



Evaluation of the 2009 Sacramento Region Spare The Air Campaign

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EXECUTIVE HIGHLIGHTS

Evaluation of the 2009 Sacramento Region Spare The Air Campaign

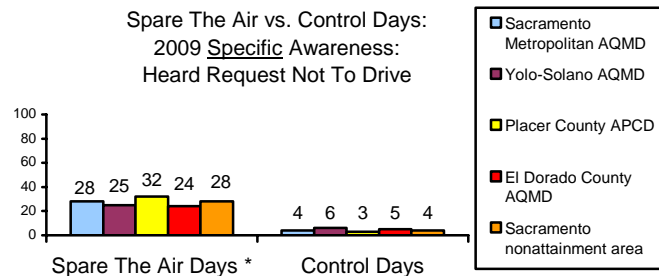
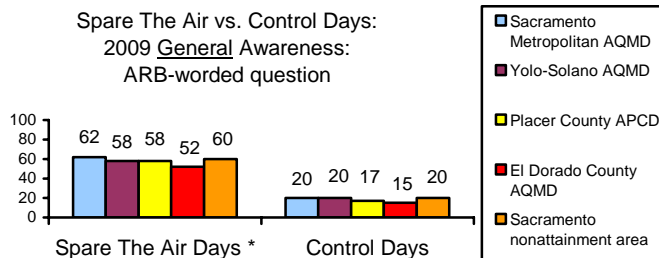
METHODOLOGY:

Spare The Air days are called throughout the entire nonattainment area whenever the Air Quality Index (AQI) is forecasted to reach or exceed 150 anywhere in the Sacramento region. Drivers are asked to voluntarily restrict the amount of driving they do on such days. Residents from four air quality management districts in the Sacramento nonattainment area were interviewed for this annual evaluation. A total of 755 (380 when weighted proportionately) interviews were conducted following the **five** Spare The Air days in 2009. On non-Spare The Air (or Control) days 1,212 (455 weighted) interviews were conducted on matched days of the week.

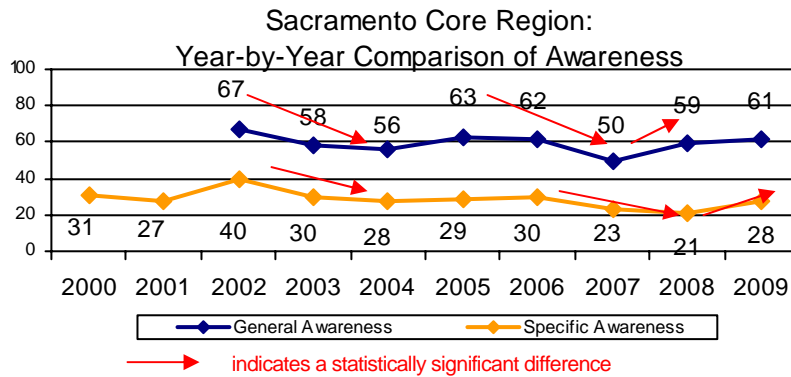
SUMMARY RESULTS:

Awareness:

- ◆ In terms of general awareness, 60% of respondents in the Sacramento region heard Spare The Air announcements in the summer of 2009. Twenty-eight percent (28%) of respondents were aware of the specific request not to drive on Spare The Air days, up significantly from 21% in 2008.
- ◆ In terms of general awareness and adjusting for Control day responses, results indicate that over half a million (578,000) drivers in the nonattainment area were aware of Spare The Air. In terms of specific awareness, and again correcting for Control day responses, nearly 350,000 drivers in the region remembered the request not to drive on Spare The Air days.

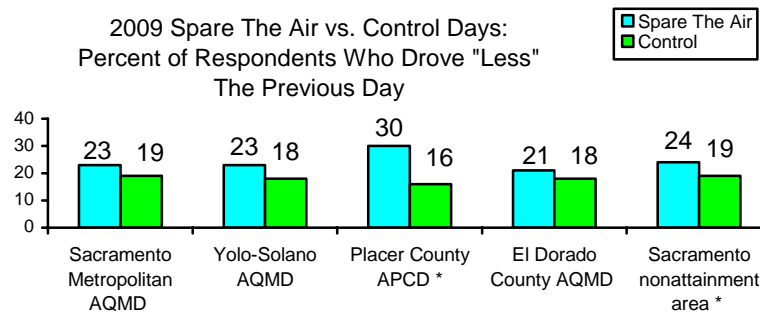


- ◆ The program continues to be effective in reaching residents, as significantly more respondents interviewed following Spare The Air days were aware of the program than their Control day counterparts.
- ◆ Excluding El Dorado County AQMD, levels of awareness in 2009 are similar to multiple-year averages (8-year average of 60% for general and 10-year average of 29% for specific awareness).

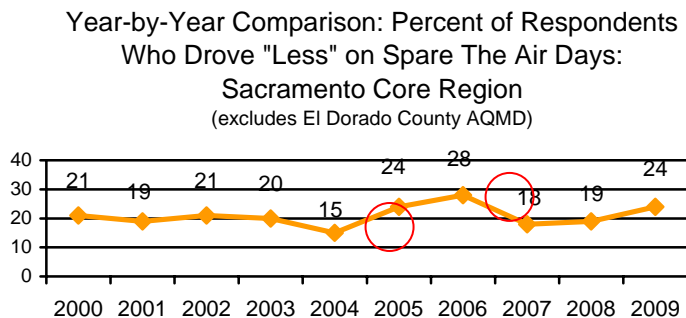


Driving Reduction:

- ◆ A significantly higher percentage of respondents in the nonattainment area as a whole said they drove less on Spare The Air days (24%) than on Control days (19%).



- ◆ The ten-year average percent of respondents who said they drove less on Spare The Air days is 21%. This year's level, although higher at 24%, is not significantly different from the ten-year average.



- ◆ During the summer of 2009, 1.6% of all respondent drivers in the entire Sacramento nonattainment area were classified "purposeful reducers" -- they purposefully drove less on Spare The Air days because they heard the Spare The Air advisories and wanted to improve air quality in the region. This percentage is higher than last year, although the difference is not statistically significant. It is also the same as the ten-year average of 1.6%.
- ◆ When extrapolated to the population, this means that an estimated 23,132 drivers purposefully made fewer trips on Spare The Air days. They avoided an average of 3.2 single trips, translating into a total of 74,022 trips purposefully reduced on Spare The Air days. There were no drivers who specifically avoided making trips for air quality reasons on Control days, indicating that all measured driving reduction for air quality reasons occurred on Spare The Air days in 2009.



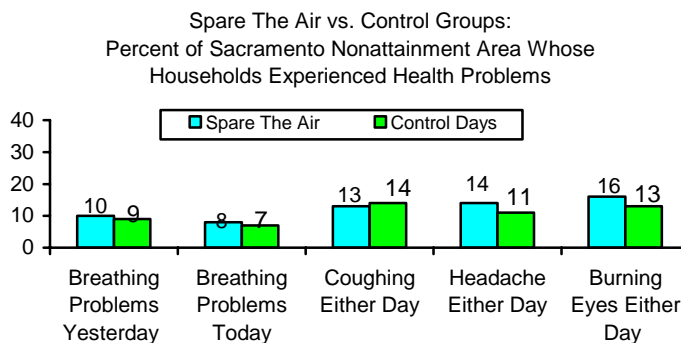
Estimated Emission Reductions:

- The 2009 Spare The Air voluntary driving reduction program was successful in reducing air pollution in the entire Sacramento nonattainment area by an estimated 0.39 tons of ozone precursors per day. This is due specifically to drivers purposefully reducing the number of trips they took on Spare The Air days for air quality reasons.

Sacramento nonattainment Area	Percent of Respondent Drivers who Drove Less for Air Quality Reasons	x Number of Licensed Drivers in SNA (1,445,778 Total)	x Mean Number of Single Trips Reduced Per Day	x 4.82 Grams of Ozone Precursors Per Trip (EMFAC 2007 V2.3) 2009 Estimate	= Estimated Tons Per Day of Ozone Precursors Reduced
Spare The Air Days	1.6% (6 / 380)	23,132	x 3.2 = 74,022	356,786 grams	0.39 tons
Control Days	0.0% (0 / 456)	0	0	0 grams	0 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions – Control Day Reductions)					0.39 tons

Health Effects:

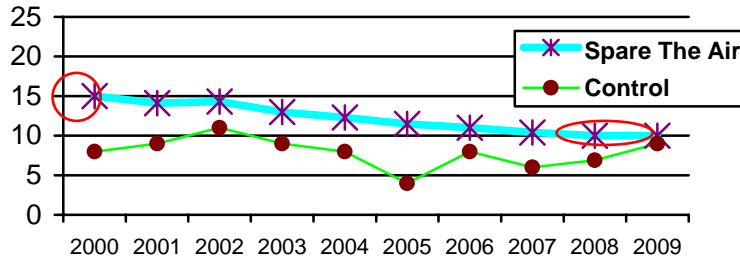
- In the Sacramento nonattainment area as a whole, 10% of households reported breathing difficulties on Spare The Air days in 2009. This was not significantly higher than the 9% of households interviewed on Control days. Nevertheless, correcting for Control day responses, this translates into 8,570 additional households that were affected specifically by ozone pollution on Spare The Air days.



