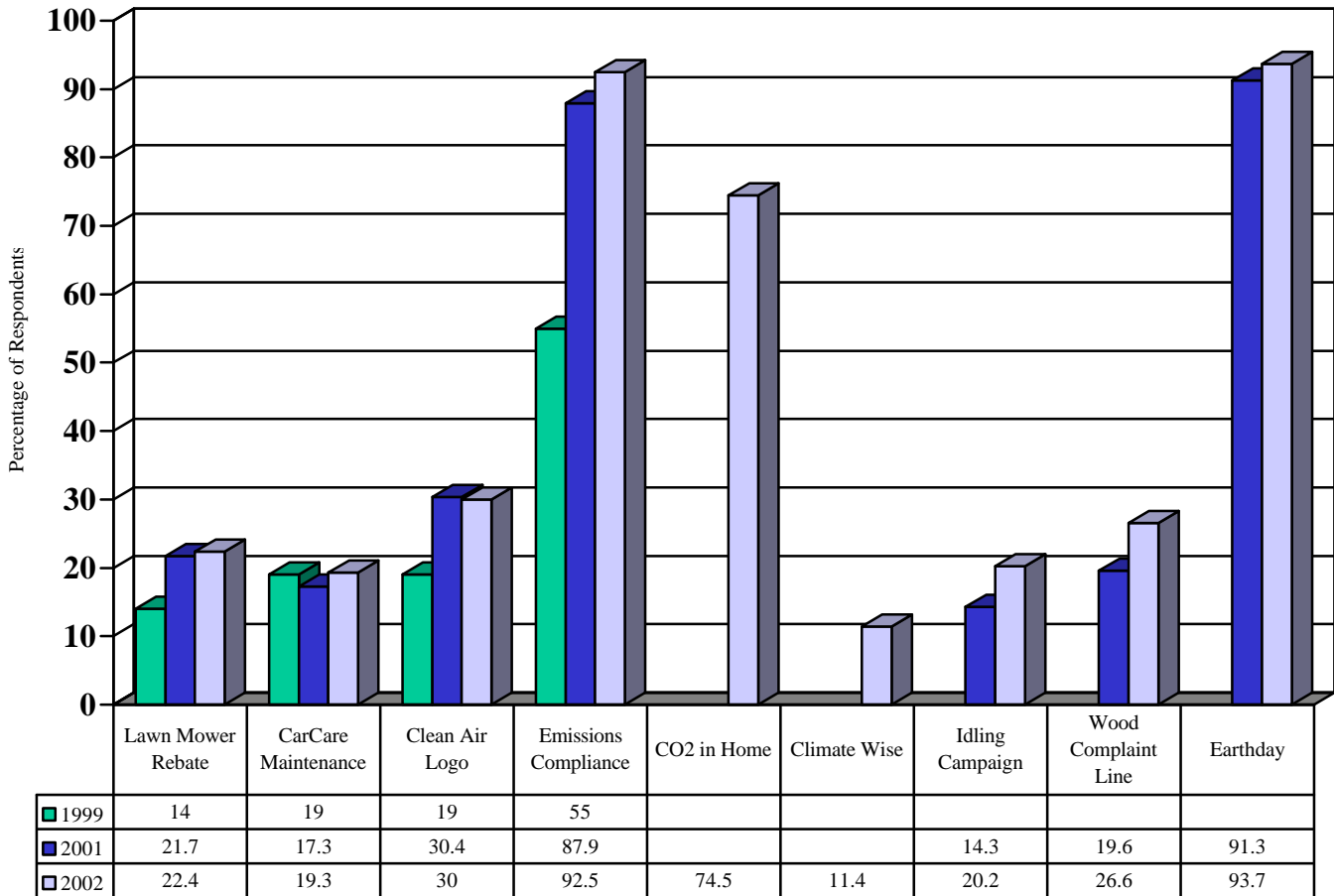
The first set of questions focused on specific air quality programs or campaigns currently in place at the City. As a check on marketing success, the responses can tell *where* money and time was well spent and where it was not well spent. This list is updated as needed for each survey year. The *Emission Sticker Law*, *Earthday*, and *Carbon Monoxide in the Home* were the programs/events most people had participated in. *Earthday*, *Carbon Monoxide in the Home*, and the *Clean Air Logo* were substantial in the “heard of it” category. However, with the exception of *Earthday*, *Emissions Sticker*, and *Carbon Monoxide in the Home*, most events and programs listed fell in the “Never Heard of It” response category.

Figure 1. Percentage of Respondents Reached Through Programs and Events: 2002



The survey in 1999 was the first year this question was asked (see Figure 2). New to this survey were the programs/events, *Carbon Monoxide in the Home*, and *Climate Wise*. Though not many changes can be seen, it is still evident that in the past few years, an increasing percentage of residents are being reached by the City's programs and events.

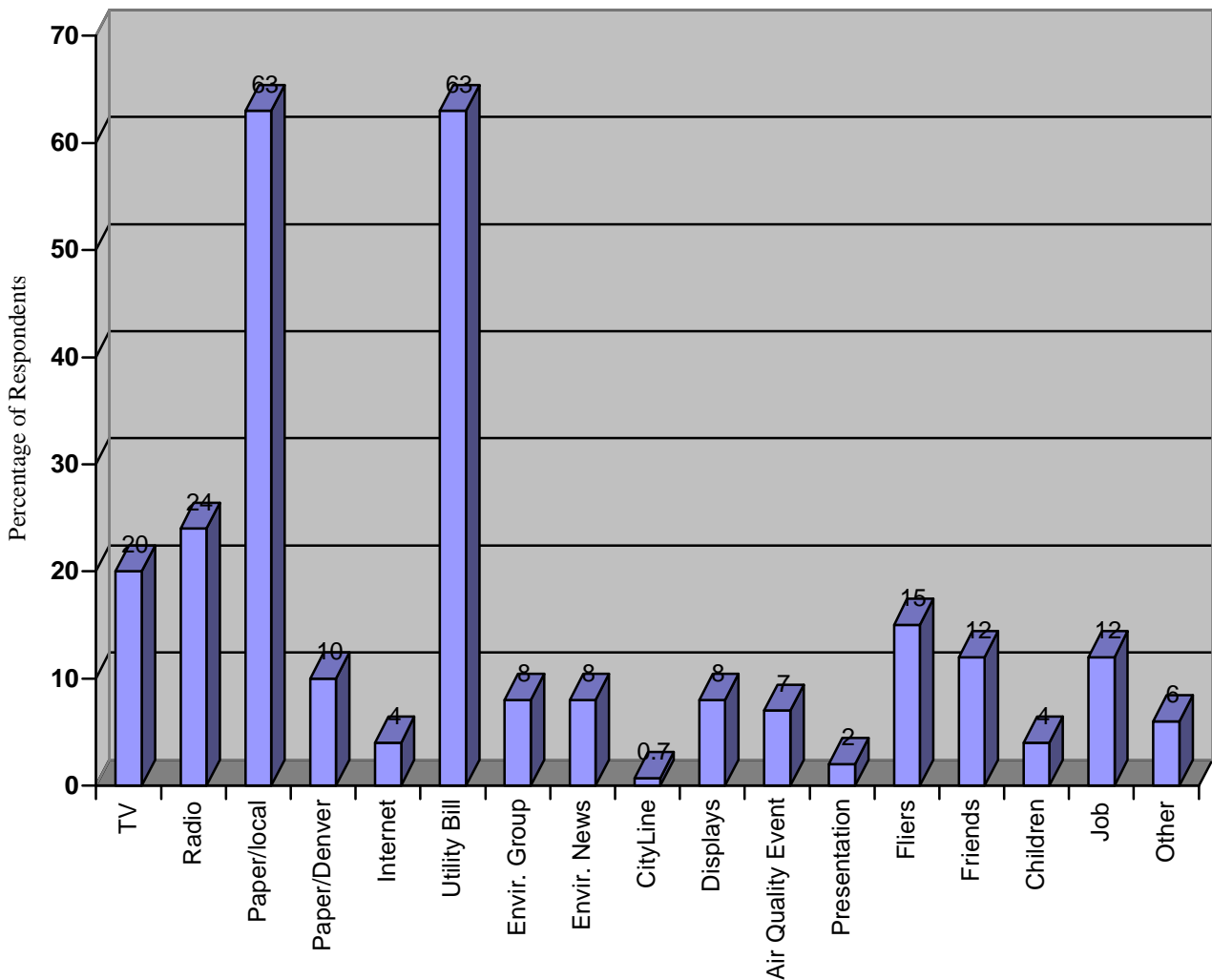
Figure 2: Either "Heard Of" or "Participated In" Programs and Events Comparison for 1999, 2001, and 2002



Q2. Where do you recall seeing or hearing information about air quality Issues in Fort Collins?

Educating Fort Collins citizens is a significant part of the City’s air quality program. This question gives staff an indication of the success of some recent programs and events the City uses to address air quality issues. This question is updated each survey year as appropriate. Question Two asked the residents how they recalled receiving information about air quality issues in Fort Collins. The *local newspaper* (63%) and the *utility bill inserts* (63%) were the main sources of information about air quality information. The least effective sources were found to be: *City Line*, *Presentations*, *Children*, and *Internet*.

Figure 3: Sources of Air Quality Information



Comparing years 1997, 1999, 2001, and 2002 (Table 4) we find that very few real changes are occurring in the major sources of air quality information overall. City Line, however, appears to be on a steady decline along with “friends”, “children”, “environmental groups”, and “Environmental News.” The “utility bill insert” and “local newspaper” remain strong sources of information for residents.

Table 4. Sources of Air Quality Information Comparisons: 1997, 1999, 2001, 2002

| Source of Information | Recalled or Heard Information | | | |
|---------------------------|-------------------------------|----------|----------|----------|
| | 1997 (%) | 1999 (%) | 2001 (%) | 2002 (%) |
| TV | 22 | 20 | 22 | 20 |
| Radio | 27 | 15 | 27 | 24 |
| Local Newspaper | 64 | 49 | 67 | 63 |
| Denver Newspaper | 16 | 11 | 8 | 10 |
| Internet | 5 | 2 | 4 | 4 |
| Utility Bill Insert | 58 | 57 | 61 | 63 |
| Environmental Group | 19 | 10 | 8 | 8 |
| Environmental News | 16 | 10 | 10 | 8 |
| City Line | 6 | 3 | 2 | 1 |
| Displays | * | 7 | 13 | 8 |
| Air Quality Program/Event | * | * | * | 7 |
| Presentations | * | 2 | 3 | 2 |
| Flyers/Brochures | * | 12 | 14 | 15 |
| Friends | 30 | 8 | 10 | 12 |
| Children | 13 | 4 | 3 | 4 |
| Jobs/School | 15 | 7 | 11 | 12 |
| Other | 7 | 3 | 6 | 6 |

Q3. For each of the following, please indicate if you believe it is a major, moderate, or minor source of air pollution in Fort Collins.

Question Three will directly tell staff where the respondent believes air pollution is coming from and how major, moderate, minor, or non-contributing that source is perceived to be by the respondent. Figures 4a, 4b, and 4c show that gasoline vehicles, followed closely by diesel vehicles are perceived to be the major source of air pollution. Of the three motor vehicle categories (gasoline, diesel, bus), buses were considered to be “minor” sources of air pollution compared to either diesel or gasoline vehicles. All other categories were perceived to be “minor” sources of air pollution in Fort Collins.

Figure 4a: Sources of Air Pollution in Fort Collins

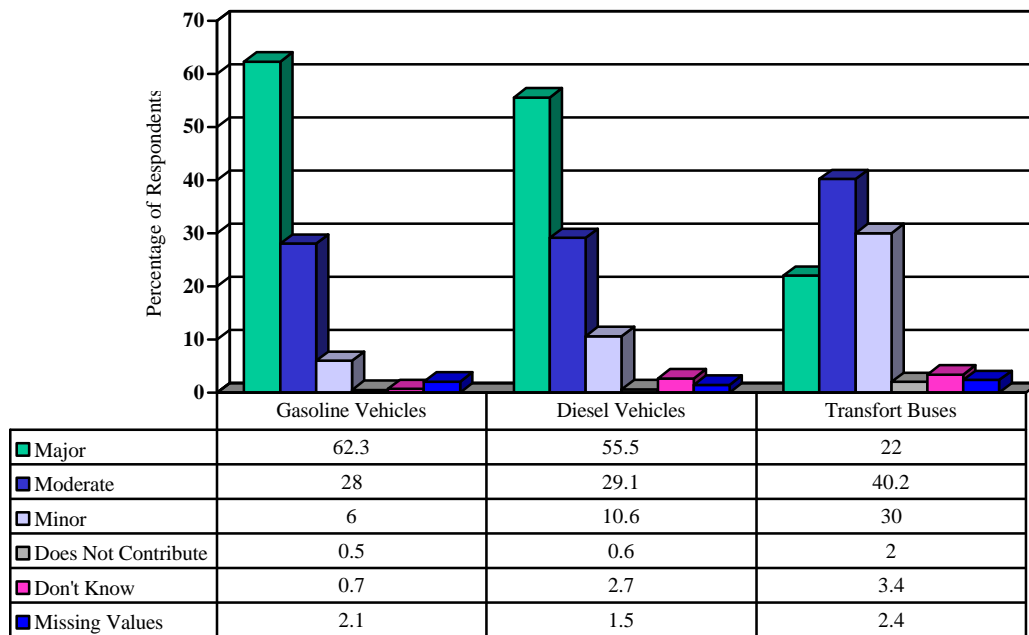


Figure 4b: Sources of Air Pollution in Fort Collins

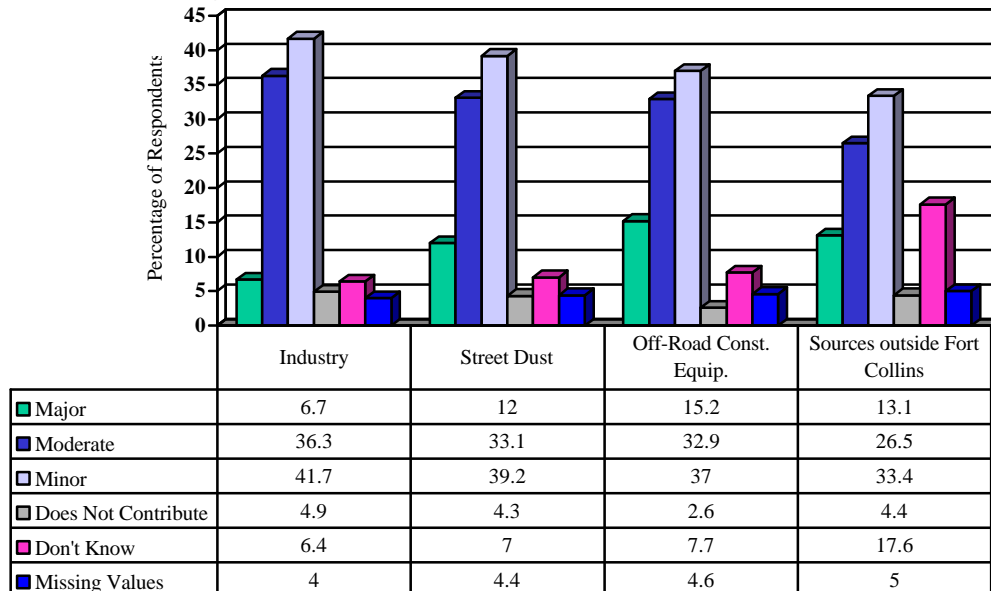
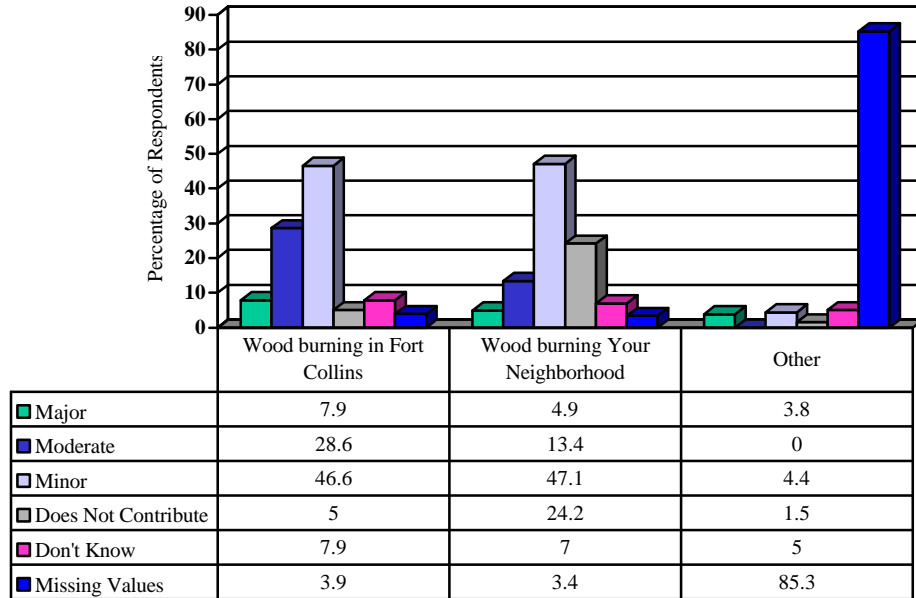


Figure 4c: Sources of Air Pollution in Fort Collins



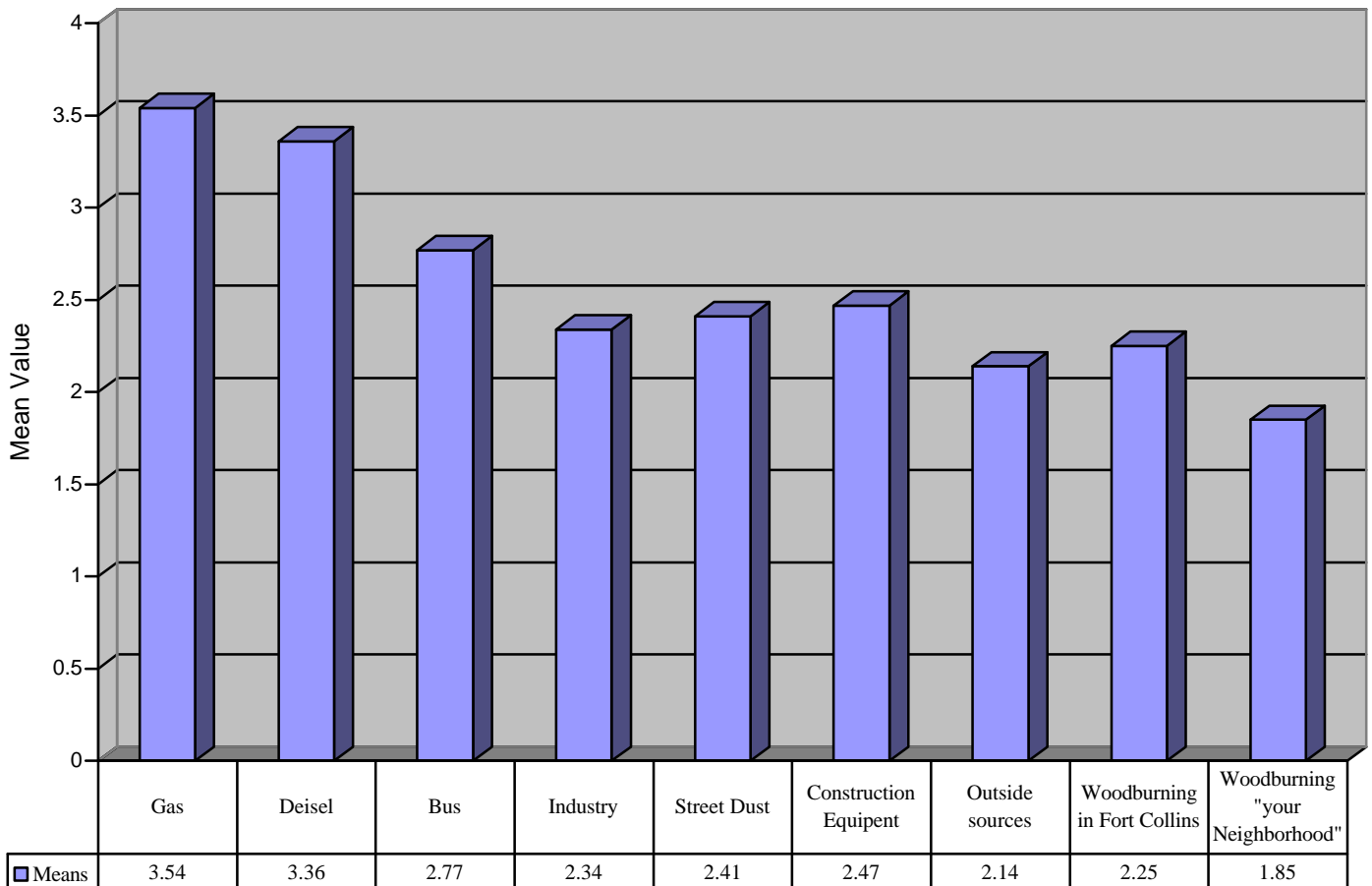
Comparing the 2002 survey to previous years, Table 5 shows that diesel and gasoline vehicles are still considered to be the biggest contributors to air pollution in Fort Collins. Transfort buses showed a slight increase as a major or moderate source, along with a decrease as a minor source. All other sources showed a decrease as a major and moderate source, and an increase as a minor source. All together, it appears that respondents perceive motor vehicle emissions to be the major source of air pollution in Fort Collins.