- There are fewer households experiencing breathing problems on Spare The Air days now than ten years ago. This could be a reflection of improved air quality in the region.

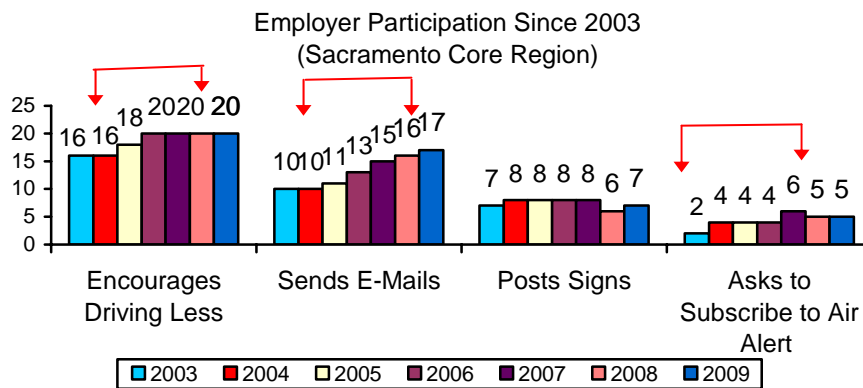


Year-to-Year Comparison of Percent of Respondents Whose Households Experienced Breathing Difficulties on Spare The Air Days: Sacramento Core Region (excludes EI Dorado AQMD)



Employer Participation:

- ◆ Employer participation in Spare The Air has remained stable at 20% for the past four years. More employers are sending e-mails about poor air quality in the last three years than in 2003 and 2004. The percent who post signs has not changed since 2003, and the percent that asks its employees to register to receive Air Alert notifications also remains stable and relatively low at 5%.



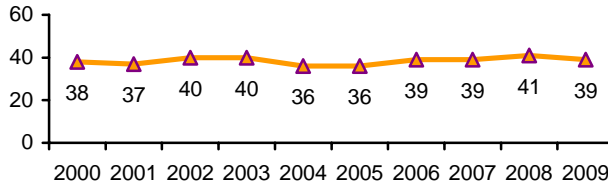
* indicates a statistically significant difference

Summertime Seasonal Trip Reductions:

- ◆ Approximately four-in-ten (39%) of all respondents in the Sacramento nonattainment area are seasonal reducers – that is, they say they usually reduce the amount of driving they do during the summer to avoid adding to air pollution. This proportion has remained stable over the past ten years.



Year-To-Year Comparison of Percent of Respondents Who Seasonally Reduce Driving to Avoid Adding to Air Pollution: Sacramento Core Region



- ◆ Seasonal reducers entered their cars fewer times than those who do not usually reduce driving during the summer. On average, they made .8 fewer trips per day.

Year	Seasonal Driving Reducers: Mean # Times Entered Vehicle	Non-Reducers: Mean # Times Entered Vehicle	Difference (Mean Number of Daily Single Trips Avoided by Seasonal Reducers)	Statistically Significant Difference?
2000	3.6	4.1	0.5	Yes
2001	3.1	4.2	1.1	Yes
2002	3.1	4.1	1.0	Yes
2003	3.1	4.2	1.1	Yes
2004	3.4	3.9	0.5	Yes
2005	3.0	3.5	0.5	Yes
2006	2.9	3.6	0.7	Yes
2007	3.2	3.8	0.6	Yes
2008	2.9	3.3	0.4	Yes
2009	2.6	3.4	0.8	Yes

- ◆ These avoided trips could translate into a reduction of 2.4 tons per day of ozone precursors. Although not considered part of the official measurement, this group nevertheless continues to contribute substantially to voluntary emission reductions during the summer months.



Evaluation of the 2009 Sacramento Region Spare The Air Campaign

BACKGROUND & METHODOLOGY

Background

Air pollution in the Sacramento region during the summer months is a major concern – the area is designated a severe ozone non-attainment area by the U.S. Environmental Protection Agency (US EPA). This means that the region fails to meet the federal health based 8-hour ozone standard¹, thus affecting the quality of life and health of residents. The Sacramento nonattainment area includes Sacramento County, Yolo County, and parts of Placer, Solano, El Dorado and Sutter Counties.

The Sacramento Metropolitan Air Quality Management District (SMAQMD) estimates that about 70% of the Sacramento region's air pollution is caused by emissions from vehicles and other mobile sources. Unhealthy levels of ground-level ozone are created when volatile organic compounds (VOC) and nitrogen oxides (NO_x), primarily from cars, trucks, construction and agricultural equipment, lawn mowers, and other mobile sources, react in the presence of sunlight, and form ozone in hot weather conditions. The residential driving population is therefore a large contributor to the air quality problem in the region.

Spare The Air was created in 1995 as an outreach program to engage the general public in voluntarily helping to solve the problem of ozone air pollution. It provides residents in the Sacramento region with information and resources to protect their health during the summer smog season (May through October) by encouraging them to be aware of ozone levels and by asking motorists to reduce their driving on days when unhealthy air is predicted. The trigger for alerting the population of a Spare The Air day for the next day is based on forecasted estimates of the Air Quality Index (AQI), which are provided by Sonoma Technology Inc. Estimates are derived using mathematical predictive modeling procedures on actual measurements obtained by local air districts and the California Air Resources Board at air quality monitoring sites throughout the region. If it is estimated that the AQI will be 150 or higher the next day, a Spare The Air advisory is issued by the Sacramento Metropolitan AQMD by 12:00 p.m.

The public is notified through a variety of communication channels, including paid radio announcements, e-mail Air Alerts, news broadcasts, the Spare The Air Web site, and the Weather Channel.

Spare The Air 2009 Season

The summer of 2009 was relatively good as far as air quality was concerned – only **five** (5) Spare The Air days were called. Sunday, June 28; Monday, June 29; Tuesday, June 30; Thursday, July 16; and Friday, July 17. Spare The Air days are called for the Sacramento nonattainment area as a whole, but all air quality districts within the area may not have the same conditions. For example, foothill districts (such as Placer and El Dorado) sometimes experience poorer air quality than central plain districts such as Yolo-Solano. To some extent this is due to the fact that ozone created by drivers in Yolo-Solano and Sacramento travels east into the foothills. It is, therefore, important that the Spare The Air message continues to involve everyone in the basin, although the air quality in individual districts on specific days may not be poor.

¹ The latest federal ozone health standard is .075 parts per million averaged over 8 hours.



In fact, when we examined the daily maximum ozone Air Quality Index (AQI), we found that the recorded actual AQI for ozone did not exceed 150 on any of the five Spare The Air days in any of the air quality districts. In other words, Spare The Air alerts were issued for days when the actual air quality turned out not to have been as poor as was expected. As can be seen in the table below², the maximum AQI reached on 2009 Spare The Air days was 122 – recorded in Sacramento on June 28, and in Folsom on July 17. While this level is considered to be “Unhealthy for Sensitive Groups”, it does not reach the 150 threshold for calling a Spare The Air day.³ It can be theorized, however, that the Spare The Air program reduced emissions enough to keep ozone levels from increasing to the threshold level. After all, the goal of the program is to reduce ozone pollution.

<i>Spare The Air date</i>	<i>Maximum AQI</i>	<i>Health Level</i>	<i>Reporting Station</i>
June 28	122	Unhealthy for Sensitive Groups	Sacramento-Del Paso Manor
June 29	97	Moderate	Roseville – N. Sunrise/Douglas
June 30	111	Unhealthy for Sensitive Groups	Roseville – N. Sunrise/Douglas
July 16	116	Unhealthy for Sensitive Groups	Folsom
July 17	122	Unhealthy for Sensitive Groups	Folsom

Media Buy

The media buy involved **radio and television commercials**, which were aired the day before and during each Spare The Air day. A total of \$36,344 was spent on these advisories: \$25,334 for radio and \$11,010 for television.⁴

Research Objectives

Annual evaluations (with the exception of 1997) have been conducted since 1995 to assess the effectiveness of the Spare The Air program. Levels of awareness, driving behaviors, health issues, employer involvement, and estimated emission reductions have been measured and tracked. In the early 2000s, numerous discussions took place between the Cleaner Air Partnership and staff of the California Air Resources Board (ARB) to arrive at an evaluation procedure acceptable to both. In 2002 an ARB-suggested question about general awareness was incorporated into the questionnaire in order to be able to calculate their definition of what qualifies as a “reduced” trip.⁵

² AQI figures obtained from the Historical Data section at www.sparetheair.com.

³ The maximum AQI recorded in the region for the entire summer season of May to October occurred, unusually, on September 27, with a measuring station in Sacramento County recording the AQI equivalent of 166. However, it was not predicted to be a Spare The Air day and so no notification was done.

⁴ Radio media spending figures were provided by Lori Kobza, SMAQMD in an e-mail, dated November 30, 2009.

⁵ The ARB recommended that only trip reductions from drivers who were aware of the Spare The Air program and purposefully reduced the number of trips they made on Spare The Air days specifically for air quality reasons should be counted in the measurement of the emissions reductions attributable to the program. This is the definition of a purposeful reducer.



Here are the specific research objectives:

1. Measure general awareness and specific understanding of the Spare The Air program among drivers in the Sacramento nonattainment area.
2. Measure the effectiveness of the Spare The Air program in terms of reduced driving among drivers who were aware of the program and purposefully reduced the number of trips they made due to air quality reasons.
3. Estimate emission reductions from the trips reduced during Spare The Air episodes.⁶
4. Compare awareness of the Spare The Air campaign and driving reduction among the individual air quality management districts.
5. Track the health effects of poor air quality.
6. Measure the percentage of drivers who habitually drive less during the summer season in order to improve air quality, and estimate the emission reductions from this group of seasonal reducers.
7. Track awareness and behavioral changes over time.

Research Methodology

As has been done since the first evaluation in 1995, two groups of respondents were interviewed, one following Spare The Air days, and the other following non-Spare The Air (or Control) days, matched for the same day of the week as the Spare The Air days. This type of experimental design adjusts for any overstatements individuals might make about their reported driving reduction on Spare The Air days, by providing a means of calculating a correction or adjustment factor. More accurate estimates about the number of drivers and households impacted by the Spare The Air program and the amount of emissions reduced are therefore obtained by subtracting this correction factor from the results. Including Control day data provides the most conservative estimates of program effectiveness. Control day data also have provided other insights into driving behavior.

Interviewing Strategy

This year, as in 2008, a slightly different sampling strategy from previous years was applied to keep survey costs down. The targeted number of completed interviews per air district was reduced. Using RDD (random-digit-dialed) procedures, telephone interviews were to be conducted with a maximum of 1,200 residents following Spare The Air days. The goal was to interview up to 400 drivers in Sacramento County (rather than 600 in years prior to 2008), 300 drivers in Yolo-Solano AQMD (instead of 500), 300 drivers in Placer County APCD (instead of 500), and 200 drivers in El Dorado County AQMD (instead of 400). Another group of 1,200 interviews (300 in each of the four air quality districts) were to be conducted on "matching" (same day of the week as the STA interviews) non-Spare The Air Control days. The margin of error associated with a sample of

⁶ Methods for estimating ozone precursor reductions based on the survey data have been used in all evaluations conducted since 1999 but were based on different Emission Factor models over the years. Estimates for the summer of 2009 were based on EMFAC2007 V2.3 figures provided and confirmed by Bruce Katayama, SMAQMD, November 17, 2009. The total ROG tons for a combined total of light duty passenger cars and two categories of light duty trucks (8.8 + 2.18 + 4.44) were converted to pounds (multiplied by 2,000) and then to grams (multiplied by 454) before dividing by the combined total number of trips (i.e. 3,081,700 for light duty passenger cars + 639,881 for light duty trucks¹ + 1,377,730 for light duty trucks²) in order to obtain the average grams per trip. The same process was used to calculate NOx grams per trip (5.48 + 1.62 + 4.54) x 2000 x 454 / (3,081,700 + 639,881 + 1,377,730). ROG grams and NOx grams were then combined (2.75 + 2.07) to obtain 4.82 grams per trip of emission precursors in the region as a whole. These are the figures considered most accurate at the time this report was written.



1,200 is +/- 2.5%, at a 95% confidence level. Quotas were set to respect geographic area,⁷ age, and gender. Additionally, respondents were screened so that only those who had driven within the last week were interviewed.

A continuing challenge in terms of methodology is trying to estimate the number of Spare The Air days each season so that interviewing days and the number of completed interviews can be representative of the season and still provide adequate statistical precision. A field house needs advance notification and a target of a certain minimum number of interviews on a given day in order to maximize efficiency and contain costs. The strategy adopted was to conduct approximately 150 interviews throughout the region (proportionally representative of the population in general by county), starting with every occurrence of a Spare The Air advisory, and then deciding on an episode-by-episode basis whether to conduct interviews, taking into consideration the month within the season, the day of the week, and whether the event was single or multi-day, until the maximum number of budgeted interviews and the best coverage was obtained. However, as there were only **five** Spare The Air days called during the 2009 summer season, we were not able to complete the targeted total of interviews following Spare The Air days.

Respondents

Spare The Air interviewing took place the day following the five Spare The Air days in June and July: i.e. interviewing took place on June 29, June 30 and July 1, about the Spare The Air days of June 28, 29, and 30; similarly, interviewing took place on July 17 and July 18 about the Spare The Air days of July 16 and 17. Control day interviewing took place on non-Spare The Air days that were matched in terms of the day of the week of the actual Spare The Air days: August 31, Sept 1, 2, 4, 5, 9, 11, and 12.

Interviews were conducted with a representative sample of residents of four of the five air quality management districts⁸ within the Sacramento nonattainment area – Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD. [In the past, interviews with residents in El Dorado County AQMD were only conducted in 2004, 2006, and 2007; and were only conducted in 2006 in the Feather River AQMD.] Respondents included a total of 1,967 drivers. (Only respondents who had driven a car, truck or van within the last week were interviewed.) Results for the Sacramento nonattainment area as a whole were weighted proportionally.⁹ The next table lists the number of completed interviews for each group along with their affiliated margins of error (at the most conservative level).

⁷ In addition to interviewing only in the relevant zip codes within certain counties (i.e. in Placer County, zip codes north or east of Auburn were excluded as well as those west of Vacaville in Solano County and those east of Placerville in El Dorado County), quotas were set (based proportionally on current Census estimates) specifically in the Davis area so as to insure that Davis was not over-represented (previous research indicates that residents of Davis are more likely than those in other areas to participate in telephone surveys).

⁸ Quotas were established (using the latest 2009 estimates of population size from the 2000 Census) for the four air districts (Sacramento, Yolo-Solano, Placer and El Dorado) as well as for gender and age in order to ensure that respondents were representative of the population as a whole. It is well-known in survey research that certain groups (such as elderly females) are more likely to respond to telephone interviews than others (such as young males). In order to avoid potential unbalanced and biased samples and to better ensure generalizability, quotas were set. There are too few residents in the nonattainment portion of the Feather River AQMD to interview.

⁹ Based on 2009 estimates from the 2000 US Census: State of California, Department of Finance, *E-1: State/County Population Estimates with Annual Percent Change-January 1, 2008 and 2009*. Sacramento, California, May 2009. Available online at: <http://www.dof.ca.gov/research/demographic/reports/estimates/e-1/2008-09/documents/E-1%202009%20Internet%20Version.xls> the total population in the entire Sacramento nonattainment area [including El Dorado AQMD] is 2,174,099: [Sacramento Metropolitan AQMD (66%) - 1,433,187; Yolo-Solano AQMD (15%) - 322,954 (this includes the total 200,709 from Yolo County and 122,245 from the Dixon, Rio Vista and Vacaville areas of Solano County); Placer County APCD (13%) - 295,432 (this figure represents the 87% of Placer County's 339,577 residents who do not live in zip codes north or east of Auburn), El Dorado AQMD (6%) - 122,526 (this figure represents 68% of El Dorado County's 180,185 residents, and includes residents from El Dorado Hills, Placerville, Shingle Springs, Georgetown, Cool, and the following unincorporated ZIP codes: 95613, 95619, 95623, 95633, 95635, 95651, 95664, and 95672).