Table 5. Sources of Air Pollution in Fort Collins Comparison: 1997, 1999, 2001, 2002

| Sources of Air Pollution in Fort Collins | Major | | | | Moderate | | | | Minor | | | | Doesn't Contrib. | | | |
|--|-------|-----|-----|-----|----------|-----|-----|-----|-------|-----|-----|-----|------------------|-----|-----|-----|
| | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 |
| Gasoline Vehicles | 57 | 65 | 70 | 62 | 32 | 26 | 22 | 28 | 9 | 9 | 7 | 6 | <1 | <1 | 0.3 | 0.5 |
| Diesel Vehicles | 56 | 50 | 56 | 56 | 33 | 35 | 30 | 29 | 9 | 12 | 9 | 11 | <1 | <1 | 0.7 | 0.6 |
| Transfort Buses | 20 | 25 | 21 | 22 | 37 | 36 | 39 | 40 | 37 | 36 | 35 | 30 | 2 | 1 | 1.7 | 2 |
| Industry in Fort Collins | 8 | 11 | 13 | 7 | 39 | 37 | 40 | 36 | 43 | 39 | 35 | 42 | 4 | 5 | 4 | 5 |
| Street Dust | 16 | 17 | 20 | 12 | 32 | 38 | 36 | 33 | 44 | 37 | 31 | 39 | 5 | 5 | 5 | 4 |
| Off-Road Construction | * | 15 | 22 | 15 | * | 45 | 37 | 33 | * | 32 | 31 | 37 | * | 3 | 3 | 3 |
| Sources Outside Fort Collins | 11 | 14 | 18 | 13 | 33 | 30 | 32 | 27 | 27 | 30 | 29 | 33 | 6 | 4 | 3 | 4 |
| Wood burning in Fort Collins | 17 | 12 | 15 | 8 | 32 | 32 | 39 | 29 | 40 | 45 | 39 | 47 | 6 | 6 | 2 | 5 |
| Wood Burning in Your Neighborhood | * | * | * | 5 | * | * | * | 13 | * | * | * | 47 | * | * | * | 24 |

A graphic of the mean values of major sources of air pollution in Fort Collins illustrates that gas and diesel vehicles are considered to be the major sources of air pollution. Wood smoke in “your neighborhood” had the lowest mean. A test of significance between the means of “wood smoke in Fort Collins” and “wood smoke in your neighborhood” revealed highly significant differences between the two choices ($p < .001$). It is common for an individual to perceive a negative situation to be affecting “everyone else” and not them, even when it is. The psychological explanation for this perception is called cognitive dissonance. It is cognitively dissonant for an individual to believe that he/she is *knowingly* doing something “wrong.” In this example, it is cognitively dissonant to believe that he/she is knowingly choosing to live someplace that has negative air quality. Especially when they may be one of the contributors of that negative air. As such, the respondents in this survey believe that wood smoke is negatively affecting the air quality in Fort Collins, but not in their neighborhood, even though “their neighborhood” is in Fort Collins.

Figure 5. Mean Comparisons of Sources of Air Pollution



Q4, Q5, Q6, and Q7. Reliability of scales.

Four of the questions in this survey, made up of several questions each, described a “general” scale that represented a concept, or construct. To verify that each question does actually make up a “scale” that reliably measures one factor, an analysis of reliability was performed on each, or Cronbach’s Alpha (α). The closer Cronbach’s Alpha comes to 1.0, the more reliable the scale. Table Six shows the reliability scores for Questions four, five, six and seven. All have good to excellent reliability.

Table 6. Reliability Scores of Questions Four, Five, Six and Seven.

| Questions | α |
|--|----------------------------|
| Q4. Adverse affects of air pollution | .87 |
| Q5. Where city should focus programs and plans | .89 |
| Q6. Something should be done about air quality in Fort Collins | .88 |
| Q7. Actions resident would take to help reduce air pollution | .80 |

Q4. Air pollution in Fort Collins affects me because it...

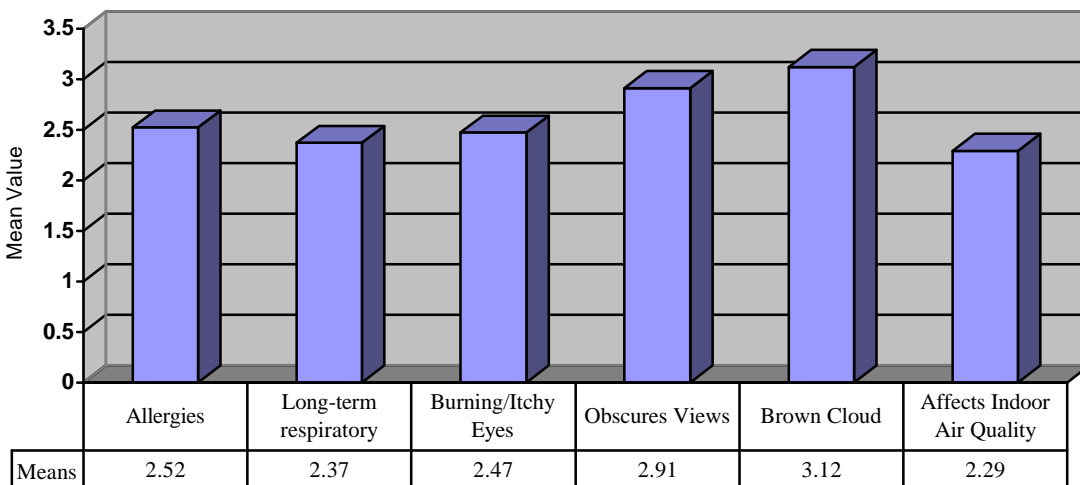
Question Four measured residents’ opinion or belief of how outdoor air quality in Fort Collins affects their lives. Table Seven shows the overall responses (the sum of all statements or questions for each “agree” category) to Question Four. Sixty two per cent (62%) of the residents state that air pollution in Fort Collins affects them in some negative way (allergies, respiratory, visually, indoor air). Four percent (4%) were missing values.

Table 7. Overall Responses of Adverse Affects of Air Pollution.

| Strongly Agree | Agree | Somewhat Disagree | Disagree | Don’t Know |
|-----------------------|--------------|--------------------------|-----------------|-------------------|
| 25 | 37 | 12 | 13 | 9 |

Mean values of the adverse affects of air pollution show that more people believe they are affected negatively by *visual impacts*, such as “obscuring mountain views” and “creating a brown cloud” than by physical impacts. Significant differences ($p < .05$) were found between all the means except “triggers allergies/respiratory problems” and “causes burning/itchy eyes, nose” and “causes long-term respiratory problems” and “affects my indoor residential air quality” ($p > .05$).

Figure 6. Mean Comparisons for Adverse Affects of Air Pollution



The results of how residents perceive the adverse affects of air pollution are broken down in Figures 7a and 7b. Visual affects, such as *creating a brown cloud* and *obscuring mountain views*, are rated the highest by the respondents as an adverse affect.

Figure 7a. Adverse Affects of Air Pollution

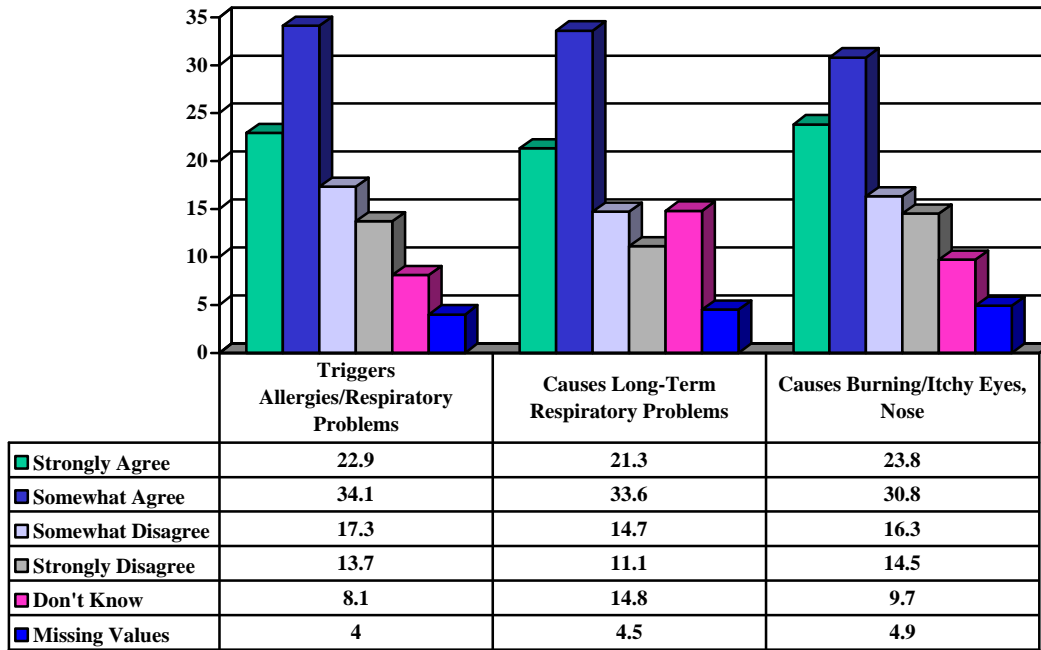
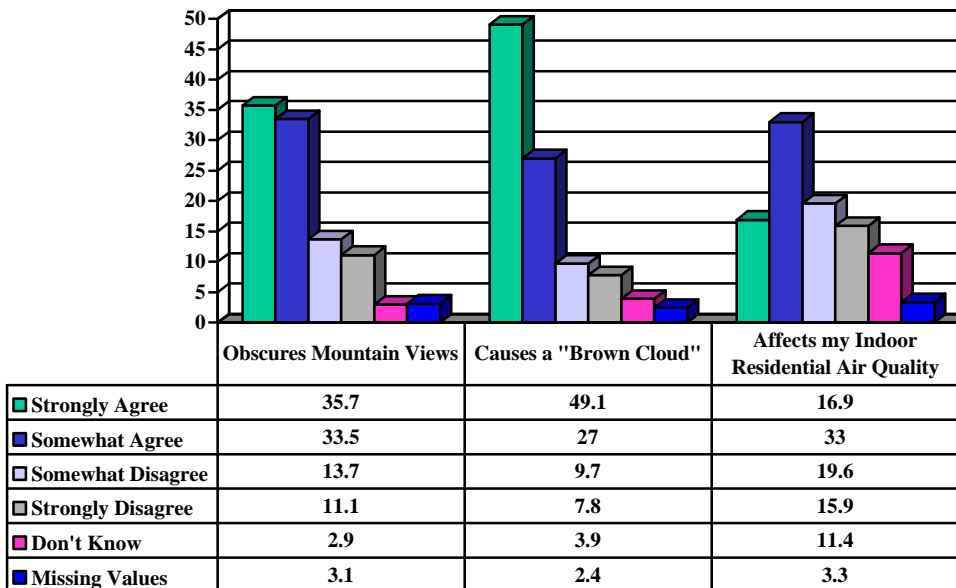
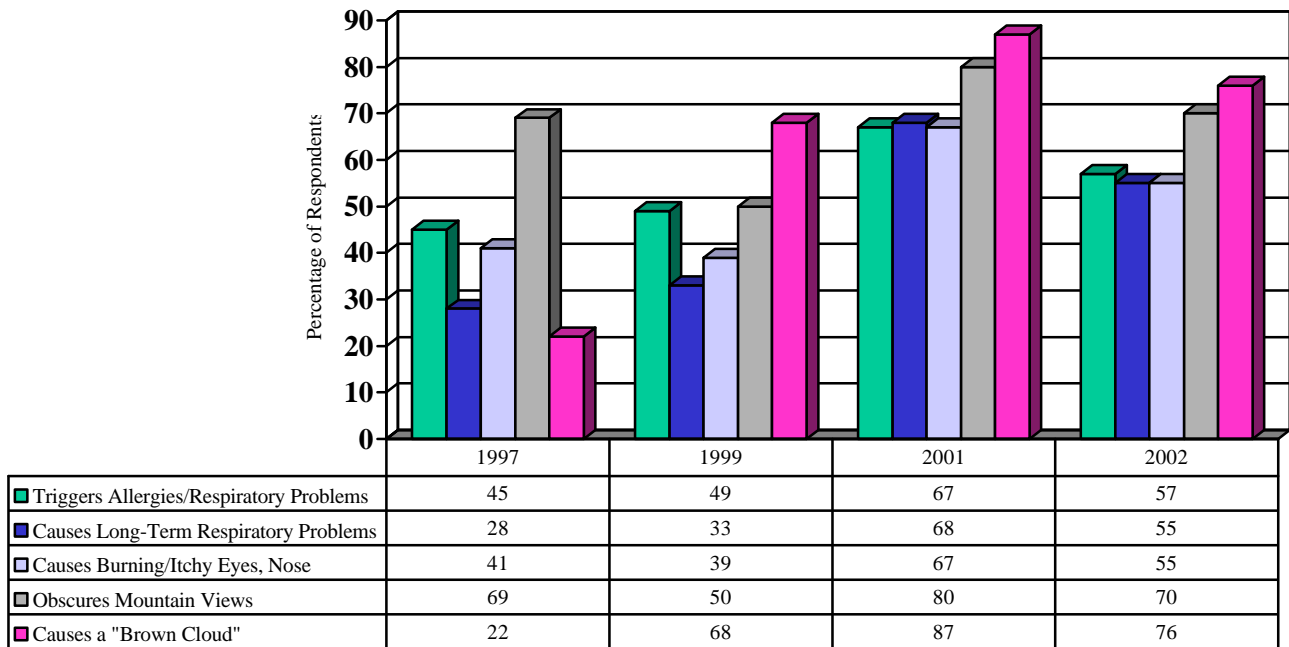


Figure 7b. Adverse Affects of Air Pollution



The 2001 and 2002 surveys asked respondents to answer on a scale of “agreement”, instead of “Yes/No” questions asked in the 1997 and 1999 surveys. The result is a more accurate and complete measure of respondents’ perceptions of the adverse affects of air pollution in Fort Collins. Even though comparisons to previous years are not as clear cut, comparisons between which categories is perceived to be the most adverse can still be made. “Strongly Agree” and “Somewhat Agree” from the 2001 survey were added together to compare to “Yes” from previous surveys. In looking closely at comparisons from 2001 to 2002, “obscuring mountain views” and “creating a brown cloud” were still considered by respondents to have the worst adverse effects (see Figure 7c). With the increased choices on the questions from “Yes” to “Strongly Agree” and “Somewhat Agree” more respondents ranked “allergies”, “respiratory problems”, and “burning, itchy eyes/nose” as important negative effects than did so in both 1997 and 1999.

Figure 7c. Adverse Affects of Air Pollution: Changes From 1997, 1999, 2001, 2002



Q5. To help improve air quality, City air quality programs and plans should...

The main focus of Question Five is to determine where the City should focus air quality programs and plans. Responses should help staff focus efforts where they will be most easily and readily accepted. In response to statements and questions regarding where the City should focus programs and plans, responses ranged from 75 percent “agree” to 17 percent “disagree” that the City should do more to improve air quality (see Table 8). Only 3 percent felt that City programs or plans “would not help.”

Table 8. Overall: “City Air Quality Programs and Plans Should do More to Control Air Pollution in Fort Collins”.

| Strongly Agree | Agree | Somewhat Disagree | Disagree | Would Not Help |
|-----------------------|--------------|--------------------------|-----------------|-----------------------|
| 45 | 30 | 10 | 7 | 3 |

The comparison of the means (Table 9) and the frequencies (Figures 9a-9d) for “City Air Quality Programs and Plans Should...” show that improving traffic light timing is a very high priority in terms of what the residents believe the City should be doing to improve air quality. Increasing enforcement of exhaust regulations, prohibiting wood burning on high pollution days, increasing enforcement of emissions compliance, and doing more to improve visibility are also important to the residents.

Table 9: Mean Comparisons Of “City Air Quality Programs And Plans Should...” With “4” = “Strongly Agree” And “1” = “Strongly Disagree” From Highest To Lowest

| Statement | Means |
|---|--------------|
| Improve traffic light timing to reduce vehicle idling at lights. | 3.75 |
| Increase enforcement of exhaust regulations for both gas and diesel vehicles. | 3.30 |
| Prohibit wood-burning on high pollution days. | 3.30 |
| Increase enforcement of emissions law. | 3.26 |
| Do more to reduce the "brown cloud" and improve visibility. | 3.23 |
| Promote the use of alternative fuel vehicles. | 3.20 |
| Improve safety and access for bikes, skates, pedestrians. | 3.11 |
| Develop economic incentives for repair of high polluting vehicles. | 3.00 |
| Improve convenience of bus service. | 2.94 |
| Encourage drivers to turn off vehicles at any wait longer than 3 minutes. | 2.91 |
| Do more to reduce local greenhouse gas emissions. | 2.85 |
| Require non-certified wood stoves to be removed at time of home sales. | 2.70 |

Interestingly, the programs/plans that best predict whether a person believes the City should do “more” to control air pollution are not in the same order as the means. Table Nine shows a large effect of *doing more to reduce the brown cloud, doing more to reduce local greenhouse emissions, increasing enforcement of exhaust regulations for motor vehicles and increasing enforcement of emissions laws* on how strongly residents believe the City should do more. A moderate effect is seen with *prohibiting wood-burning on high pollution days, requiring non-certified wood stoves to be removed at time of home sales, and promoting the use of alternative fuel vehicles* on the belief that the City should do more to control air pollution. A small effect was found for *improving*

convenience of bus service; developing economic incentives for repair of high polluting vehicles; improving safety and access for bikes, skates, pedestrians; encouraging drivers to turn off vehicles at any wait longer than 3 minutes; and improving traffic light timing to reduce vehicle idling at lights. It is not surprising that improving traffic light timing did not predict as strongly as some of the others since almost all the respondents strongly agreed to this statement. Though the table of means (Table 9), and frequencies of the responses are important statistics to examine, it is also useful to look at Table 10. Means and frequencies are only revealing preferences for programs or plans to improve air quality in Fort Collins. Table 10 reveals how important each program or plan is to the residents in predicting whether the City should be doing more to control air pollution. In other words, programs and plans that focus on visibility, greenhouse gas emissions, exhaust from motor vehicles, and wood smoke are the programs or plans that most residents believe the City should do more of to control air pollution. Conversely, programs that had a small effect on predicting strong responses to the City needing to do more, may have been chosen often (frequencies and means), but the same people did not think the City should actually do more of anything to control air pollution. This information should help guide marketing efforts.