<i>Number of Completed Interviews (unweighted)</i>	<i>Spare The Air Days</i>	<i>Margin of Error</i>	<i>Control Days</i>	<i>Margin of Error</i>	<i>Total</i>	<i>Margin of Error</i>
Sacramento Metropolitan AQMD	251	+/- 6.2%	301	+/- 5.7%	552	+/- 4.2%
Yolo-Solano AQMD	187	+/- 7.2%	300	+/- 5.7%	487	+/- 4.4%
Placer County APCD	190	+/- 7.1%	302	+/- 5.6%	492	+/- 4.4%
El Dorado County AQMD	127	+/- 8.7%	309	+/- 5.6%	436	+/- 4.7%
Total Regional (Unweighted)	755	+/- 3.6%	1,212	+/- 2.8%	1,967	+/- 2.2%
Total Regional (Weighted)	380	+/- 5.0%	455	+/- 4.6%	835	+/- 3.4%

It can be seen in the previous table that a total of **755** interviews were conducted on days following Spare The Air episodes, which was 445 fewer than the budgeted target of 1,200. Control day interviewing completed the targeted number of **1,212** interviews. When weighted, the total number of completed interviews was 380 following Spare The Air days, and 455 on Control days in the Sacramento nonattainment area as a whole. In order to be able to compare current results with those from previous years' evaluations, El Dorado County results have been excluded from some of the year-to-year analyses, and the "**Sacramento Core Region**" is the term used for the combined air districts of Sacramento Metropolitan AQMD, Yolo-Solano AQMD, and Placer County APCD. Proportions and weights were appropriately re-calculated for these analyses.¹⁰

The Questionnaire

The main body of the questionnaire has remained the same for the past nine years in order to maintain consistency, although slight modifications have sometimes occurred, due to information needs. In 2002 a question about Spare The Air awareness that was worded by the Air Resources Board (ARB)¹¹ was added and has been used every year since. All surveys were conducted using a Computer Assisted Telephone Interviewing (CATI) system. The average interview lasted approximately 4 minutes.

Questions about Driving Behavior on the Previous Day

The questionnaire begins by asking respondent drivers how many times they entered a vehicle to drive the preceding day, and then whether they had driven the "same", "more" or "less" than usual. Respondents who reported driving less were then asked what they did instead of driving and why they reduced driving. Those who drove less for air quality reasons were then asked to describe how many single trips they avoided.

¹⁰ Excluding El Dorado AQMD, the new proportions for the smaller Sacramento Core Region for 2009 are: 70% in Sacramento Metropolitan AQMD, 16% in Yolo-Solano AQMD, and 14% in Placer County APCD.

¹¹ ARB memo dated April 26, 2002 by J. Weir, J. Lu, & E. Schreffler sent to J. Lamare, Cleaner Air Partnership.



Questions about Air Quality

After the portion of the interview about driving, respondents were asked questions about air quality. Awareness of the Spare The Air program was asked in two questions, and the order of these two was randomized so as to eliminate any possible order-response bias. The two questions are:

- 1) General awareness: “In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?” (the ARB-worded question)
- 2) Specific awareness of the request not to drive: “Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?” (original question)

Respondents were also asked whether they typically tried to reduce driving for air quality reasons in the summer. In addition, they were asked whether anyone in the household had had trouble breathing, or experienced headaches, coughing, or burning eyes because of poor air quality.

Questions about Employment

Respondents who were employed were asked how they usually commute to work (by driving alone; carpooling, transit, biking, or walking; work out of the home; work out of vehicle (delivery, service or sales); or a combination of commuting with working out of vehicle.) Employed respondents were also asked if their employer encouraged them to drive less on poor air quality days, if their employer notified them of poor air quality days, and how that notification occurred (e-mail, signs, asking employees to sign up for Air Alert).

Caveat

The sole purpose of this report is to provide a collection, categorization and summary of public opinion data. Aurora Research Group intends to neither endorse nor criticize the Spare The Air program, the Sacramento Metropolitan Air Quality Management District (SMAQMD), Yolo-Solano AQMD, Placer County APCD or El Dorado County AQMD; Katz and Associates or their policies, products, or staff. The Client (SMAQMD) shall be solely responsible for any modifications, revisions, or further disclosure/distribution of this report.

RESULTS & CONCLUSIONS

AWARENESS OF THE 2009 SPARE THE AIR CAMPAIGN

Objectives

The specific objectives of the current section are to:

- a. measure awareness of the 2009 Spare The Air campaign using two questions and determine if awareness was similar or different among drivers in four air quality districts in the Sacramento nonattainment area (Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD),
- b. determine if awareness during annual summer Spare The Air seasons has increased, decreased, or stayed the same from 2000 to the present,
- c. compare levels of awareness between respondents interviewed following Spare The Air days and those interviewed on Control (non-Spare The Air) days, and
- d. extrapolate the results to the population by estimating the number of **drivers** who were aware of the 2009 Spare The Air campaign (correcting for Control days).

Results

General Awareness

- 1 ➤ ***Sixty percent (60%) of respondents in the Sacramento region were aware of Spare The Air in general – they had either heard, read, or seen the Spare The Air announcements. This translates into over 1,300,000 residents who were aware of the 2009 Spare The Air campaign.***

General awareness was measured by a question suggested by the Air Resources Board (ARB), and introduced into the survey in 2002. Respondents interviewed following Spare The Air days were asked: “in the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?” In the 2009 campaign, the radio commercials were designed to create awareness of air quality issues and Air Alert e-mails by using humorous pets to deliver the message: “Spare The Air. If not for yourself, do it for the dog.”

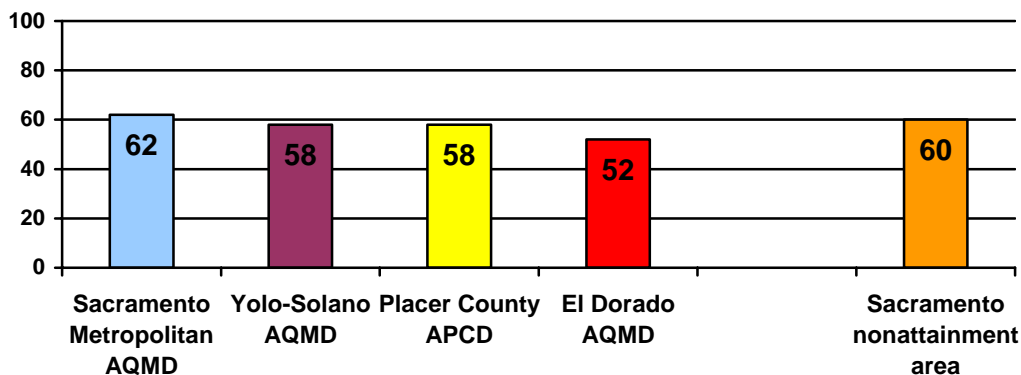
This year, in the Sacramento nonattainment area as a whole, 60% of respondents were aware of Spare The Air in general (weighted results). This means that over a million (1,304,459) residents in the region¹² were aware of Spare The Air during the five days of the 2009 season (June 28, 29, and 30; and July 16 and 17).

In the individual air district areas, general awareness ranged from 52% in the El Dorado to 58% in both Yolo-Solano and Placer, to 62% in the Sacramento Metropolitan Air Quality Management District; as seen in the next chart. None of the differences were statistically significant.

¹² Based on 2009 estimates from the 2000 US Census: State of California, Department of Finance, *E-1: State/County Population Estimates with Annual Percent Change-January 1, 2008 and 2009*. Sacramento, California, May 2009. Available online at: <http://www.dof.ca.gov/research/demographic/reports/estimates/e-1/2008-09/documents/E-1%202009%20Internet%20Version.xls> the total population in the entire Sacramento nonattainment area [including El Dorado AQMD] is 2,174,099: [Sacramento Metropolitan AQMD (66%) - 1,433,187; Yolo-Solano AQMD (15%) - 322,954 (this includes the total 200,709 from Yolo County and 122,245 from the Dixon, Rio Vista and Vacaville areas of Solano County); Placer County APCD (13%) - 295,432 (this figure represents the 87% of Placer County's 339,577 residents who do not live in zip codes north or east of Auburn), El Dorado AQMD (6%) - 122,526 (this figure represents 68% of El Dorado County's 180,185 residents, and includes residents from El Dorado Hills, Placerville, Shingle Springs, Georgetown, Cool, and the following unincorporated ZIP codes: 95613, 95619, 95623, 95633, 95635, 95651, 95664, and 95672).



2009 General Awareness of Spare The Air (ARB wording)

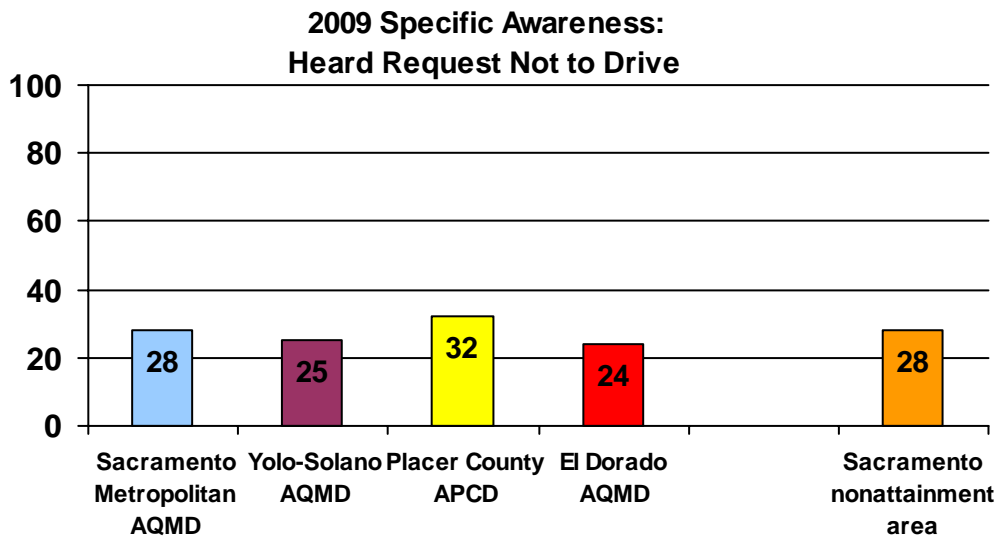


Specific Awareness: Request not to drive

- 2 ➤ *Over a quarter (28%) of respondents in the Sacramento region were aware of the specific request not to drive on Spare The Air days.*

Specific awareness of the request not to drive has been measured every survey year since 1995 with the following question: “Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?” The Spare The Air specific advisory is: “Drivers in the Sacramento region are asked to reduce driving or not drive at all during this period of unhealthy air quality. Carpool to sports and recreation activities, bike or walk in the morning hours when pollution levels are low, postpone errands or take the bus and light rail.”

The next chart indicates that 28% of respondents in the region as a whole (weighted results) were aware of this specific request. Although this is significantly fewer than the 60% who said they heard Spare The Air announcements (general awareness), it is consistent with all previous years’ results – specific awareness has always been found to be lower than general awareness. The individual air district results are not significantly different from one other.



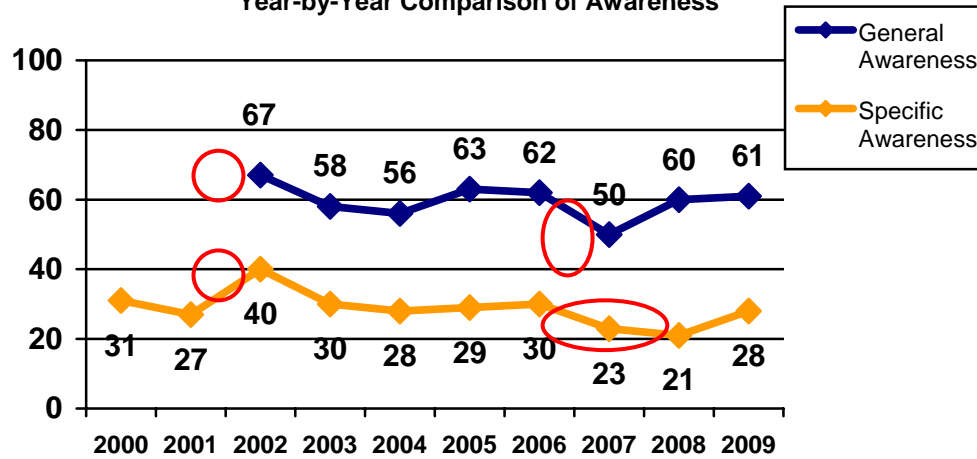
Year-To-Year Comparisons of Awareness: Sacramento Core Region

- 3 ➤ *General awareness at 61% in the Sacramento Core Region (excluding El Dorado AQMD) is similar to last year, and consistent with many years prior to 2007. The average over time is 60%. Specific awareness is up significantly at 28% from both 2007 and 2008, but similar to many years prior to 2007. Overall the average for specific awareness since 2000 is 29%.*

The next graph plots annual levels of general (since 2002) and specific awareness (since 2000) of Spare The Air for the Sacramento Core Region, excluding El Dorado County AQMD in order to allow direct comparisons. It can be seen, first of all, that 2002 was an exceptional year – both types of Spare The Air awareness were at their highest levels, and the season was one of the poorest in terms of air quality. At the other end, 2007 recorded the lowest level of general awareness at 50% and nearly the lowest level of specific awareness (23%). This year both types of awareness were significantly higher than 2007 results, and in addition, this year’s level of specific awareness (28%) was higher than last year’s level (21%). In other words, current results are more similar to those obtained in the years prior to 2007 that they are to the previous two years. Over time, the average level of general awareness is 60% and that of specific awareness is 29%.



Sacramento Core Region (excludes El Dorado AQMD):
 Year-by-Year Comparison of Awareness



Circled percentages represent significant highs and lows.

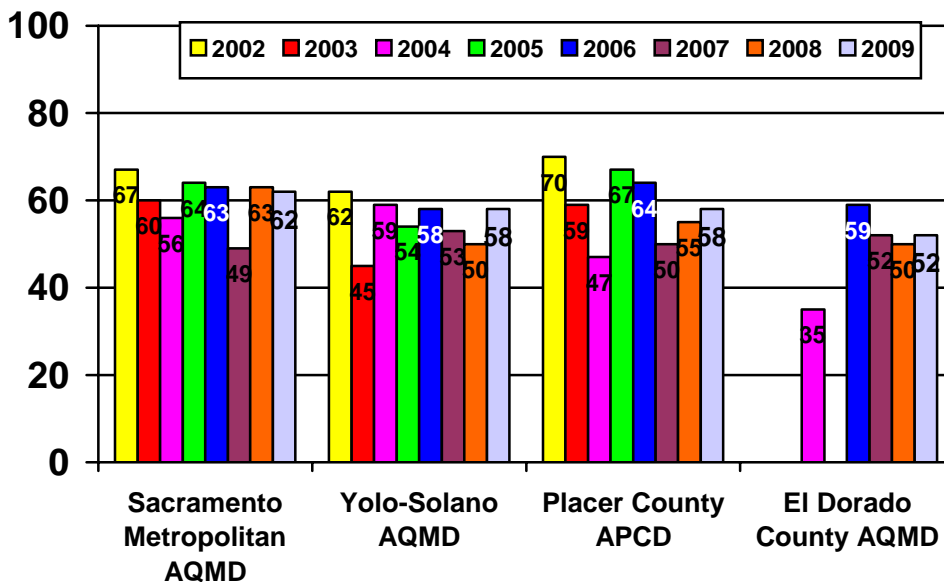
Year-To-Year Comparisons by Air District: General Awareness

- 4 ➤ *Levels of general awareness in Sacramento Metropolitan AQMD (average of 61%) and Yolo-Solano AQMD (average of 55%) have been relatively stable since 2002, with two exceptions. Year-to-year results in Placer County APCD have been the most variable.*

The individual air district annual levels of general awareness since 2002 are presented in the next chart. (El Dorado County AQMD residents were not interviewed in 2002, 2003, or 2005). It can be seen that general awareness in all air districts was the highest in 2002 (yellow bars), a particularly poor year for air quality. Results in Sacramento Metropolitan AQMD were the lowest in 2007 (at 49%) than in any previous year. The average over time is 61%. In Yolo-Solano AQMD, the lowest level of general awareness occurred in 2003, and the average is 55%. Results have been the most variable in Placer County APCD from one year to the next. The average level of general awareness in Placer County APCD is 59%. The average over time in El Dorado County AQMD is 50%.