Table 10. Effect Size Of Each Program And Plan On Residents’ Belief That The City Should Do More To Control Air Pollution In Fort Collins

| Statement | R² |
|---|----------------------|
| Do more to reduce the "Brown Cloud" and improve visibility. | .47 |
| Do more to reduce local greenhouse gas emissions. | .40 |
| Increase enforcement of exhaust regulations for both gas and diesel vehicles. | .37 |
| Increase enforcement of emissions law. | .36 |
| Prohibit wood-burning on high pollution days. | .28 |
| Require non-certified wood stoves to be removed at time of home sales. | .26 |
| Promoting the use of alternative fuel vehicles | .26 |
| Improve convenience of bus service. | .18 |
| Develop economic incentives for repair of high polluting vehicles. | .17 |
| Improve safety and access for bikes, skates, pedestrians. | .14 |
| Encourage drivers to turn off vehicles at any wait longer than 3 minutes. | .07 |
| Improve traffic light timing to reduce vehicle idling at lights. | .04 |

Figure 8a. City Air Quality Programs and Plans Should...

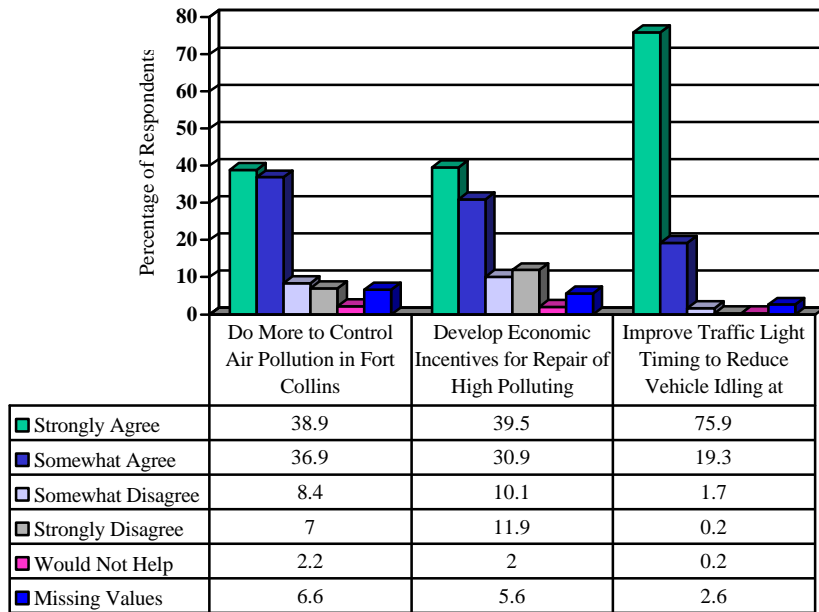


Figure 8b. City Air Quality Programs and Plans Should...

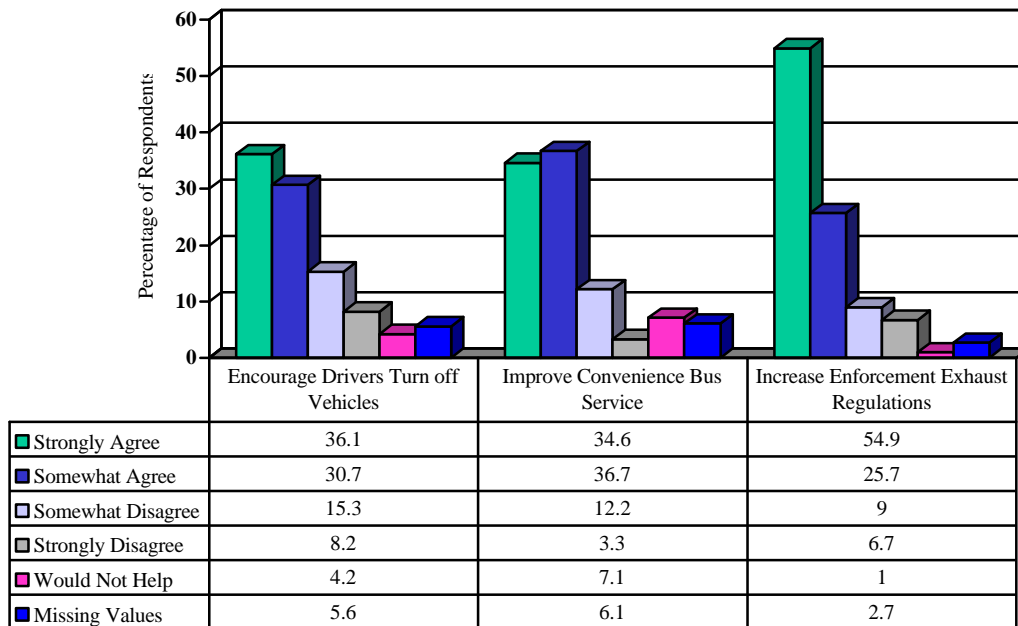


Figure 8c. City Air Quality Programs and Plans Should...

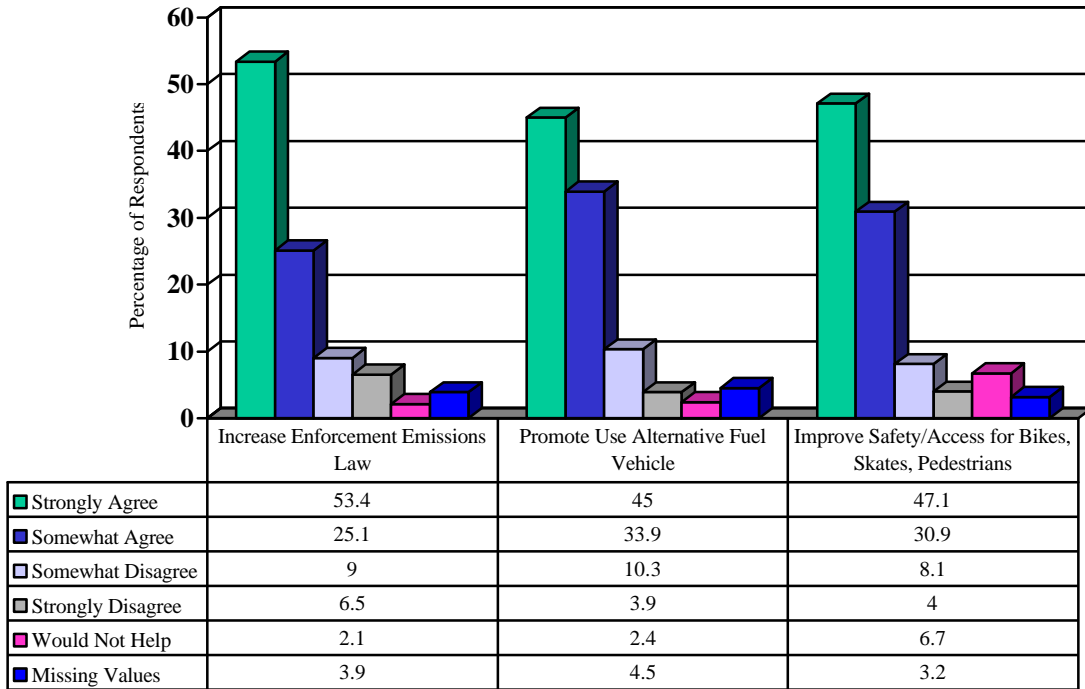
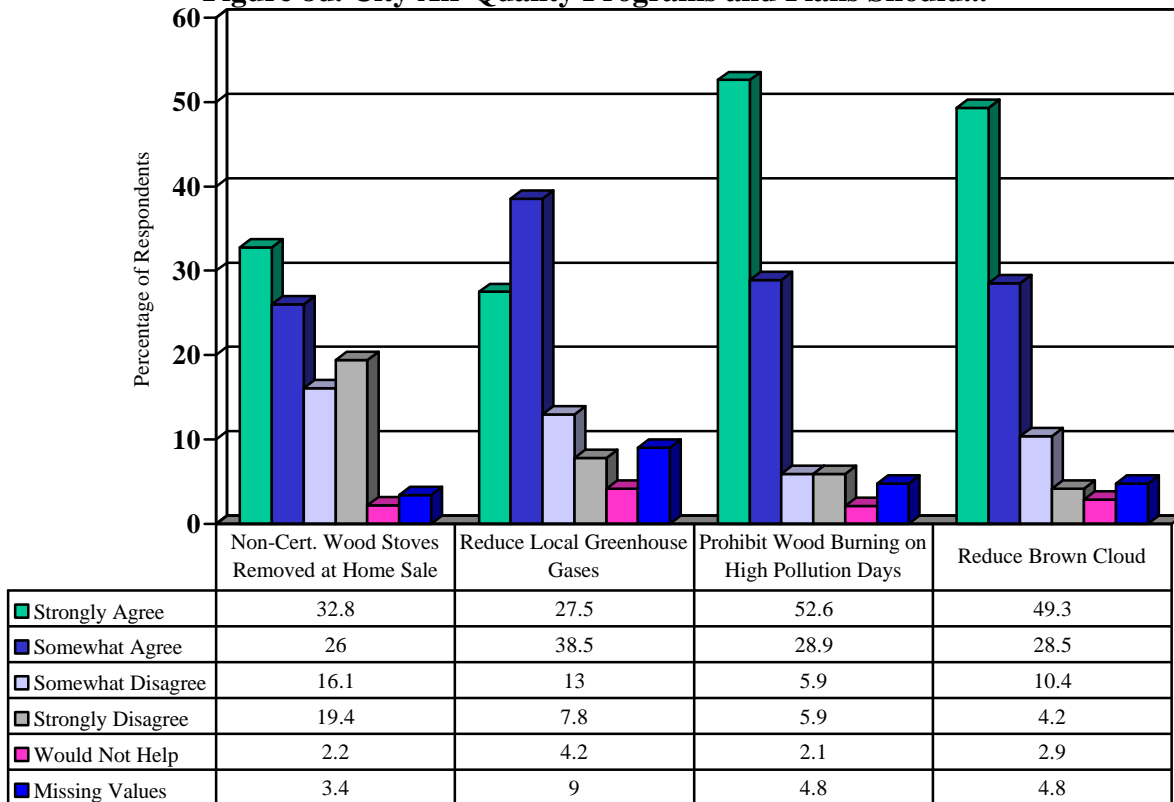


Figure 8d. City Air Quality Programs and Plans Should...



As in previous years, residents generally support the City’s efforts to improve air quality. In 1997, 1999, and 2001, residents agreed that *Improved traffic light timing* should remain at the top of the list of what actions the City should take to improve air quality. Traffic signal timing was followed closely by *Increase enforcement of exhaust regulations for both gas and diesel vehicles*, *Improve safety and access for bikes, skates, and pedestrians*, and *Increase enforcement of emissions laws*. No major changes were observed from previous years, with the exception that residents appear to be slightly less concerned about *bike safety and access* and more concerned about *drivers leaving vehicles running at a wait longer than 3 minutes* (Table 11).

Table 11. City “Should Focus Programs and Plans on” Comparison: 1997, 1999, 2001, 2002

| Programs and Plans | Strongly Agree | | | | Somewhat Agree | | | | Somewhat Disagree | | | | Strongly Disagree | | | |
|--|----------------|-----|-----|-----|----------------|-----|-----|-----|-------------------|-----|-----|-----|-------------------|-----|-----|-----|
| | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 |
| Develop economic incentives for repair of high polluting vehicles. | 32 | 36 | 44 | 40 | 37 | 40 | 36 | 31 | 16 | 10 | 10 | 10 | 9 | 11 | 9 | 12 |
| Improve traffic light timing to reduce vehicle idling at lights. | 76 | 73 | 76 | 76 | 20 | 21 | 21 | 19 | 2 | 2 | 2 | 2 | <1 | 2 | 0 | .2 |
| Encourage drivers to turn off vehicles at any wait longer than 3 minutes. | 36 | 30 | 39 | 36 | 28 | 32 | 34 | 31 | 23 | 19 | 17 | 15 | 8 | 13 | 6 | 8 |
| Improve convenience of bus service. | * | 48 | 47 | 35 | * | 7 | 7 | 37 | * | 8 | 2 | 12 | * | 6 | 5 | 3 |
| Increase enforcement of exhaust regulations for both gas and diesel vehicle. | 59 | 65 | 60 | 55 | 30 | 25 | 26 | 26 | 6 | 5 | 7 | 9 | 4 | 4 | 4 | 7 |
| Increase enforcement of emissions laws. | 58 | 58 | 58 | 53 | 28 | 27 | 29 | 25 | 7 | 6 | 8 | 9 | 5 | 6 | 4 | 7 |
| Promote the use of alternative fuel vehicles. | 39 | 40 | 50 | 45 | 39 | 36 | 38 | 34 | 10 | 11 | 7 | 10 | 4 | 5 | 2 | 4 |
| Improve safety and access for bikes, skates, and pedestrians. | * | 67 | 59 | 47 | * | 24 | 27 | 31 | * | 4 | 7 | 8 | * | 2 | 2 | 4 |
| Require non-certified wood-stoves to be removed/replaced at time of home sale. | 33 | 35 | 30 | 33 | 26 | 27 | 30 | 26 | 19 | 16 | 22 | 16 | 15 | 18 | 14 | 19 |

Q6. How strongly do you agree/disagree with the following?

The next scale, or set of questions, gets at resident’s belief of how important the issue of air quality in Fort Collins is to him or her. The questions are based on three factors: (1) statements of their beliefs or perceptions of the air quality in Fort Collins (attitudes, beliefs), (2) their perception of what type of actions other residents may make (social norms), and (3) how much difference their own actions would make (perceived control). According to the Theory of Planned Behavior, the sum of responses to these questions should give a general idea of whether or not the resident may actually act in a pro-environmental fashion. In other words, if residents generally agreed there is a problem, their neighbors and friends believed there was a problem, and they could actually do some things to alleviate the problem, they would be more likely to take action. This scale can tell planners an overall “intent to act/behavior.” In looking at all the responses, most residents (70%) agreed, indicating that they would be more likely to act (or at least be open to accepting pro-environmental programs or plans), pro-environmentally. See Figures 9a-9d.

Even though people responded that they would be willing to make changes, they perceived that others will not. We see this in Figure 9a where respondents state they will make changes, but perceived that no one else they know will. Figure 9b shows that people are disturbed by the poor visibility caused by air pollution in Fort Collins. They agree, but not strongly, that air pollution may be negatively impacting the economy and that the air smells bad. More people believe that Fort Collins is impacting and being impacted by global warming than those who do not believe this. Based on the reliability factor of this survey, the City should be confident that citizens believe the emissions program should be retained.

Figure 9a: Attitudes, Norms, and Perceived Control of Air Quality in Fort Collins

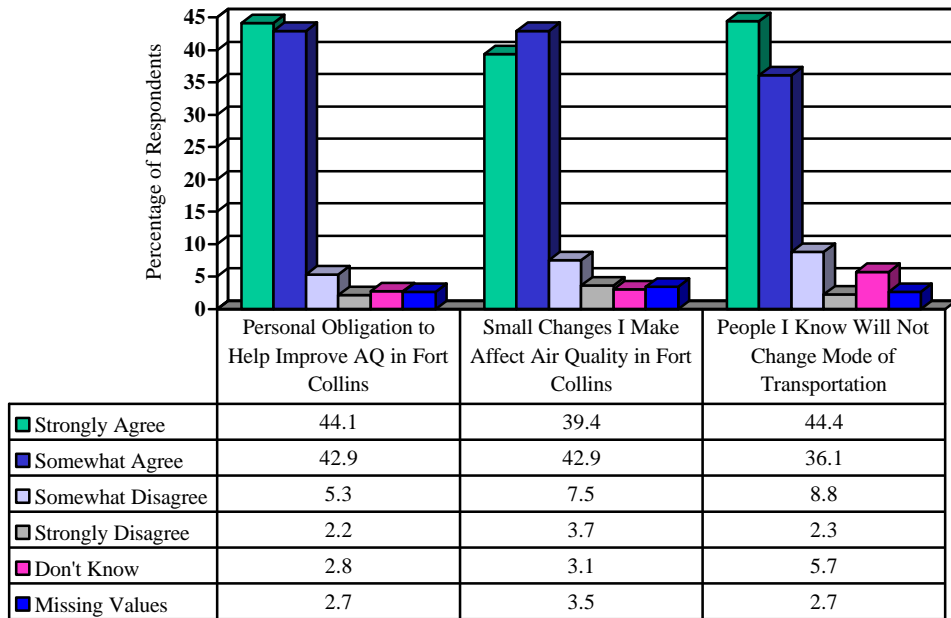


Figure 9b: Attitudes, Norms, and Perceived Control of Air Quality in Fort Collins

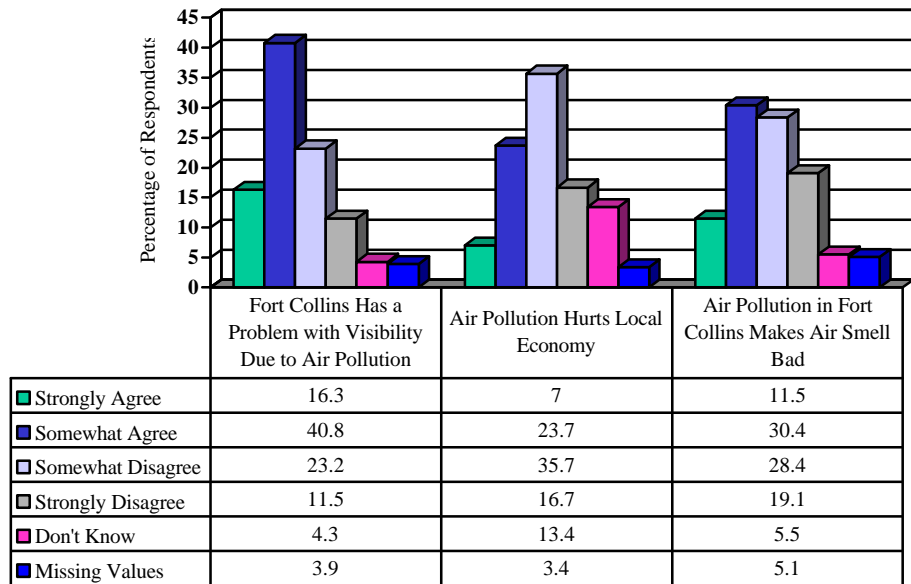


Figure 9c: Attitudes, Norms, and Perceived Control of Air Quality in Fort Collins