**General Awareness: Individual Air Districts
 Year-by-Year Comparisons (Since 2002)**



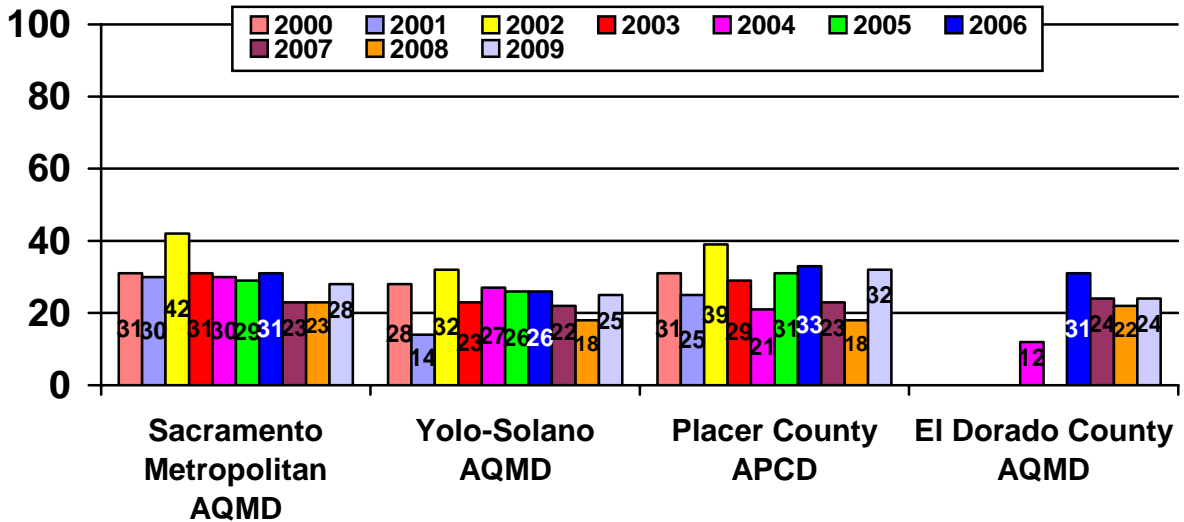
Year-To-Year Comparisons by Air District: Specific Awareness

- 5 ➤ *Levels of specific awareness have remained the most stable over time in SMAQMD (a ten-year average of 30%).*

Levels of specific awareness of Spare The Air since 2000 are presented in the next chart. Once again, it can be seen that results were significantly higher in 2002 (yellow bars), a very poor air quality season in all air districts. The ten-year average for specific awareness is 30% in Sacramento Metropolitan AQMD, 24% in Yolo-Solano AQMD, and 28% in Placer County APCD. The average level of specific awareness for all five years that El Dorado County AQMD residents have been surveyed is 23%. This year's results in Placer County APCD are significantly higher at 32% than last year's level of 18%.



**Specific Awareness: Individual Air Districts
 Year-by-Year Comparisons (Since 2000)**



Spare The Air Versus Control Days

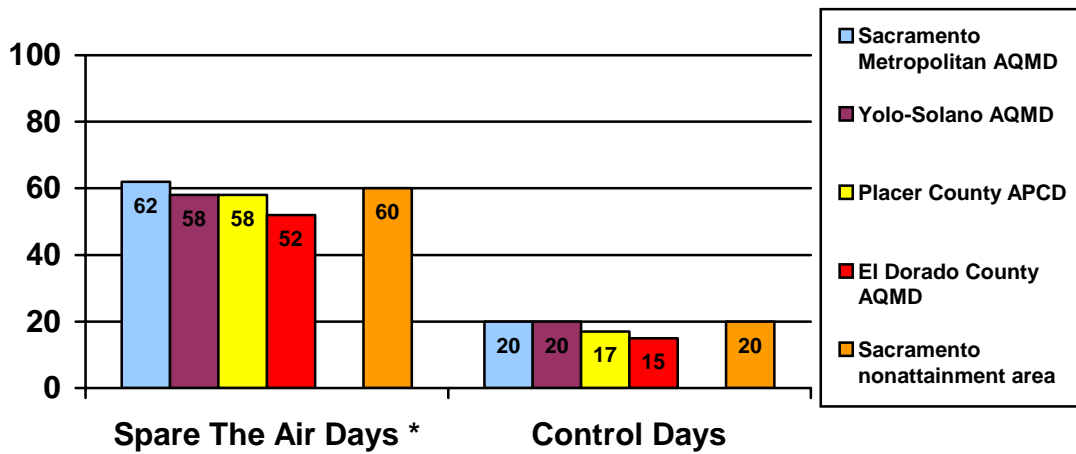
- 6 ➤ *The Spare The Air program continues to be effective in reaching residents: significantly more respondents interviewed following Spare The Air days were aware of the Spare The Air advisories than were respondents interviewed on Control days.*

Control day interviewing is a study design element whereby random samples of respondents in all air districts in the nonattainment area are given the same questionnaire as those interviewed following Spare The Air days. It insures that any positive results attributed to the Spare The Air program are indeed due to the program itself and not to a possible “socially acceptable” response bias. Control day interviews took place on the same days of the week as the Spare The Air interviews, but on days when the Air Quality Index (AQI) was estimated to be good (0 - 50).

Results for general awareness are presented in the next chart and indicate, that although 20% of area respondents interviewed on Control days incorrectly said they had seen or heard Spare The Air announcements, significantly more (60%) of those interviewed after Spare The Air days correctly remembered seeing or hearing the general advisories. Results in each of the individual air districts were similar.



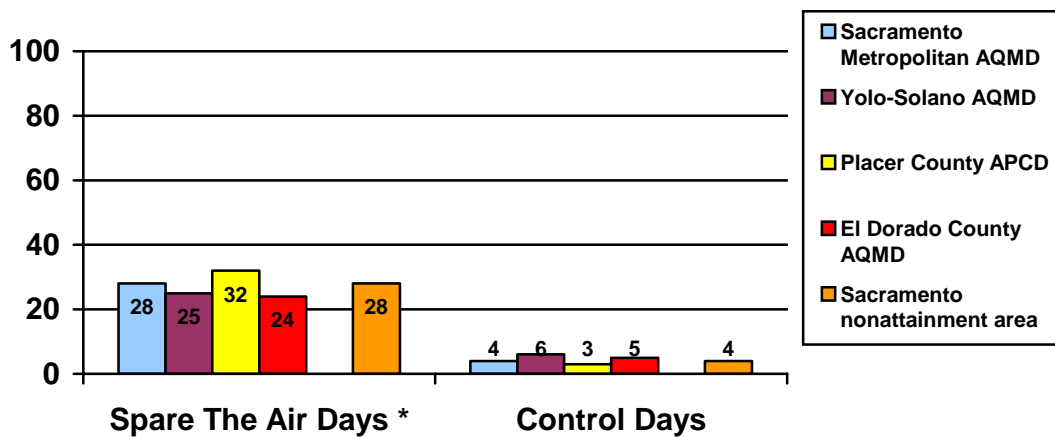
Spare The Air vs. Control Days: 2009 General Awareness



* indicates statistically significant differences between Spare The Air and Control percentages in all districts.

In terms of specific awareness, 4% of Control day respondents in the area as a whole (weighted results) incorrectly heard a request not to drive versus the 28% of respondents who correctly remembered the request following Spare The Air days. As can be seen in the following chart, the difference between Spare The Air and Control day interviewing in each individual air district was likewise significant. These results indicate that, as in past years, the **Spare The Air program is still effective in reaching area residents.**

Spare The Air vs. Control Days: 2009 Specific Awareness



* indicates statistically significant differences between Spare The Air and Control percentages in all districts.



Estimating the Number of STA-Aware Drivers

- 7 ➤ *In terms of general awareness, and adjusting for Control day responses, results indicate that over half a million (578,311) drivers in the nonattainment area were aware of Spare The Air day during the 2009 season.*

In the summer of 2009 there were an estimated 1,445,778 drivers in the Sacramento nonattainment area.¹³ As the level of general awareness of Spare The Air was 60%, this means that an estimated 867,467 **drivers** in the region were aware of Spare The Air in the summer of 2009. However, we also know that 20% of respondents (or 289,156 drivers) interviewed on non-Spare The Air (Control days) said they heard a Spare The Air advisory when in fact none had been issued. Correcting then for Control day responses through subtraction means that **578,311 drivers in the Sacramento nonattainment area as a whole were aware of the 2009 Spare The Air campaign in general.** The table below indicates the calculations and the estimated number of drivers who heard the advisories by air district.

Air District	Total Estimated Number of Drivers	Percent Aware of STA (General Awareness) STA / Control	Estimated Number of Drivers Aware of STA in General (STA - Control)
Sacramento Metropolitan AQMD	922,117	62% / 20%	571,712 – 184,423 = 387,289
Yolo-Solano AQMD	203,604	58% / 20%	118,090 – 40,721 = 77,369
Placer County APCD	223,380	58% / 17%	129,561 – 37,975 = 91,586
El Dorado County AQMD	96,678	52% / 15%	50,272 – 14,502 = 35,771
Sacramento Nonattainment Area¹⁴	1,445,778	60% / 20%	867,467 – 289,156 = 578,311

¹³ The number of drivers in the Sacramento nonattainment area for 2009 was estimated, using the number of driver licenses by county for 2008, obtained from the California Department of Motor Vehicles database at http://www.dmv.ca.gov/about/profile/dl_outs_by_county.pdf, and calculating the percentage increase, based on county population figure increases from 2008 to 2009 listed at: (<http://www.dof.ca.gov/research/demographic/reports/estimates/e-1/2008-09/documents/E-1%202009%20Internet%20Version.xls>). The estimated number of licensed drivers for the total Sacramento nonattainment area in 2009, therefore, was 1,445,778: Sacramento Metropolitan AQMD: total 922,117 + Yolo-Solano: total of 203,604 (124,281 in Yolo County + Solano County: 273,524 * 29% for the proportion located within the Air Quality district = 79,322) + Placer County: total of 223,380 (256,759 * 87% for Air Quality district) + El Dorado County: total of 96,678 (142,173 * 68% for Air Quality district).

¹⁴ The results for the Sacramento nonattainment area as a whole are not the simple sum of the individual air districts, but rather, are weighted results which reflect the relative proportional distribution of residents in the area.



- 8 ➤ In terms of specific awareness, and again correcting for Control day responses, this represents nearly 350,000 drivers in the region who heard the specific request not to drive on Spare The Air days.

The estimated numbers of drivers who were aware of the specific request not to drive are presented in the next table. For the entire Sacramento nonattainment area, and correcting for Control day responses, this translates into an estimated 346,987 drivers who were specifically aware of the requests not to drive on Spare The Air days.

Air District	Total Estimated Number of Drivers	Percent Aware of STA (Specific Awareness) STA / Control	Estimated Number of Drivers Aware of STA Specific Request Not to Drive (STA - Control)
Sacramento Metropolitan AQMD	922,117	28% / 4%	258,193 – 72,294 = 185,899
Yolo-Solano AQMD	203,604	25% / 6%	50,901 – 12,216 = 38,685
Placer County APCD	223,380	32% / 3%	71,482 – 6,701 = 64,780
El Dorado County AQMD	96,678	24% / 5%	23,203 – 4,834 = 18,369
Sacramento Nonattainment Area ¹⁵	1,445,778	28% / 4%	404,818 – 57,831 = 346,987

PURPOSEFUL DRIVING REDUCTION

Objectives

One measure of the effectiveness of the Spare The Air public education program in the Sacramento nonattainment area is to examine actual **changes in driving behavior**. Since 2002, following discussions with the Air Resources Board (ARB), the following standard for measuring behavioral driving reductions was implemented – it requires that drivers be aware of Spare The Air, make fewer vehicle trips on Spare The Air days, and further, that they do so purposefully to help reduce air pollution on Spare The Air days. These drivers are called “purposeful reducers.”

The broad objectives of the current section are to calculate purposeful driving reduction within the Sacramento nonattainment area using the strict ARB standard, and to see whether driving reduction will be lower this year compared with previous years. Specifically, the objectives are to:

¹⁵ The results for the Sacramento nonattainment area as a whole are not the simple sum of the individual air districts, but rather, are weighted results which reflect the relative proportional distribution of residents in the area.



- e. report the percentage of respondents who reported driving “less” the previous day and statistically compare with annual results from 2000 to the present
- f. calculate the percentage of purposeful “reducer” drivers, that is, those who:
 - i. made fewer vehicle trips on Spare The Air days, and
 - ii. did so purposefully to help reduce air pollution in the region, and
 - iii. were aware of the Spare The Air advisories (general awareness).and determine if the percentage of reducers is similar or different among four air quality districts in the Sacramento nonattainment area (Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD)
- g. determine if the percentage of purposeful reducers in the Sacramento Core Region has increased, decreased, or stayed the same from 2000 to the present
- h. extrapolate to the population by estimating the number of **drivers** in the Sacramento nonattainment area who purposefully reduced the number of trips they made on Spare The Air days in 2009
- i. estimate the number of **single trips** avoided by purposeful reducers on Spare The Air days, and
- j. compare the percentage of reducers found in the group of respondents interviewed about Spare The Air days with that of the group interviewed on Control (non-Spare The Air) days.

Results

Driving Behavior Yesterday

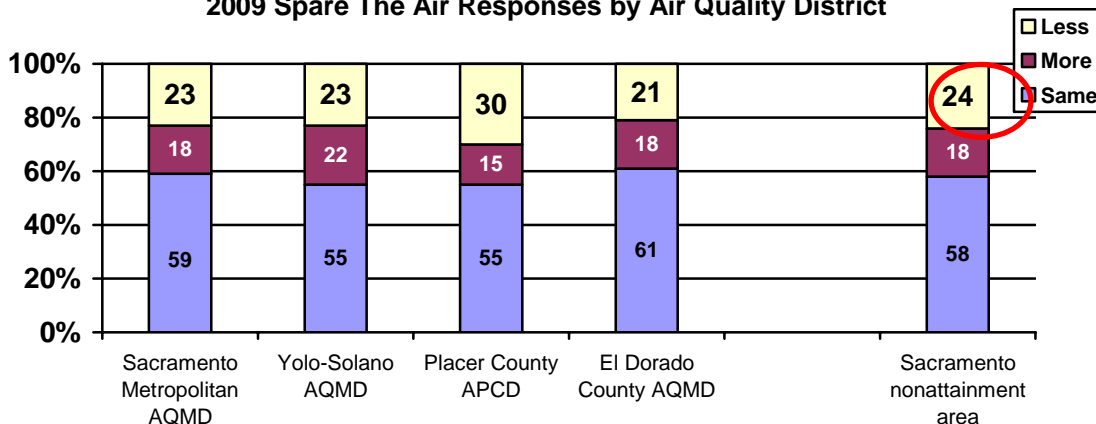
- 9 ➤ *Nearly a quarter of respondents (24%) interviewed following Spare The Air days in the region as a whole said they drove “less” the previous day. Placer County APCD respondents drove the least (30%), but the percentage was not statistically significantly different from the other air districts.*

Respondents were asked to think about their driving behavior the previous day and whether they drove the “same, more, or less frequently” than they normally did on that particular day of the week. Results from the individual air quality districts as well as for the entire Sacramento nonattainment area (weighted results) are presented in the next chart. It can be seen that the greatest percentage of respondents had not made any changes in their driving – for the nonattainment area, 58% said they drove the same as usual the previous day. Eighteen percent (18%) said they drove more, and nearly a quarter - 24% said they drove less. Results from each of the individual air quality districts were similar. Although the percentage of Placer County APCD respondents who drove less was greater at 30% than any of the other air districts, the differences were not statistically significant.¹⁶

¹⁶ This is related to the sample sizes and their affiliated margins of error. In Placer County APCD, for example, 190 interviews were completed following Spare The Air days, yielding a margin of error of +/-6.5%.