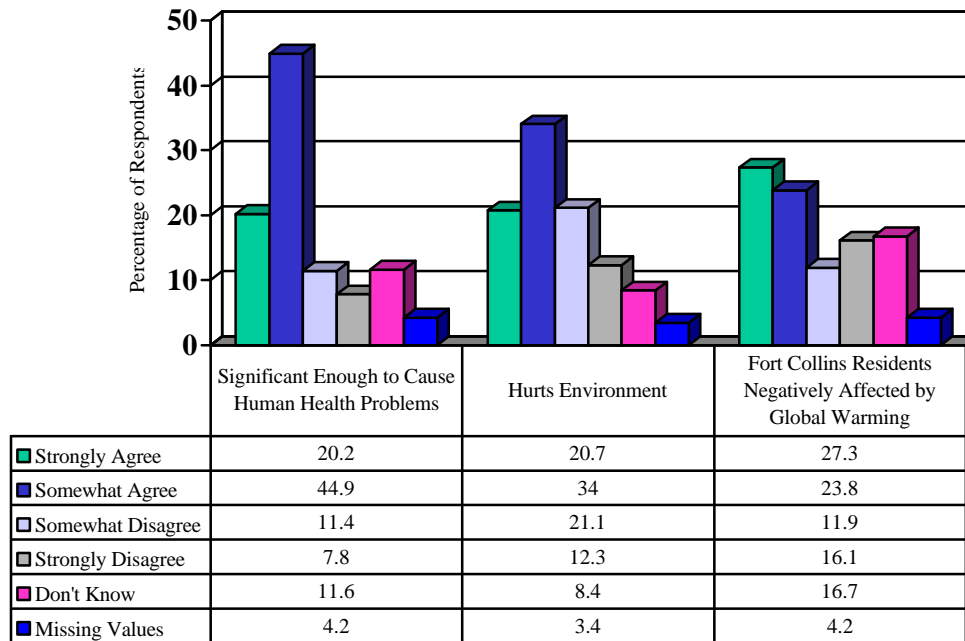
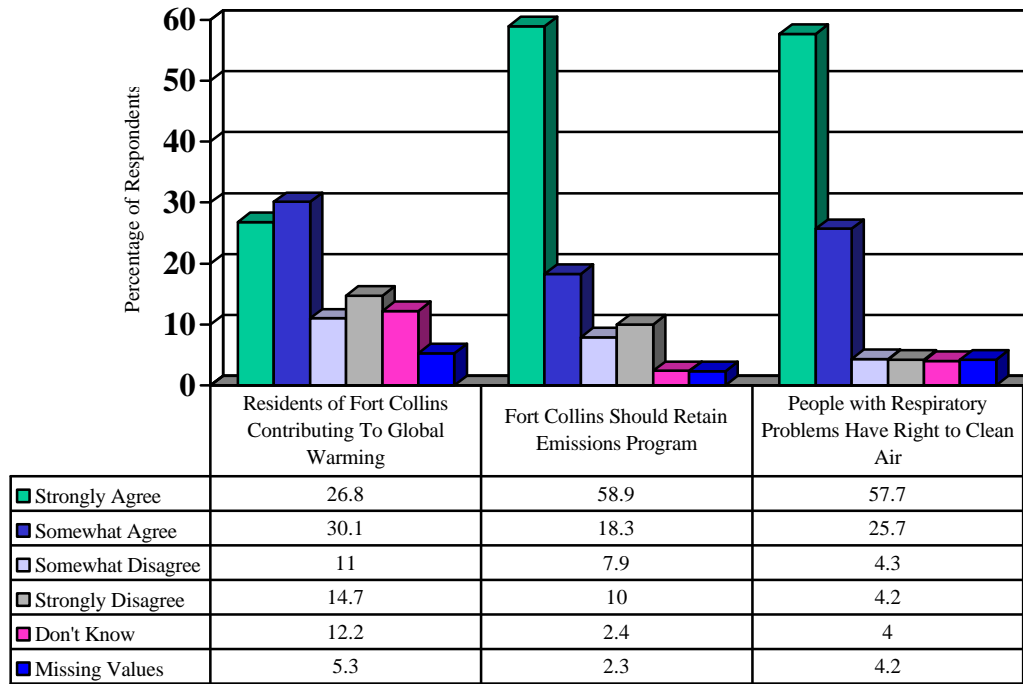


Figure 9d: Attitudes, Norms, and Perceived Control of Air Quality in Fort Collins



For 2001 and 2002, all statements were compared. Small, non-significant changes were seen.

Table 12: Comparison Between Belief Statements 2001, 2002

| Statements | Strongly Agree | | Somewhat Agree | | Somewhat Disagree | | Strongly Disagree | |
|---|----------------|------|----------------|------|-------------------|------|-------------------|------|
| | 2001 | 2002 | 2001 | 2002 | 2001 | 2002 | 2001 | 2002 |
| I feel a personal obligation to help improve the air quality in Fort Collins. | 41 | 44 | 48 | 43 | 7 | 5 | 2 | 2 |
| I feel that small changes I make <i>can</i> affect the air quality in Fort Collins. | 38 | 39 | 46 | 43 | 10 | 8 | 5 | 4 |
| Many of the people I know in Fort Collins will not change their transportation habits to improve air quality in Fort Collins. | 41 | 44 | 39 | 36 | 12 | 9 | 1 | 2 |
| Fort Collins has a problem with visibility due to air pollution. | 21 | 16 | 40 | 41 | 27 | 23 | 7 | 12 |
| Air pollution in Fort Collins hurts the local economy. | 9 | 7 | 29 | 24 | 37 | 36 | 14 | 17 |
| Air pollution in Fort Collins makes the air smell bad. | 16 | 12 | 32 | 30 | 33 | 28 | 15 | 19 |
| Air pollution in Fort Collins is bad enough to cause human health problems. | 29 | 20 | 40 | 45 | 16 | 11 | 7 | 8 |
| Air pollution in Fort Collins is significant enough to hurt the environment. | 28 | 21 | 33 | 34 | 22 | 21 | 11 | 12 |
| The City of Fort Collins's residents will be negatively affected by global warming. | 32 | 27 | 32 | 24 | 11 | 12 | 11 | 16 |
| The City and residents (including myself) of Fort Collins are contributing to global warming. | 34 | 27 | 37 | 30 | 10 | 11 | 10 | 15 |
| Even if not required, Fort Collins should retain motor vehicle emissions inspection program. | 64 | 59 | 23 | 18 | 7 | 8 | 7 | 10 |
| People with respiratory problems have a right to breathe clean air. | 68 | 58 | 23 | 26 | 4 | 4 | 3 | 4 |

Q7. To Help Reduce Air Pollution in the City of Fort Collins, ‘I’ Would be Willing To...

When asked the question of what residents would be willing to do to help reduce air pollution in Fort Collins, overall, most agreed they would be willing to do something (average of 55.3%) compared to residents who disagreed that they would be willing to do something (average of 36.4%). An average of 3% felt their actions would not help. The top action residents would be willing to take is to keep their *vehicles tuned up*. The next set of actions many residents state they would be willing to take includes: *reduce the number of miles they drive their vehicle, ride a bike for work or errands, reduce number of miles driven in car if there was a tax break incentive, and use public transportation if it were more convenient* (Figures 11a and 11b). An action the residents would very much oppose (69%) is to *contribute \$10 when registering vehicle to subsidize repair of high-polluting vehicles*. Residents also appear to disagree/somewhat disagree that taking the bus is a possible action they might take to reduce air pollution (53%).

Compared to the surveys of 2001, 1999 and 1997, residents again picked *keep my vehicle tuned up* as a top action they would take to help reduce air pollution. This year, fewer residents stated they would be willing to *ride their bike* or *take the bus* (see Table 11). Overall, residents stated they were less likely to take actions that would contribute to reducing air pollution. Even though the 2001 survey changed the dollar amount of the *contribution when registering their vehicle*, the number of residents who disagreed that this is an action they would be willing to take remained larger than those who agreed they would take action.

Mean comparisons of the measures of the intent to behave pro-environmentally (Figure 10) show that people are most willing to keep their car tuned up, and least willing to contribute \$10.00 to subsidize the repair of high polluting vehicles. Residents are willing to spend much more money on their own property to reduce air pollution, but not willing to spend a small (in comparison to a tune-up) amount on someone else’s property. The City should consider how a marketing or education program could address this issue.

Figure 10: Individual Actions Respondents Would be Willing to Take

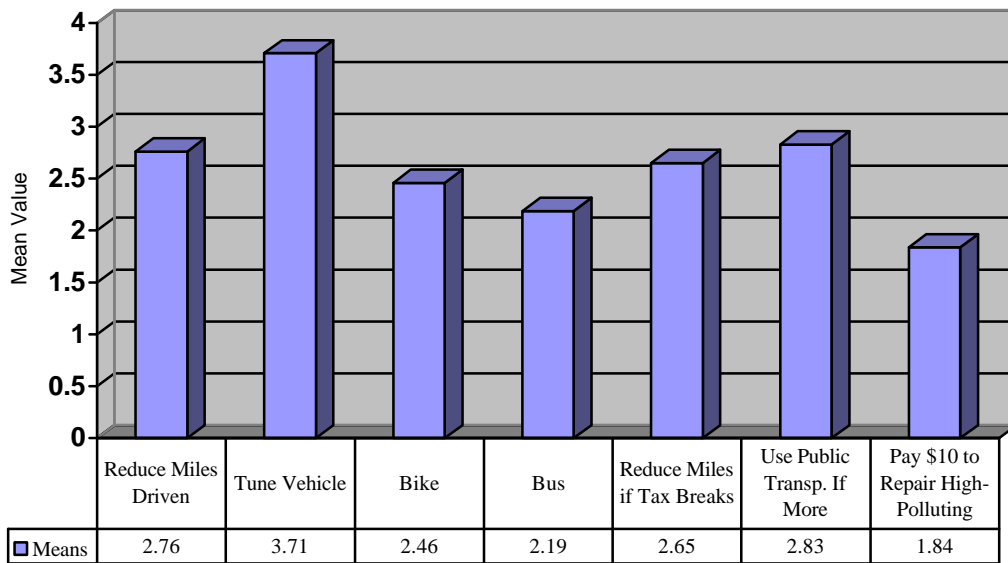


Figure 11a: Individual Actions to Reduce Air Pollution

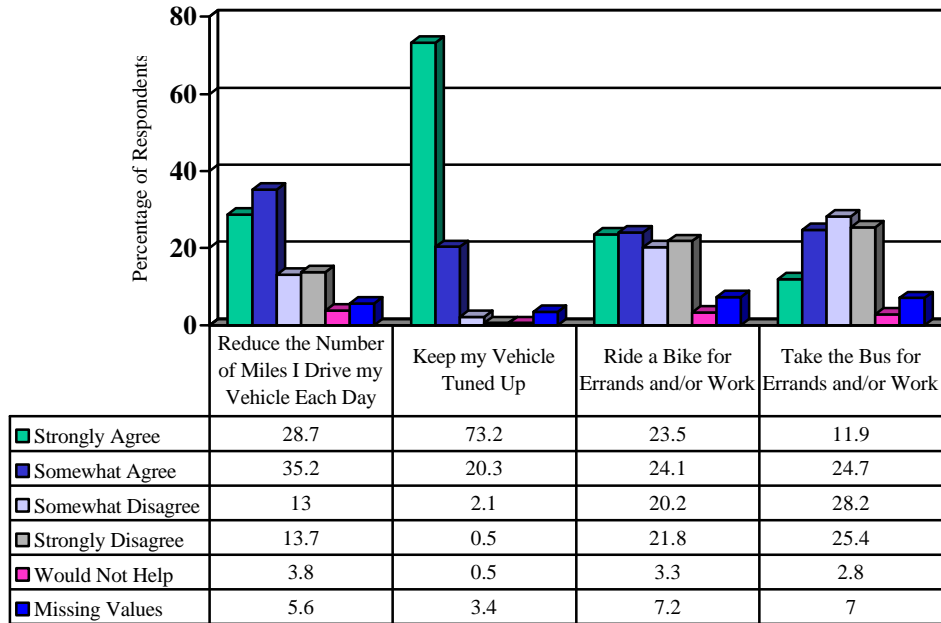


Figure 11b: Individual Actions to Reduce Air Pollution

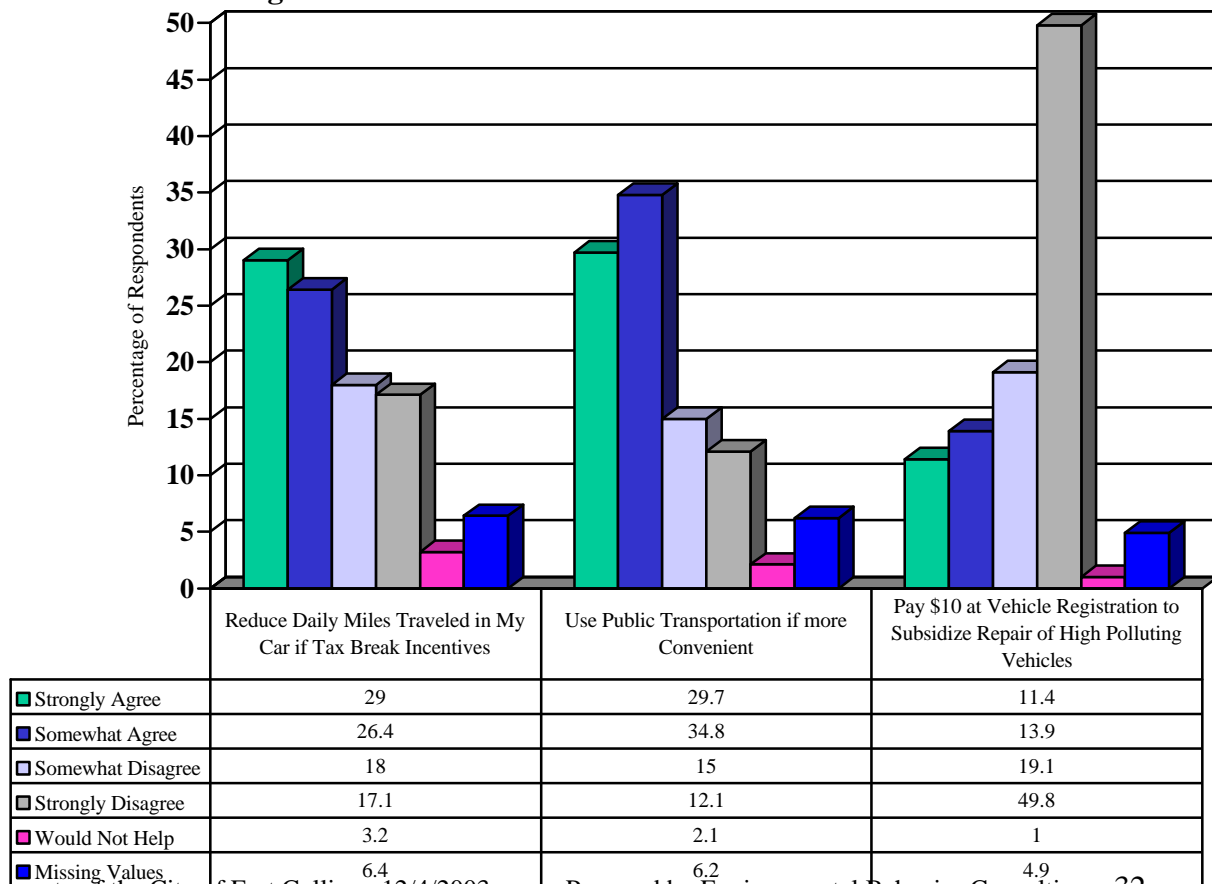


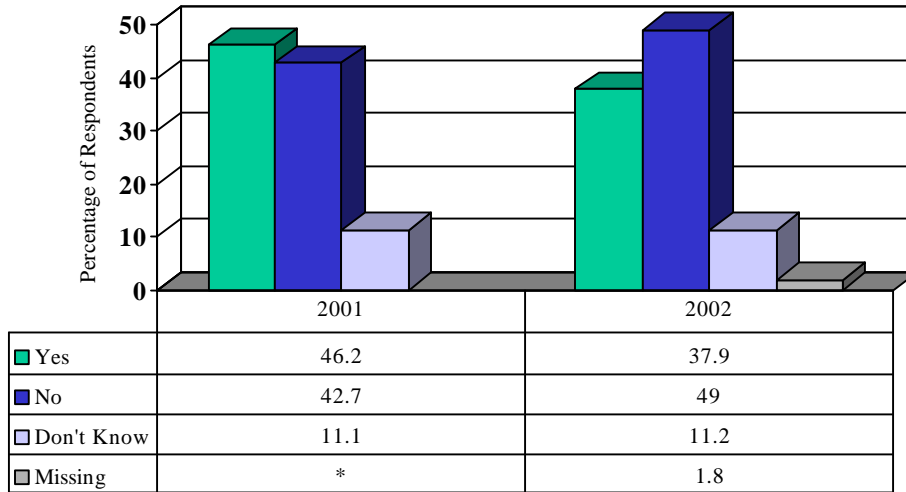
Table 13: Comparison of Individual Actions to Reduce Air Pollution: 1997, 1999, 2001, and 2002

| Statements | Strongly Agree | | | | Somewhat Agree | | | | Somewhat Disagr. | | | | Strongly Disag. | | | |
|--|----------------|-----|-----|-----|----------------|-----|-----|-----|------------------|-----|-----|-----|-----------------|-----|-----|-----|
| | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 | '97 | '99 | '01 | '02 |
| Reduce the number of miles I drive my vehicle each day. | 27 | 30 | 34 | 29 | 41 | 43 | 35 | 35 | 15 | 12 | 14 | 13 | 13 | 14 | 12 | 14 |
| Keep my vehicle tuned up. | 76 | 77 | 71 | 73 | 22 | 20 | 25 | 20 | 1 | 1 | 2 | 2 | <1 | 1 | <1 | <1 |
| Ride a bike for errands and/or work. | 21 | 26 | 30 | 24 | 22 | 27 | 30 | 24 | 16 | 16 | 19 | 20 | 34 | 27 | 18 | 22 |
| Take the bus for errands and/or work. | 10 | 12 | 15 | 12 | 19 | 23 | 30 | 25 | 34 | 28 | 29 | 28 | 28 | 31 | 22 | 25 |
| Reduce the daily miles traveled in my car if there were tax break incentives. | * | * | 34 | 29 | * | * | 34 | 26 | * | * | 16 | 18 | * | * | 11 | 17 |
| Use public transportation if it was more convenient for me. | * | * | 40 | 30 | * | * | 36 | 32 | * | * | 13 | 15 | * | * | 9 | 12 |
| Contribute (\$1*) \$10 when registering my vehicle to subsidize repair of high-polluting vehicles. | * | * | | | * | * | | | * | * | | | * | * | | |
| | 24 | 25 | 10 | 11 | 22 | 20 | 17 | 14 | 14 | 13 | 19 | 19 | 38 | 38 | 49 | 50 |

Q8. Have you ever experienced unacceptable outdoor air quality in Fort Collins?

This question was new to the 2001 survey, so only comparisons with 2001 can be made. Figure 12 shows that fewer residents experienced unacceptable outdoor air quality in Fort Collins in 2002 than in 2001. Less than half (38%) of the respondents have at some time or another experienced unacceptable air quality in Fort Collins.

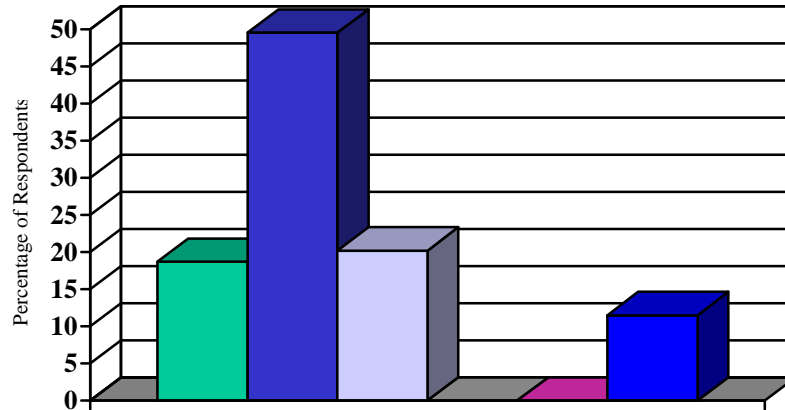
Figure 12: Resident Ever Experience Unacceptable Air Quality in Fort Collins



Q9. Overall, how would you rate the quality of outdoor air in Fort Collins?

Figure 13 shows that half of respondents rate the overall air quality in Fort Collins as “good.

Figure 13: Rating of Overall Air Quality in Fort Collins



| | |
|----------------|------|
| Very Good | 18.7 |
| Good | 49.6 |
| Fair | 20.2 |
| Poor | 0 |
| Not Sure | 0 |
| Missing Values | 11.5 |

Table 14 shows the results of previous surveys. Most respondents rated the air quality as “good”, (46% in 1997 and 43% in 1999), with very few rating it as “excellent” or “poor.” Compared to the first two surveys, both the 2001 and the 2002 surveys found fewer people rated air quality as “very good.” However, this year, no one rated it as “poor.”

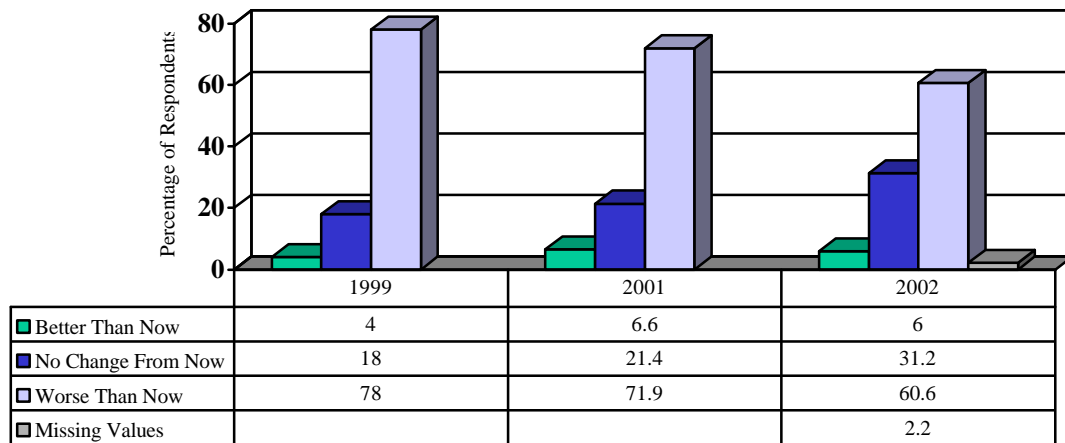
Table 14: Rating of Overall Air Quality in Fort Collins Comparison: 1997, 1999, 2001

| Rating | 1997 | 1999 | 2001 | 2002 |
|-----------|------|------|------|------|
| Excellent | 4 | 6 | - | - |
| Very Good | 23 | 24 | 16 | 19 |
| Good | 46 | 43 | 53 | 50 |
| Fair | 23 | 23 | 28 | 20 |
| Poor | 2 | 2 | 2 | 0 |
| Not Sure | - | - | 0.8 | 0 |

Q10. What do you think Fort Collins’ air quality will be like in five years?

Figure 14 shows that most respondents believe that Fort Collins’ air quality will be worse (61%) in five years, while 31% believe it will not change, and only 6% believe it will be better than it is now. From Figure 13, we know that 50% of respondents considered the air quality to be “good” and almost half have at some time or another experienced unacceptable air quality. Results from Q9 and Q10 indicate that even though respondents believe the air quality is “good” now, it is not going to remain that way, especially in light of the fact that they have already experienced unacceptable air quality.

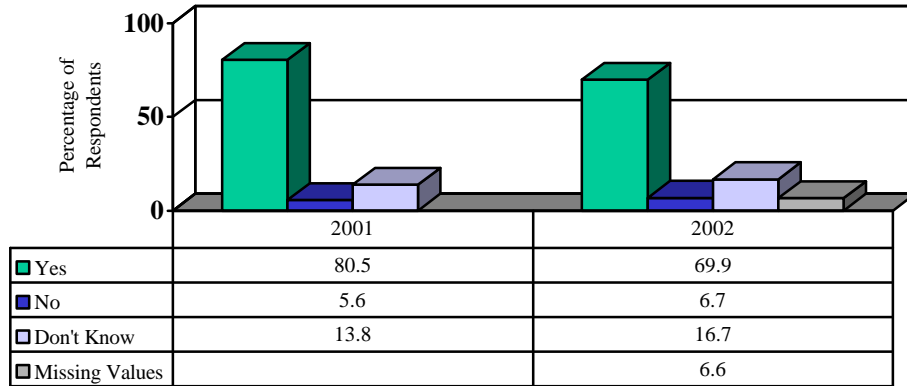
Figure 14: What Will Fort Collins' Air Quality Be Like In Five Years From Now?



The issue raised in the previous question and the next two questions gets at concerns about the chances that anything effective will or can be done to maintain and/or improve the air quality in Fort Collins. The next two questions directly assess whether something can or will be done. Results show (Figure 15) that most residents (70%) do, in general, believe that something can be done to improve or maintain the air quality in Fort Collins. However, fewer residents in 2002, compared to 2001, think that something can be done, and increasingly more people “don’t know.” Comparing “can something be done” to “will something be done” shows that four times as many people believe that nothing will be done, as can be done.

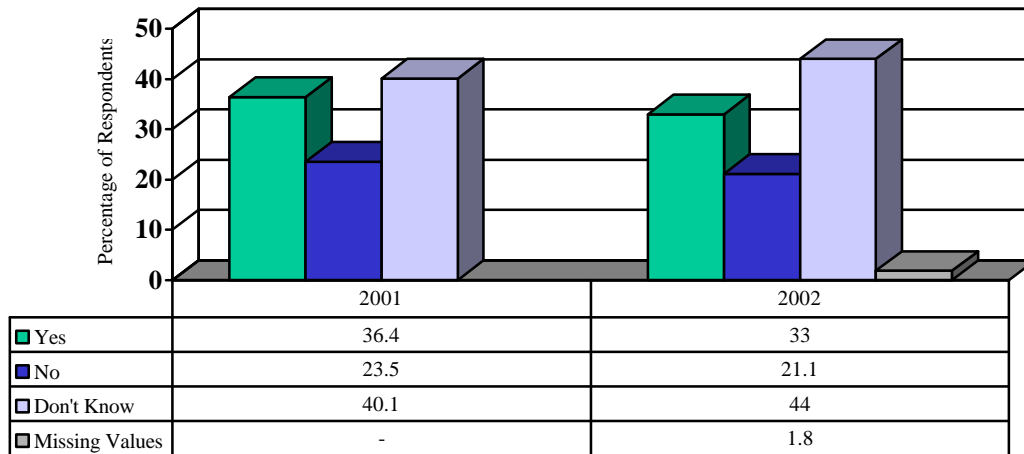
Q11. Do you think anything *can* be done to improve the air quality in Fort Collins?

Figure 15: Can Something Be Done To Maintain or Improve the Air Quality in Fort Collins?



Q12. Do you think anything *will* be done to improve the air quality in Fort Collins?

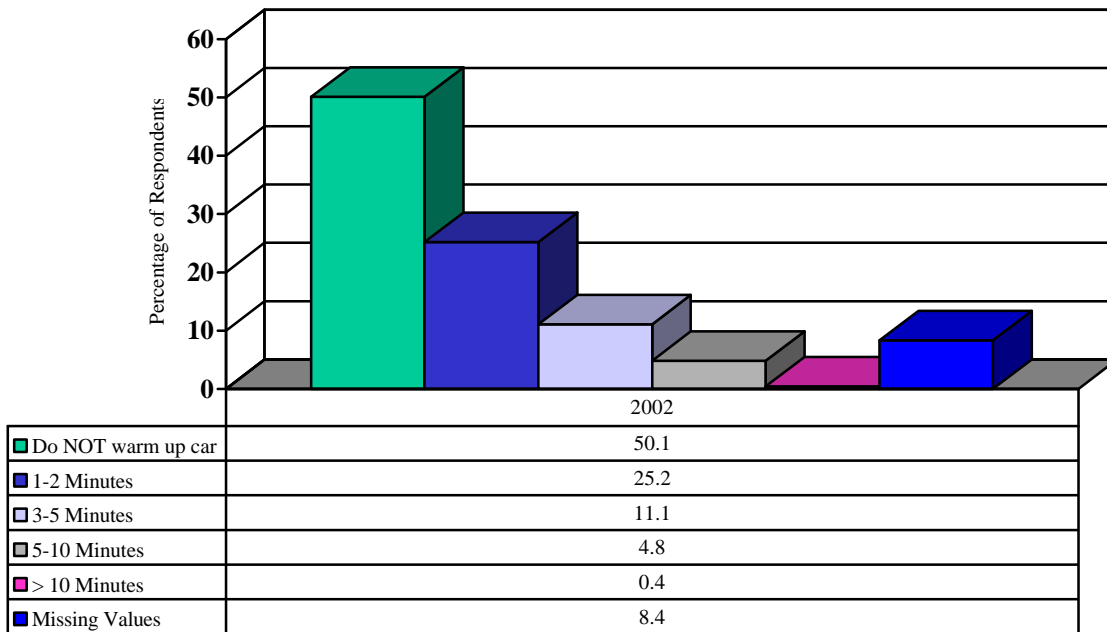
Figure 16: Will Something Be Done To Improve or Maintain the Quality of Air in Fort Collins?



Q13. How long do you *typically* warm up your car on winter mornings before driving away?

Figure 17 shows that almost half of the respondents do not warm up their car at all, a quarter of the respondents warm it up for 1-2 minutes. Very few (5.2%) warm it up more than five minutes.

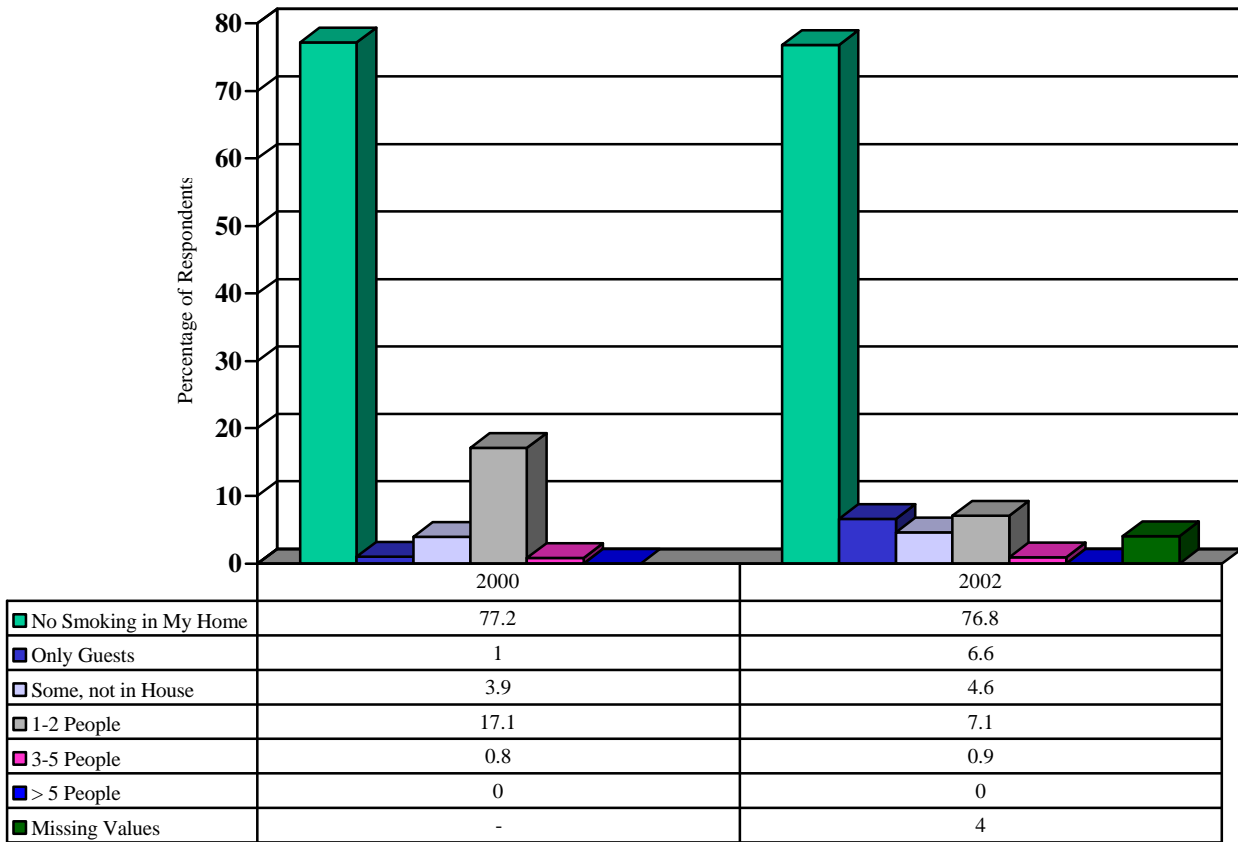
Figure 17: Amount of Time Respondent Warms up Car on Cold Days



Q14. How many people in your household smoke cigarettes, cigars, or pipes?

This is an interesting change from the Indoor Air Quality survey of 2000. The numbers of people who will allow guests to smoke has increased, while the number of people actually smoking in their own homes has dramatically decreased.

Figure 18: Household Smoking

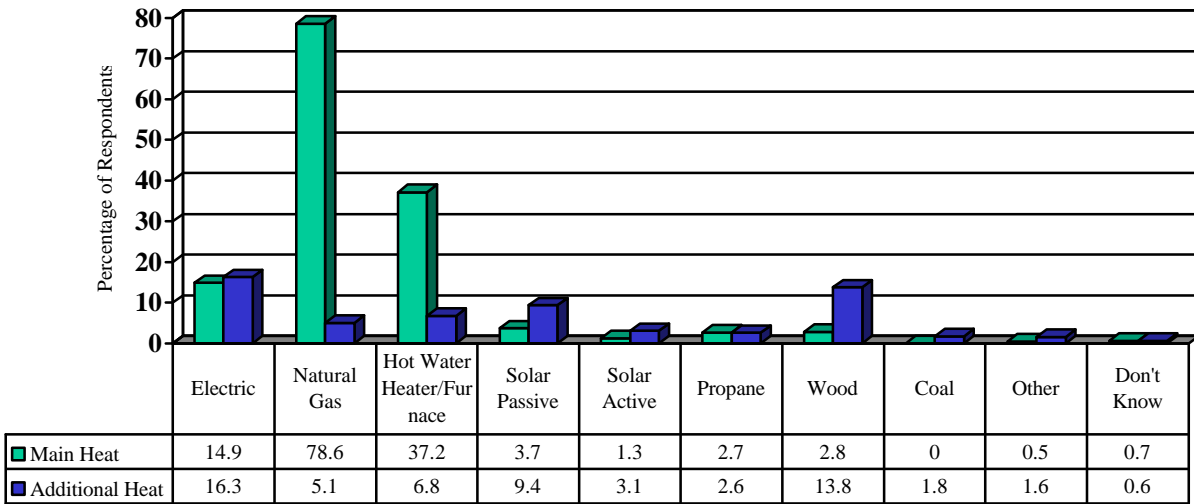


Q15. Main sources of heat currently used in home.

The main source of heat used in the homes of respondents in the 2002 survey was natural gas (79%). Hot water (37%), and electric (15%) were the next most frequently checked sources.

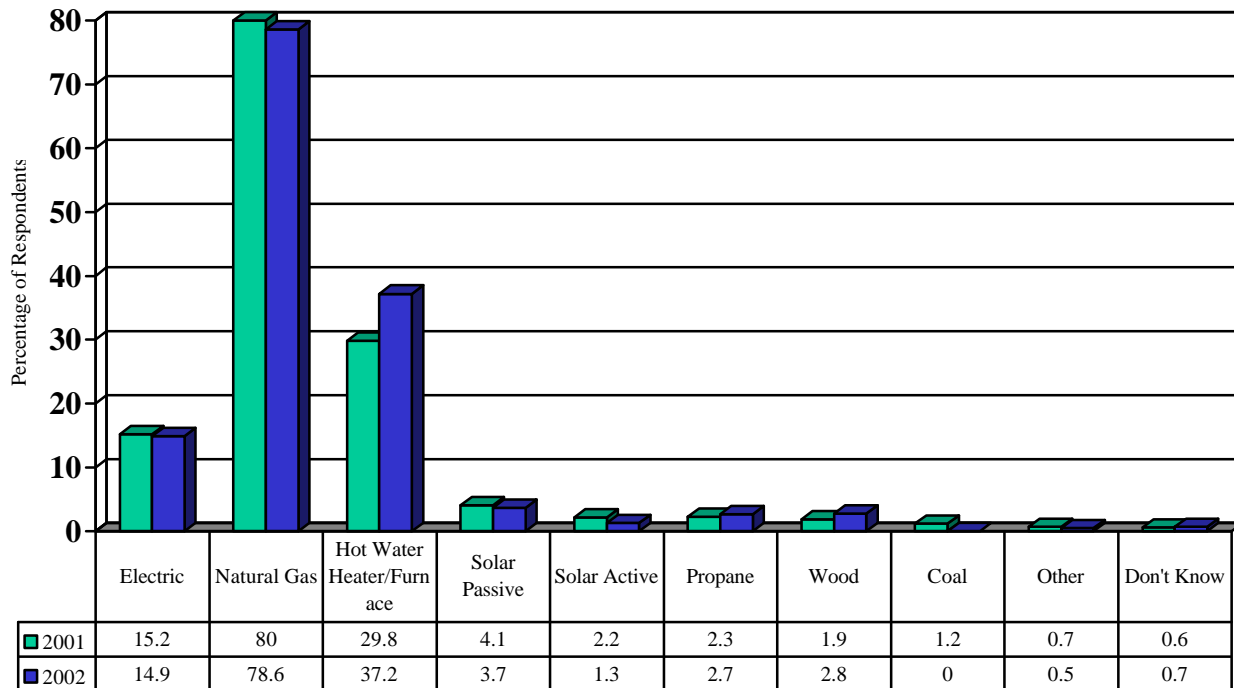
* Numbers do not add to 100% because each source was checked “yes” or “no.”

Figure 19: Main and Additional Sources of Heat



For 1995 and 1997, natural gas was cited as the most common source of heat at 81% and 79% respectively. Hot water heat was not listed in 1995 as a choice, was 4% in 1997 and has increased to 37% in 2002. Electric heat was 15% in 1995, and 12% in 1997. Hot water decreased somewhat and wood and propane increased.

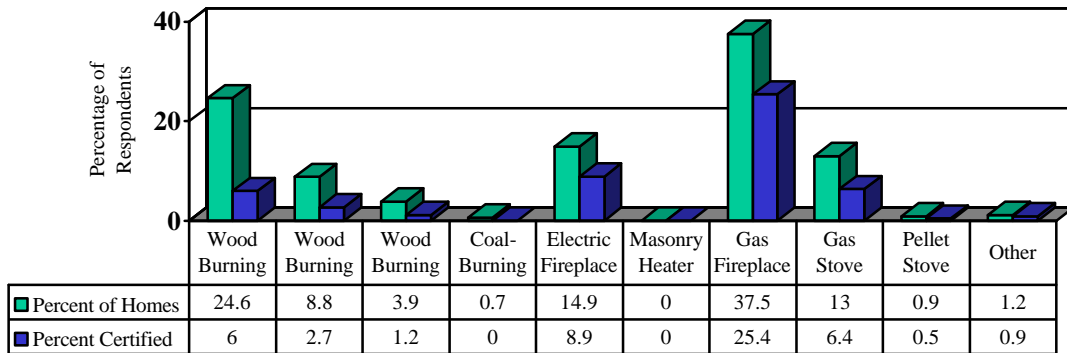
Figure 20: Comparison of Main Heating Sources: 2001, 2002



Q16. Please indicate if your home has each of the following and if it is certified?

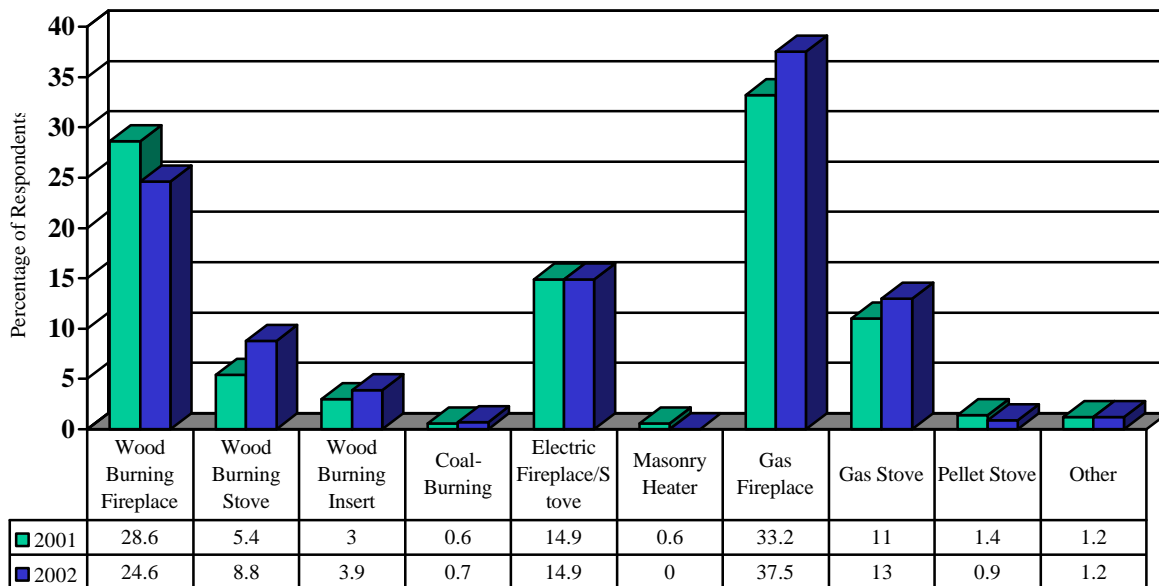
Gas fireplaces are the top “other sources of heat” for residents (38%) followed by wood burning fireplaces (25%) and electric fireplaces (15%). The percentage of those who checked they are certified were calculated only from the group of those who responded “Yes” to each. Gas fireplaces appear to be the most likely to be “certified.” Any of the wood burning sources were the least likely to be certified.

Figure 21. Percent of Homes With Other Sources of Heat and Percentage of Certified Units



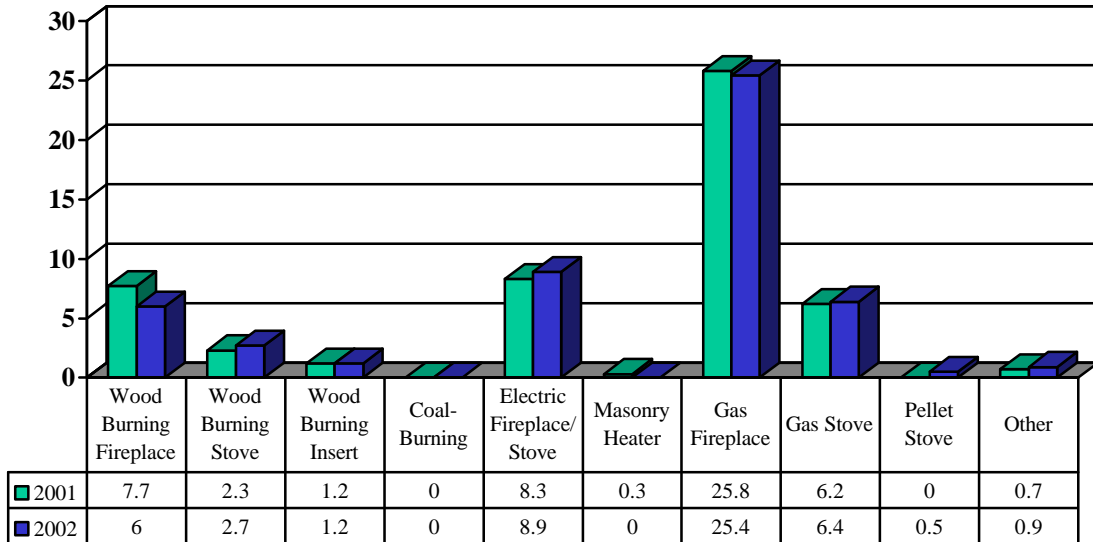
Comparing results to the 2001 survey, the percentage of “other heat sources” did not change. Small increases occurred in the number of wood burning stoves and inserts, and a decrease occurred in the number of wood burning fireplaces. Gas fireplaces and stoves increased.

Figure 22. Comparison Between Percentage of Homes with Other Sources of Heat in 2001, 2002



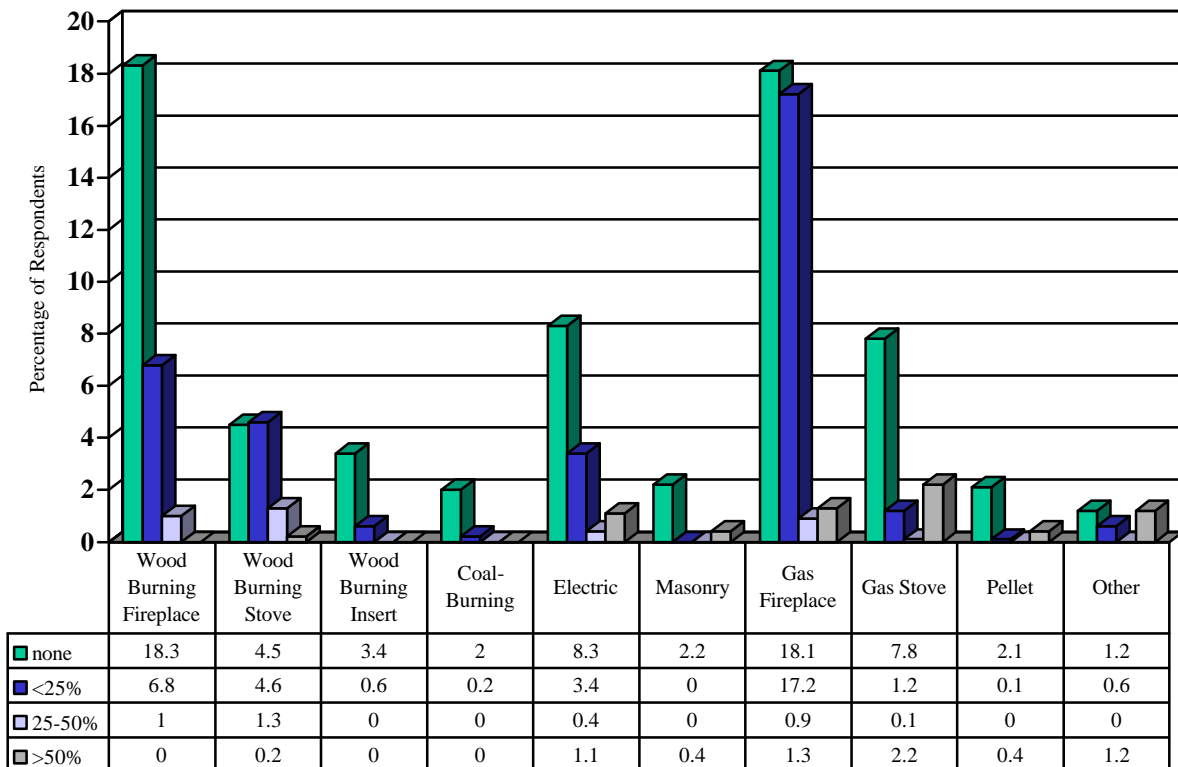
No changes were found from the 2001 survey to the 2002 survey when comparing the percentages of certified “other sources of heat.”

Figure 23. Percentage of Certified Other Sources of Heat From 2001 to 2002



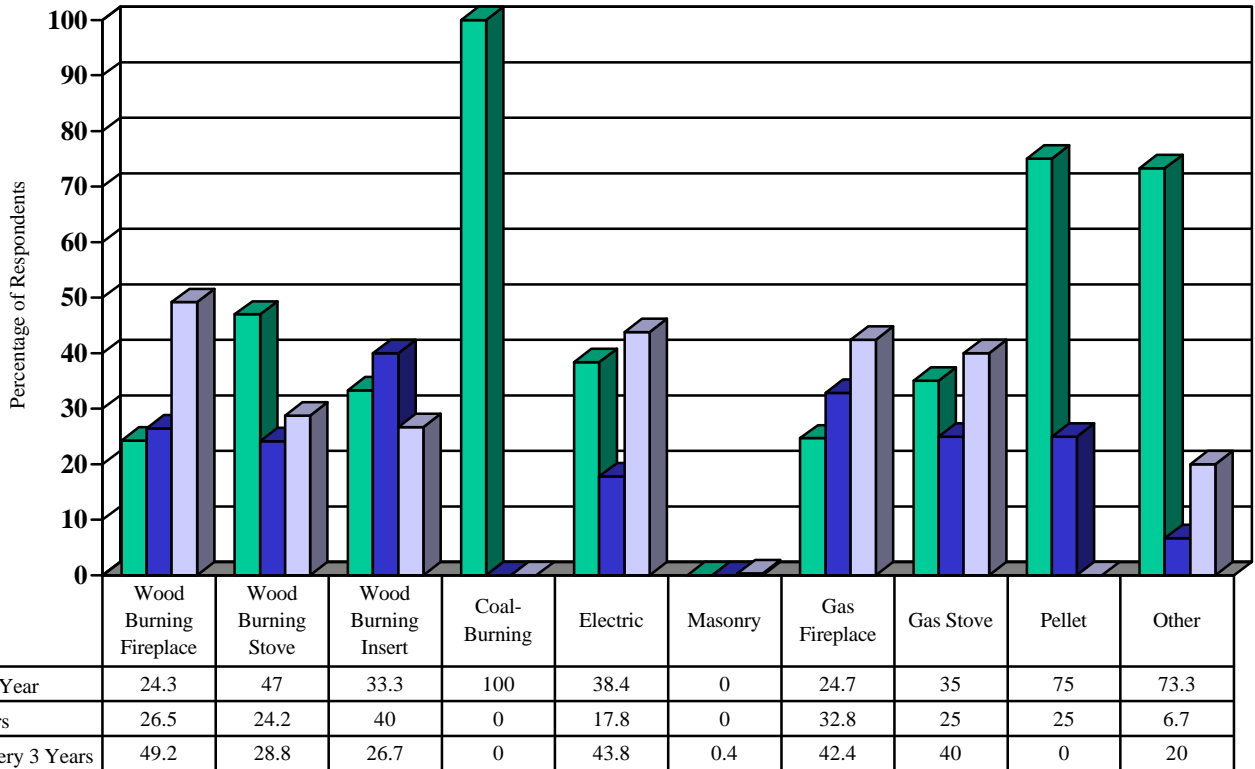
A new question for 2002, respondents were asked what percentage of heating each “other source of heat” provided. The gas fireplace was used more often (19.4%) at least 25% of the time to provide the “other heat source” for respondents. Wood fireplaces (7.8%) and wood stoves (6.1%) were the next most frequently used other sources of heat at least 25% of the time.

Figure 24: Percentage of Heating Provided by Other Heat Sources



Another new question for 2002, respondents were asked how often the “other source of heat” in homes were checked or cleaned. Of respondents that had each “other source of heat”, the coal-burning fireplace or stove (N=2), and pellet stove (N=4) was checked or cleaned 100% of the time on a yearly basis. “Other” sources of heat (80%), “wood burning inserts” and “wood burning stoves”, were checked or cleaned at least every 3 years.

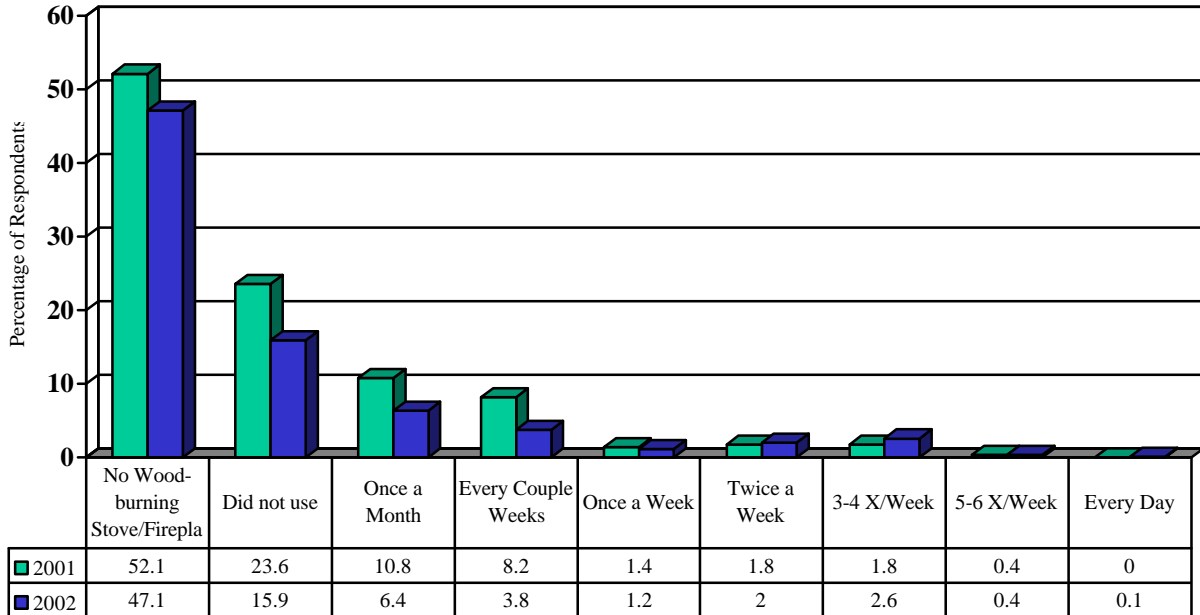
Figure 25: How Often is the Other Source of Heat Cleaned or Checked?



Q17. If resident has a wood burning fireplace or stove, how often was it used last winter?

Most respondents did not use their wood stove or fireplace at all last winter (23.6%). Only one respondent used their wood stove or fireplace every day.

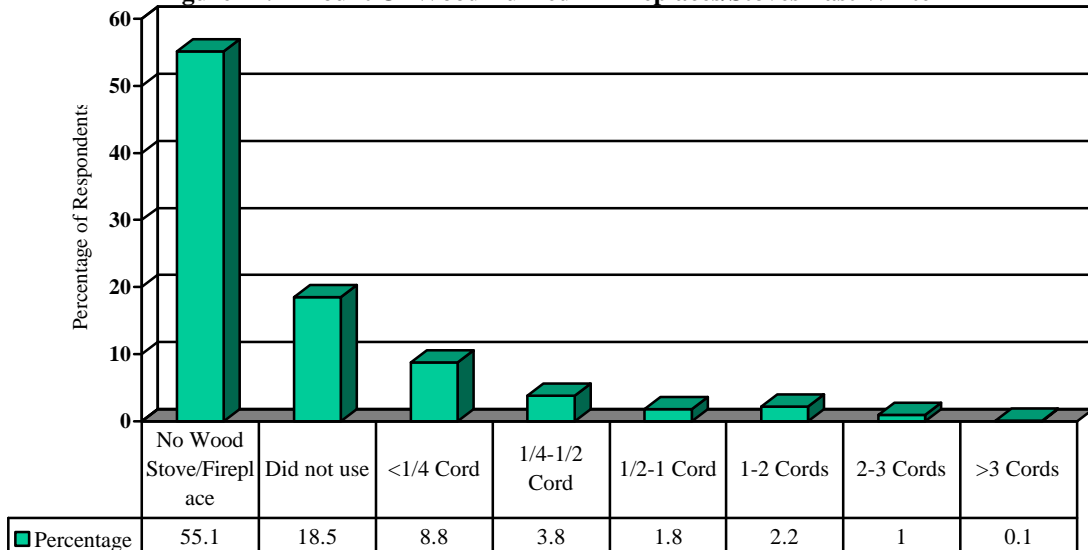
Figure 26: Days Per Month Wood Stove/Fireplace Used



Q18. About how much wood did you burn this past winter in your fireplace of heating stove?

Most respondents (18.5%) did not use their wood stove or fireplace last winter. One used more than 3 cords and the majority (8.8%) used under 1/4 of a cord.

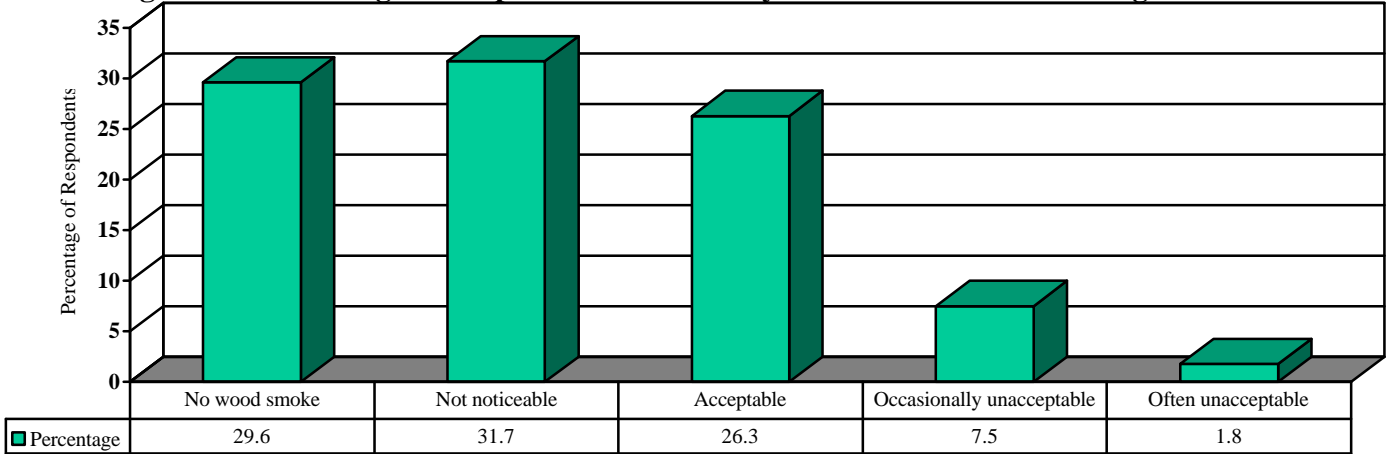
Figure 27: Amount Of Wood Burned in Fireplaces/Stoves Last Winter



Q19. To what extent are you affected by wood smoke in your neighborhood?

Most respondents are not negatively affected (87.6%) by wood smoke in their neighborhood, because there is no wood smoke (29.6%), or there is wood smoke but it is acceptable (55.9%). 9.3% of respondents find wood smoke in their neighborhood to be unacceptable.

Figure 28: Percentage of Respondents Affected by Wood Smoke in Their Neighborhood



Cross-tabs were performed on the type of wood burning appliance used and the amount of wood burned last winter. From the cross tabulation, findings show the majority of homes with wood burning sources did not burn any wood last year. Homes with either a wood insert or stove burned more wood than those with a fireplace.

Table 15. Type of Wood Burning Appliance used and Amount of Wood Burned Last Winter

| | | Fireplace | | Stove or Insert | | Fireplace and Stove or Insert | |
|--------------------|------------------------------|--------------------|--------|-----------------|--------|-------------------------------|--------|
| | | # Responses to Q16 | | | | | |
| # Responses to Q18 | | 201 | | 102 | | 32 | |
| | | % | Number | % | Number | % | Number |
| 451 | No fireplace or stove | | 0 | 9% | 9 | 0 | 0 |
| 151 | None-did not use | 49% | 99 | 35% | 35 | 42% | 13 |
| 72 | Less than ¼ cord | 30% | 60 | 22% | 22 | 35% | 11 |
| 31 | ¼ to ½ cord | 9% | 17 | 15% | 15 | 3% | 1 |
| 15 | ½ to 1 cord | 4% | 8 | 6% | 6 | 3% | 1 |
| 18 | 1 to 2 cords | 7% | 13 | 7% | 7 | 13% | 4 |
| 8 | 2 to 3 cords | 2% | 4 | 5% | 5 | 3% | 1 |
| 1 | More than 3 cords | 0 | 0 | 1% | 1 | 0 | 0 |

✦ Wood Smoke Management Options Insert

A special “Wood Smoke Management Options” insert was included in the mailing. There were 477 wood smoke questionnaires completed and returned. The questionnaire asked respondents to rank order a set of preferences for wood smoke management possibilities in the City of Fort Collins. The wood smoke management option “most preferred” was the “Voluntary no burn on high pollution days.” The option chosen as “least preferred” was the “Mandatory removal or upgrade of non-EPA-certified wood stoves or inserts (older than 1990).”

Figure 29: Wood Smoke Management Options

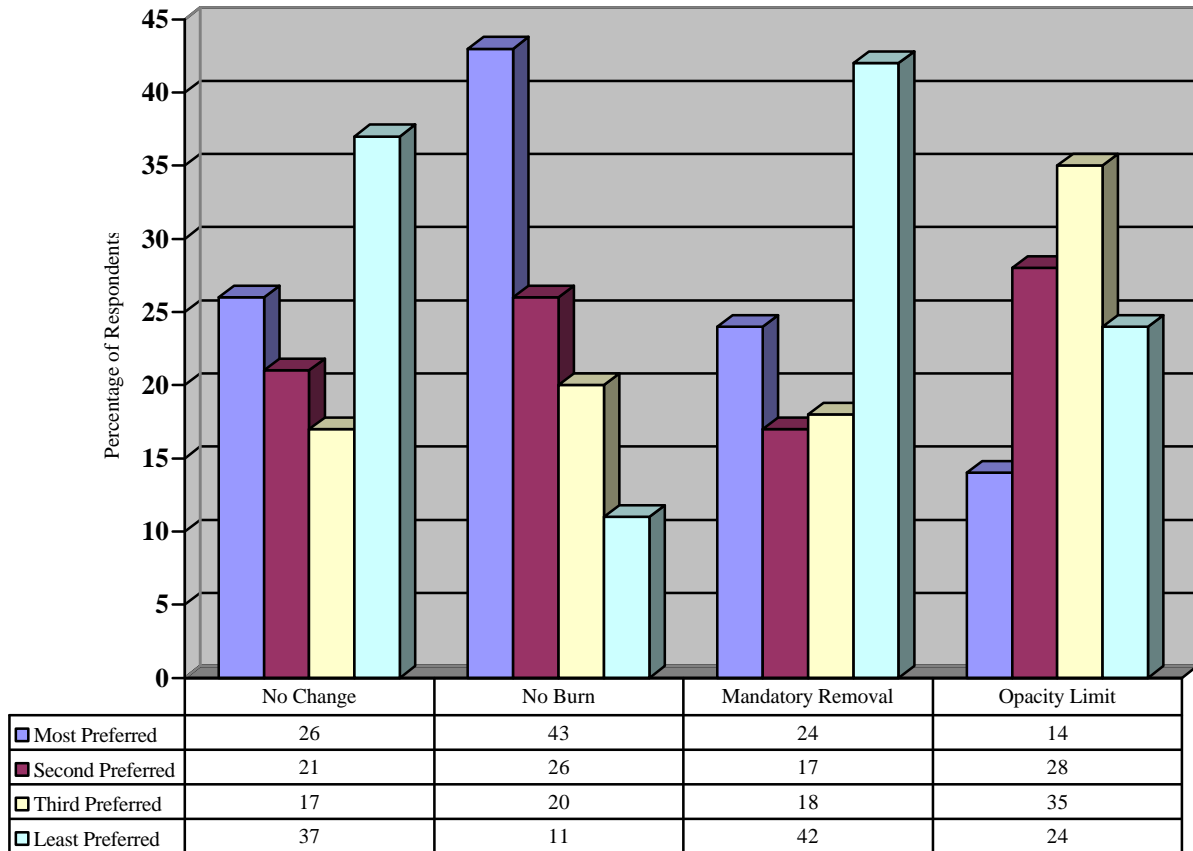


Table 16: Means for each Wood Smoke Management Option

| No Change | No Burn | Mandatory Removal | Opacity Limit |
|-----------|---------|-------------------|---------------|
| 2.65 | 1.99 | 2.77 | 2.69 |

Means provide support for validity in determining the “Voluntary *No Burn* on high pollution days” is the most often preferred option and the “Mandatory removal or upgrade of Non-EPA-certified wood stoves or inserts (older than 1990)” is the least preferred option. All means were compared for significant differences using a paired-samples T-test. No significant differences were found (>.01) comparing means of: “No change” and “Opacity limit”; “No change” and “Mandatory removal”; or, “Mandatory removal” and “Opacity limit.” Significant difference were found (<.01) when comparing means of: “No change” and “No burn”; “No burn” and “Mandatory removal”; or, “No burn” and “Limit opacity.”

Table 2. Paired Samples Test

| Pairs | t | df | Significance (2-tailed) |
|--|--------|-----|-------------------------|
| No change from present - voluntary no burn | 9.438 | 476 | .000 |
| No change from present - Mandatory removal or upgrade of Non-certified woodstoves | -.926 | 476 | .23 |
| No change from present - Tighten residential chimney opacity limit from 40% to 20% | -.359 | 476 | .63 |
| Voluntary "no burn" - Mandatory removal or upgrade of non-certified woodstoves | -8.671 | 476 | .000 |
| Voluntary "no burn" - Tighten residential chimney opacity limit from 40% to 20% | -9.614 | 476 | .000 |
| Mandatory removal or upgrade of non-certified woodstoves - Tighten residential chimney opacity limit from 40% to 20% | .945 | 476 | .29 |

✘ Evaluation of Surveys

Responses: 143

•**How long did the survey take you?**—Minimum time: 15 minutes

–Maximum time: 50 minutes

–Mode: 30 minutes

–Mean: 31 minutes

It is important to survey citizens’ opinions of the air quality to help the city make planning decisions.

–Strongly Agree 26

–Agree 38

–Neutral 10

–Disagree 18

–Strongly Disagree 8

•**It is important to survey citizens’ opinions to let the City know whether their education efforts to improve air quality are effective.**

–Strongly Agree 18

–Agree 41

–Neutral 26

–Disagree 10

–Strongly Disagree 5

Demographics

The following questions will address the demographics of the survey, or *who* responded to the survey.

Gender

The sex of the respondents (Figure 1D, Table 1D) remains essentially equal, with slightly more males responding to the surveys as females.

Figure 30: Gender of Respondent

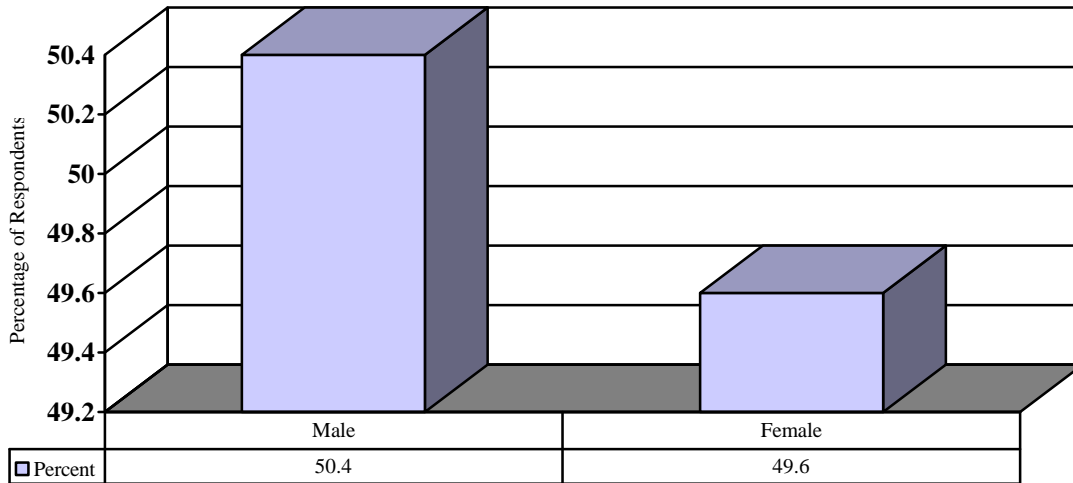


Table 18: Gender Comparison Surveys 1994, 1995, 1997, 1999, 2001, 2002

| Gender | 1994 | 1995 | 1997 | 1999 | 2001 | 2002 |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Male | 52.9 | 49 | 53 | 46 | 45.5 | 50.4 |
| Female | 47.1 | 51 | 47 | 54 | 54.5 | 49.6 |

Age of Respondent

As in previous years (Figure 31, Table 19), the majority of the respondents fell between 40 and 60 years of age.

Figure 31: Age of Respondent

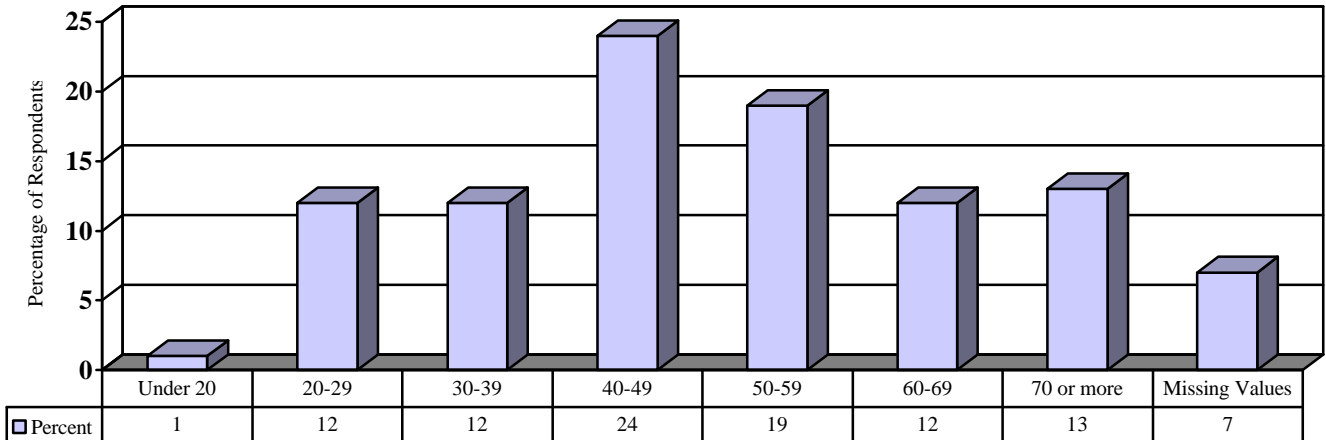


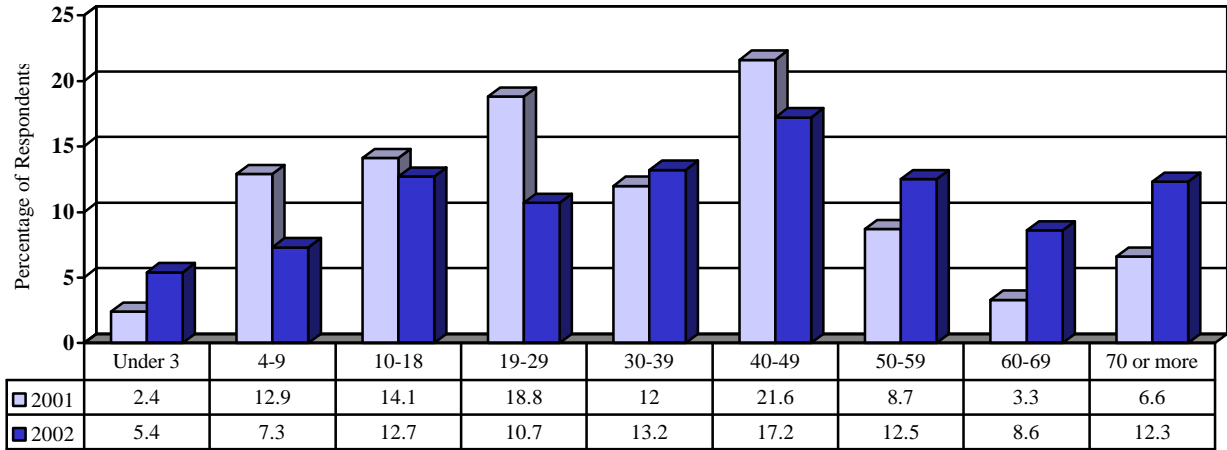
Table 19: Age of Respondent Comparison, 1994, 1995, 1997, 1999, 2001, 2002

| <u>Age</u> | 1994 | 1995 | 1997 | 1999 | 2001 | 2002 |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Under 20 | 0 | 0 | 0 | 0 | 1 | 1 |
| 20-29 | 9.22 | 7 | 5 | 6 | 12.4 | 12 |
| 30-39 | 20.6 | 19 | 10 | 14 | 14.7 | 12 |
| 40-49 | 23.6 | 26 | 21 | 24 | 21.6 | 24 |
| 50-59 | 15.5 | 18 | 29 | 24 | 24.9 | 19 |
| 60-69 | 11.2 | 10 | 12 | 16 | 13.4 | 12 |
| > 70 | 19.8 | 20 | 14 | 16 | 12.5 | 13 |

Ages of People in Household

The ages of people in the household show the largest group to be between 40 and 49 (see Figure 32). The range of ages went from 4 months to 98 years. The mean age was between 30-39; the mode (most often occurring) is 40-49; and the average age is also 40-49.

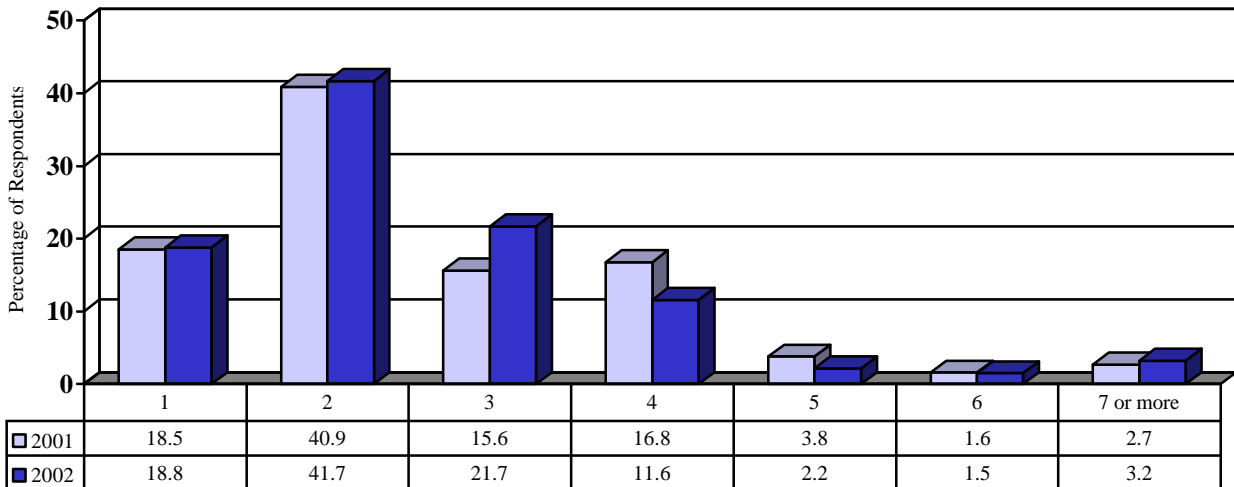
Figure 32: Ages of People in the Household



Number of People in Household

The majority of households responding to the survey were two-member households. Three and four-member households totaled 33.4%. 6.9% were five or more member households, and a moderate percentage (18.8%) were one-member households.

Figure 33: Number of People in the Household



Anyone in Household Pregnant?

Almost two times as many households reported a pregnant person in their household as did in 2001. This number is very similar to the 1994 and 1995 surveys.

Figure 34: Percent of Households with a Pregnant Member

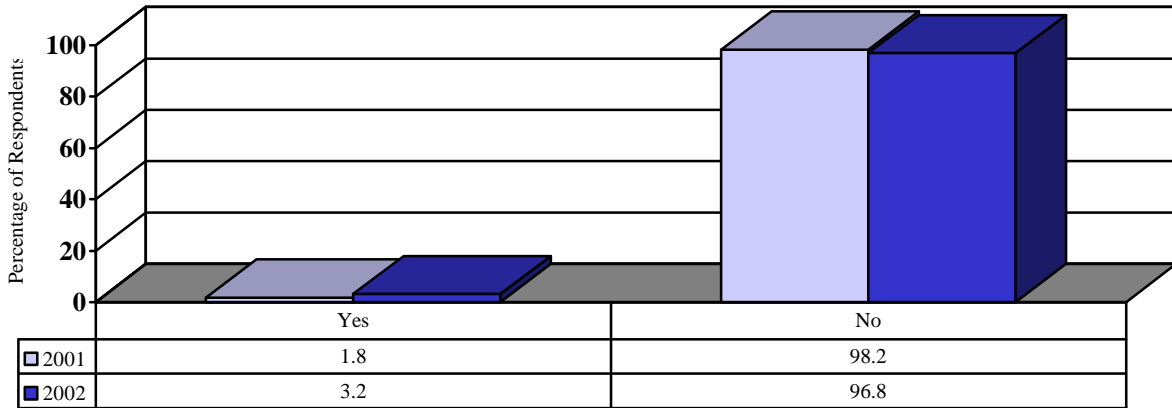


Table 20: Anyone in Household Pregnant? Comparison: 1994, 1995, 1997, 2001, 2002
Is anyone in household currently pregnant?

| Response | 1994 | 1995 | 1997 | 2001 | 2002 |
|-----------------|-------------|-------------|-------------|-------------|-------------|
| Yes | 2.4 | 3 | 2 | 1.8 | 3.2 |
| No | 97.6 | 97 | 98 | 98.2 | 96.8 |

Anyone in Household Suffer from Asthma, Emphysema, Heart Disease, or other Respiratory Ailments?

Of the households reporting, 31.8% stated that there was a member suffering from asthma, emphysema, heart disease, or other respiratory ailments (see Figure 6D). This number has been rising steadily since the first record in 1994 (see Table 3D).

Figure 7D shows the percent of respondents that answered “yes” to the above question, that believe the outdoor air quality negatively affects their symptoms or their health. More people (58.8%) believed that the outdoor air negatively impacted their respiratory problems than did not believe it was affecting their symptoms (41.5%).

Figure 35: Percent of Households With Member With Asthma, Respiratory Problems

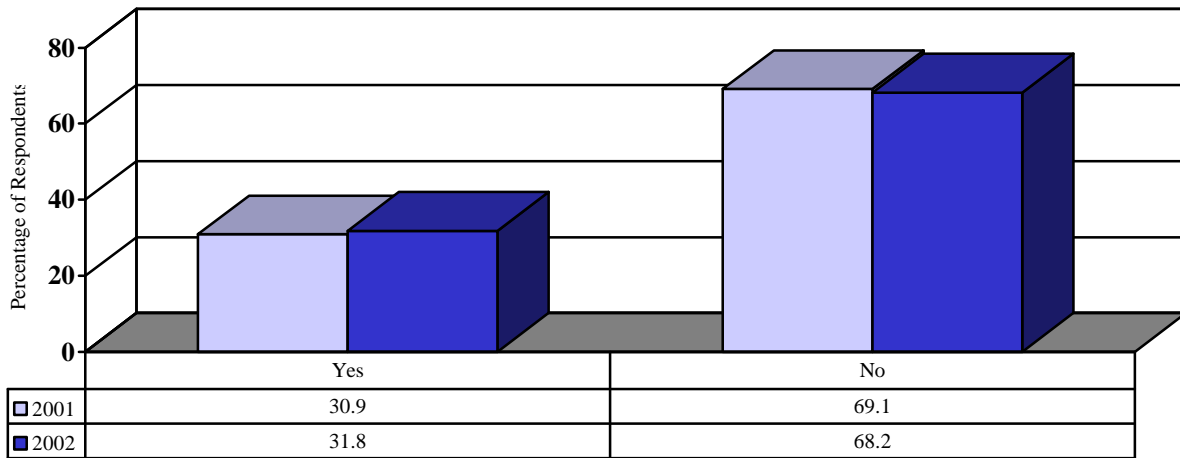
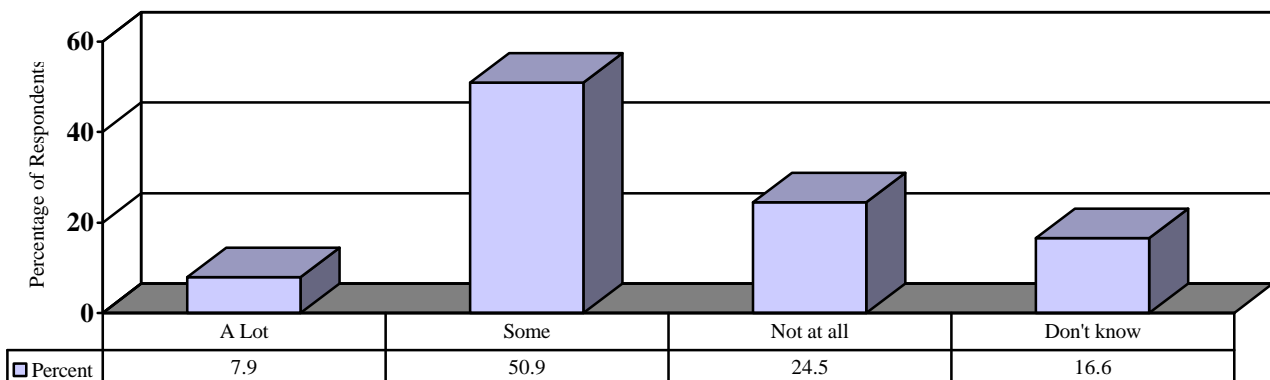


Table 4D: Percent of Households With Asthma, Emphysema, Heart Disease, or Other Respiratory Disease, Comparison: 1994, 1995, 1997, 2001, 2002

| Response | 1994 | 1995 | 1997 | 2001 | 2002 |
|----------|------|------|------|------|------|
| Yes | 20.5 | 23 | 26 | 30.9 | 31.8 |
| No | 79.5 | 77 | 74 | 69.1 | 68.2 |

Figure 36: Percent Answering "Yes" to Asthma, Emphysema, Heart Disease or Other Respiratory Ailments That Believe Outdoor Air Quality Negatively Affects Their Health



How Many Years in Fort Collins?

The 2002 survey showed a decrease in number of respondents living in Fort Collins for less than five years (Figure 37 and Table 21). The percentage of respondents living in Fort Collins more than 20 years increased from 2001, while the percentage living in Fort Collins less than 20 years is decreasing.

Figure 37: Years Lived in Fort Collins

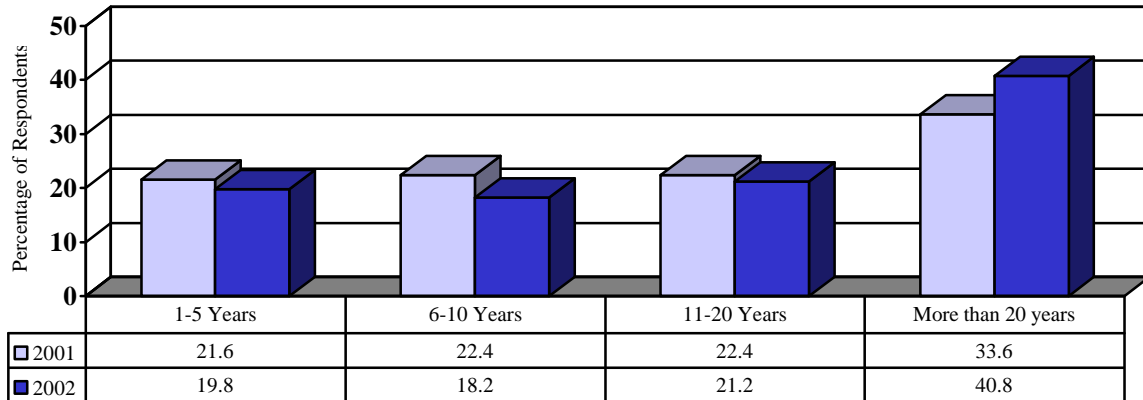


Table 21: Years Lived in Fort Collins, Comparison: 1997, 1999, 2001, 2002

| Years | 1997 (%) | 1999 (%) | 2001 (%) | 2002 (%) |
|--------------|-----------------|-----------------|-----------------|-----------------|
| 0-5 | 17 | 33 | 22 | 19.8 |
| 6-10 | 16 | 17 | 22 | 18.2 |
| 11-20 | 27 | 20 | 22 | 21.2 |
| More Than 20 | 39 | 29 | 34 | 40.8 |

Education Level

Figure 38 shows that most respondents have at least some college education. A large percentage have a graduate degree (27.1%). Table 22 shows very few changes in the education level of the respondents from 1997 to 2002. According to the 1990 *Trends*, a report available for the City of Fort Collins, 43% of the residents have a Bachelor’s degree or higher. This survey found 60% to have a Bachelor’s degree or higher in the sample of respondents. Even though this number is much higher in this survey, the *Trends* data is over 10 years old.

Figure 38: Education Level of Respondent

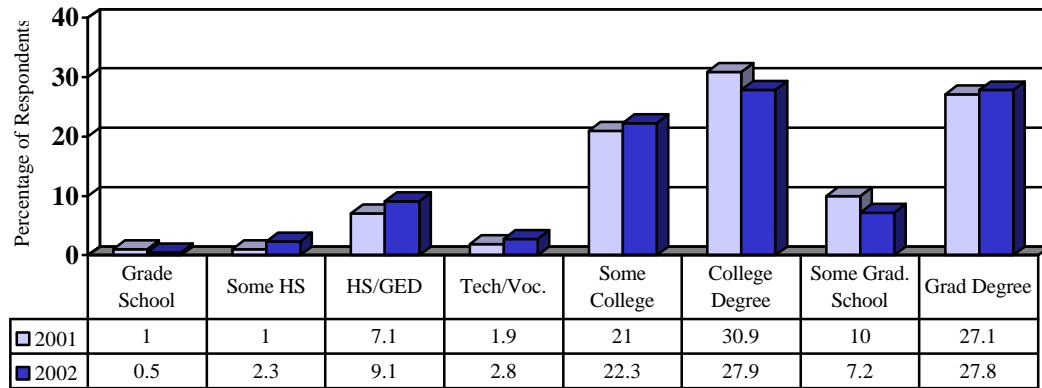


Table 22. Respondent’s Education Level, Comparison: 1994, 1995, 1997, 2001, 2002

| Education Level | 1994 | 1995 | 1997 | 2001 | 2002 |
|-----------------------------|------|------|------|------|------|
| Grade school | | * | 0 | 1 | .5 |
| Some high school | 1.9 | 5 | 1 | 1 | 2.3 |
| High school diploma/GED | 34 | 5 | 10 | 7.1 | 9.1 |
| Technical/vocational school | * | * | 3 | 1.9 | 2.8 |
| Some college | * | 23 | 23 | 21 | 22.3 |
| College degree | 38 | 27 | 30 | 30.9 | 27.9 |
| Some graduate degree | * | * | 9 | 10 | 7.2 |
| Graduate degree | 26 | 32 | 23 | 27.1 | 27.8 |

Yearly Family Income

Figure 39 shows that a very even number of respondents reported earnings at several of the categories: \$25,000-\$39,999 (13.4%), \$40,000-\$59,999 (17.7%), \$60,000-\$74,999 (16.1%), and \$75,000-\$99,999 (15.3%). Comparing to *Trends* data from 1990, whereas the median family income was reported at \$27,000, this survey's median family income was in the \$40,000-\$59,000 range (17.7%). Again, the *Trends* data is over 10 years old and caution must be made in comparing the two.

Figure 39: Yearly Family Income



Employment Situation

As in 1997, 1999, and 2001, most respondents were employed outside the home (47%), with an increasing number of self-employed (12%) and a growing group of retired respondents (28%). See Figure 40 and Table 23.

Figure 40: Employment Status

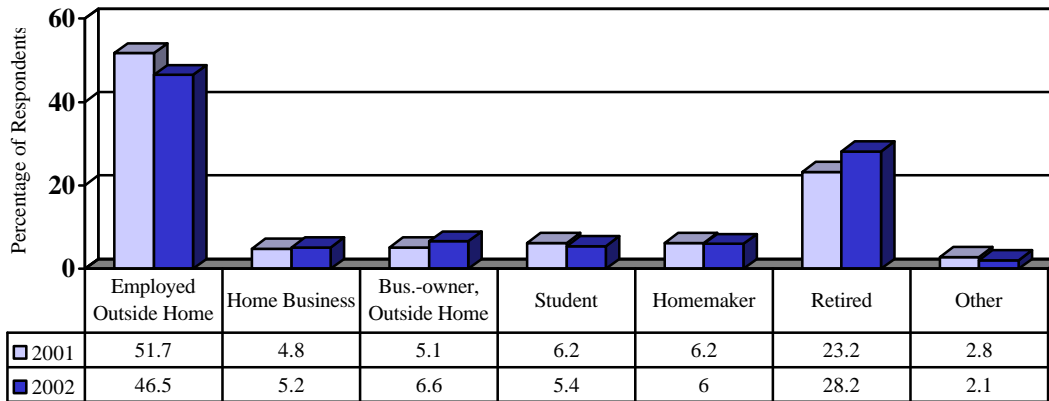


Table 23: Employment Situation Comparison: 1997, 1999, 2001, 2002

| Employment Situation | 1997 (%) | 1999 (%) | 2001 (%) | 2002 (%) |
|-----------------------------|-----------------|-----------------|-----------------|-----------------|
| Employed Outside Home | 57 | 53 | 52 | 47 |
| Home Business | 10 | 10 | 5 | 5 |
| Business Owner-Outside Home | * | * | 5 | 7 |
| Student | 4 | 9 | 6 | 5 |
| Homemaker | 5 | 4 | 6 | 6 |
| Retired | 24 | 21 | 23 | 28 |
| Other | 1 | 3 | 3 | 2 |

Home Ownership

Figure 41 shows that most respondents (81.2%) are home-owners are the majority in the 2002 survey. The percent of renters is considerably lower compared to 2001. The results of increased home ownership, more college graduates, and higher incomes are an indication of the reliability of the measures. If one does increases, the others would be expected to increase. Home ownership appears to be slowly on the rise for respondents from 1994 through 2002.

Figure 41: Home Ownership

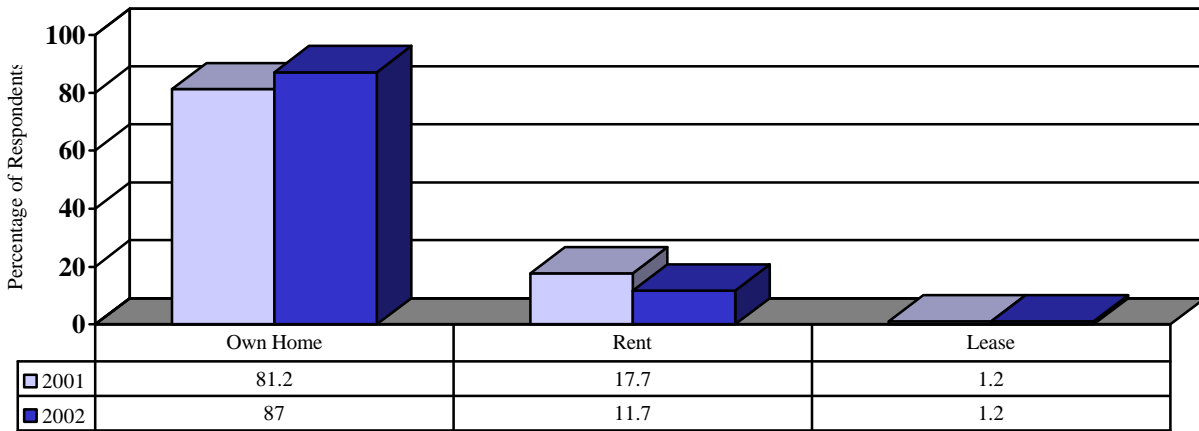


Table 24. Home Ownership Comparison: 1994, 1995, 1997, 2001

| Response | 1994 | 1995 | 1997 | 2001 | 2002 |
|-----------------|-------------|-------------|-------------|-------------|-------------|
| Own | 75.9 | 79 | 80 | 81.2 | 87 |
| Rent | 24.1 | 20 | 19 | 17.7 | 11.7 |
| Lease | 0 | 0 | 1 | 1.2 | 1.2 |

Home Type

Most of the respondents (48.3%) live in a home that is more than one-story, followed closely by single story (44.1%) homes which appears to be on the increase (See Figure 12D). Respondents living in apartments or condominiums is decreasing steadily (See Table 9D).

Figure 42: Home Type

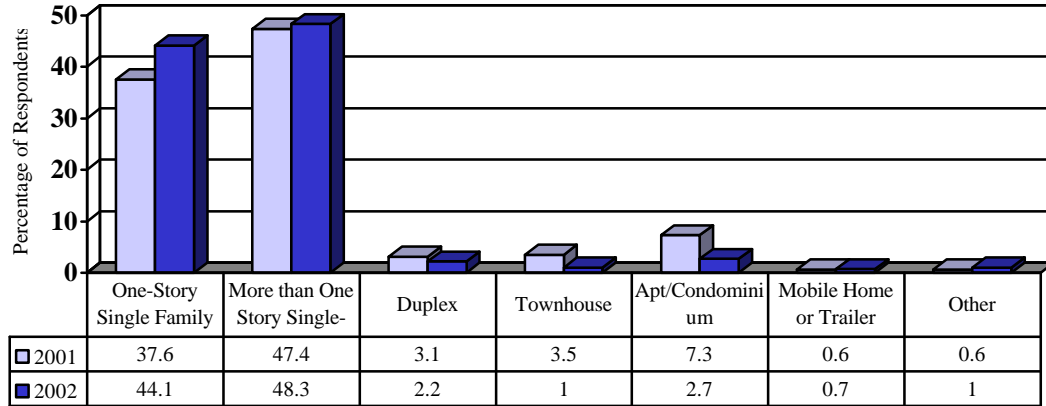


Table 25. Home Type Comparison: 1994, 1995, 1997, 2001, 2002

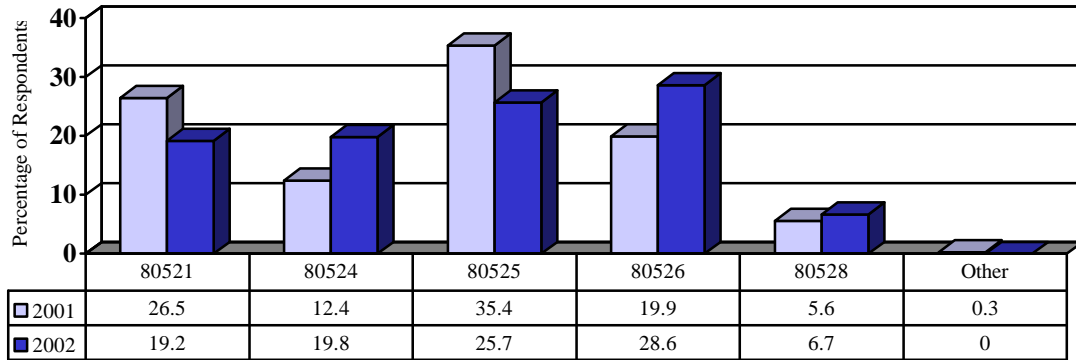
Which of the following best describes your home?

| Home Type | 1994 | 1995 | 1997 | 2001 | 2002 |
|--|------|------|------|------|------|
| One-story single-family | 34 | 34 | 33 | 37.6 | 44.1 |
| More than one story single-family | 36.9 | 39 | 44 | 47.4 | 48.3 |
| Duplex | 3.9 | 4 | 4 | 3.1 | 2.2 |
| Townhouse | 4.0 | 3 | 3 | 3.5 | 1 |
| Apartment or condominium | 16.6 | 12 | 10 | 7.3 | 2.7 |
| Mobile home or trailer | 4.5 | 6 | 4 | 0.6 | 0.7 |

1

Zip Code

Figure 43: Zip Code of Respondents



What is the zip code of your current residence?

| Zip Code | 1994 | 1995 | 1997 | 2001 | 2002 |
|--------------|------|------|------|------|------|
| 80521 | 21 | 25 | 20 | 26.5 | 19.2 |
| 80524 | 13 | 25 | 18 | 12.4 | 19.8 |
| 80525 | 38 | 25 | 31 | 35.4 | 25.7 |
| 80526 | 28 | 25 | 28 | 19.9 | 28.6 |
| 80528 | 0 | 0 | 0 | 5.6 | 6.7 |
| Other | 0 | 0 | 3 | 0.3 | 0 |

Appendices

| | |
|------------|---|
| Appendix A | Introductory letter |
| Appendix B | Survey cover letter |
| Appendix C | Survey |
| Appendix D | Wood smoke management questionnaire |
| Appendix E | Reminder post card |
| Appendix F | Reminder letter for second survey mailing |
| Appendix G | Final reminder letter |
| Appendix H | List of tables and figures |
| Appendix I | Budget and Timeline |
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