**Driving Behavior Yesterday:
 2009 Spare The Air Responses by Air Quality District**



Year-to-Year Comparisons: Percent Who Drove Less

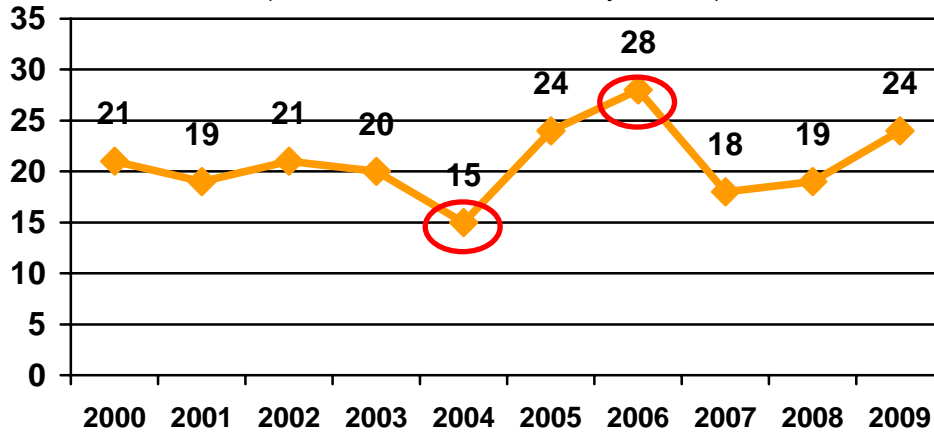
- 10 ➤ *The ten-year average percent of respondents who said they drove less on Spare The Air days is 21%. This year's level, although higher at 24%, is not significantly different from that average.*

The next graph plots the percentages of drivers from 2000 to the present who said they drove less on Spare The Air days in the Sacramento Core Region (which excludes El Dorado County AQMD).¹⁷ Year-to-year tests of proportion indicate that self-reported driving reduction on Spare The Air days from 2000 to 2003 was fairly stable at about one in five respondents, but declined significantly to 15% in 2004, a summer that experienced relatively good air quality and only six Spare The Air days. 2005 saw a significant increase (to 24%) in the percentage of respondents who said they drove less on Spare The Air days, and 2006 registered the highest percentage of all years, at 28%. 2006 was a poor air quality summer, with 15 Spare The Air days. Results in 2007 (18%) and 2008 (19%) were significantly lower than in either 2005 or 2006, but not significantly different from any of the previous five years (2000 to 2004). This year's level at 24% is significantly higher than 2007 results, but not significantly higher than last year's level. The ten-year average of the percent of respondents who said they drove less on Spare The Air days was 21%. Current results, although higher, are not significantly different from the 10-year average.

¹⁷ Results are for the Sacramento Core Region (weighted) and exclude El Dorado County AQMD because interviews were not conducted with El Dorado respondents in all survey years.



Year-by-Year Comparison: Percent of Respondents Who Drove "Less" on Spare The Air Days: Sacramento Core Region
 (excludes El Dorado County AQMD)

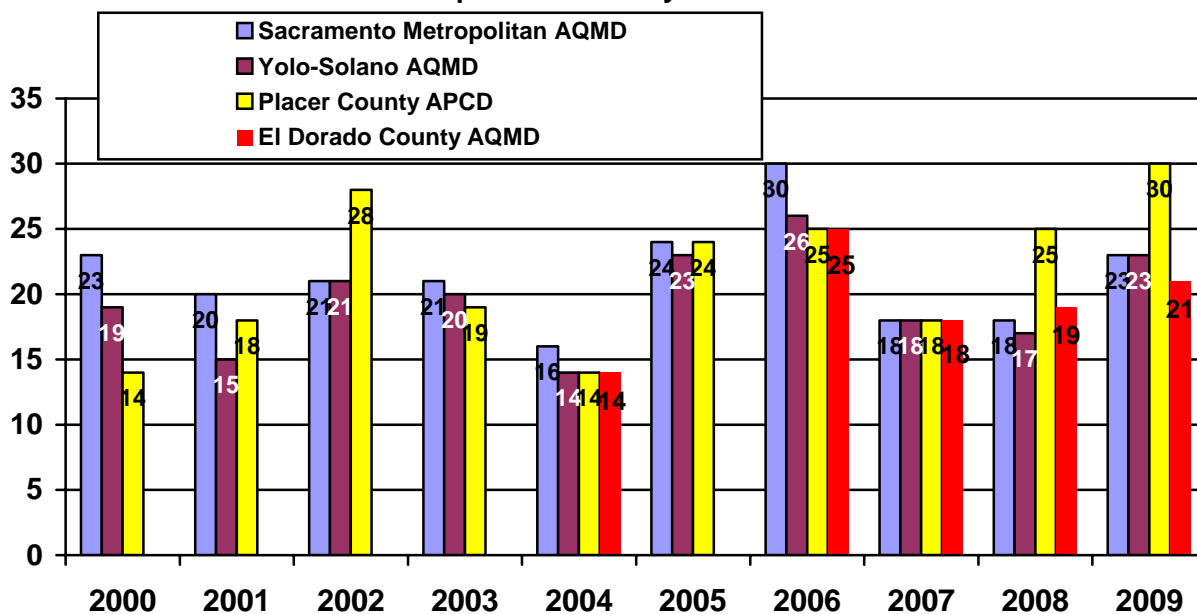


- 11 ➤ *With the exception of Placer County APCD, the percentages of residents in the individual air districts who said they drove less on Spare The Air days this year did not differ from the long-term averages. In Placer County APCD, results tended to fluctuate the most from one year to the next, with the highest level reported this year at 30%.*

Results from 2000 to the present for each individual air district are presented in the next chart. It can be seen that the percentage of residents who said they drove less on Spare The Air days in the **Sacramento Metropolitan AQMD** ranged from a low of 16% in 2004 to a high of 30% in 2006. This year's percentage of 23% is not significantly different from the 10-year average of 21% in SMAQMD. In **Yolo-Solano AQMD**, it can be seen that the percentage of self-reported driving reducers also ranged from a low of 14% in 2004 to a high of 26% in 2006; and this year's 23% did not differ significantly from the 10-year average of 20% in that air district. In **Placer County APCD** results tended to fluctuate more from one year to the next. This year's 30% of residents who said they drove less was the highest in ten years, significantly higher than the 10-year average of 22%, although not significantly different from last year's 25%. Drivers in **El Dorado County AQMD** were only interviewed in five of the ten years, and this year's 21% of self-reported reducers was not significantly different from the 5-year average of 19%. *



Year-to-Year Comparison of Percent of STA Respondents Who Drove "Less" on Spare The Air Days: Individual Air Districts



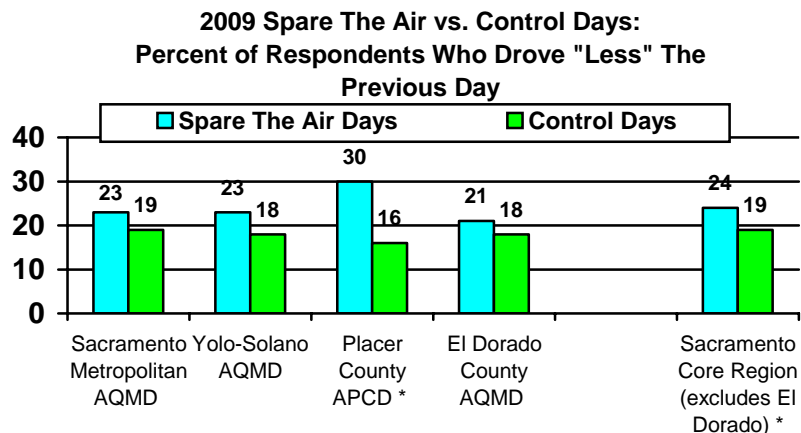
Spare The Air Days vs. Control Days

- 12 ➤ *A significantly higher percentage of respondents in the Sacramento Core Region said they drove less on Spare The Air days (24%) than on Control days (19%), one indication of the continuing effectiveness of the program.*

Control day interviewing has been part of the evaluation methodology of Spare The Air to correct for possible respondent exaggeration about driving behavior. Samples of respondents were interviewed about the same days of the week as the Spare The Air interviews, but on cooler, non Spare The Air days during the season. The use of Control day interviewing provides a means of calculating a correction or adjustment factor to account for any tendency for individuals to overstate their driving reduction on Spare The Air days (social desirability effect), and, therefore, provides the most conservative (and probably more accurate) estimates of program effectiveness.

The next chart shows the results of Spare The Air and Control day interviewing for each individual air district and for the weighted Sacramento Core Region (excluding El Dorado County AQMD in order to be able to make comparisons with previous years). It can be seen that the percentage of respondents who said they drove less on Spare The Air days was greater than the percentage who drove less on Control days in every air quality district, and significantly so for the Sacramento Core Region as well as for Placer County APCD.¹⁸

¹⁸ In Sacramento Metropolitan AQMD and Yolo-Solano AQMD results were not significant.



This year's results are more consistent with results from 2000 to 2006 than with those of the last two years, in that the difference between Spare The Air and Control day responses was statistically significant. Only three times in the past ten years was the difference not significant,¹⁹ as can be seen in the next table.

Year	Percentage of Respondents Who Drove "Less" Yesterday: <u>Sacramento Core Region</u> (excludes El Dorado County AQMD)		Difference (or "Spread")	Statistically Significant Difference?
	Spare The Air Day Respondents	Control Day Respondents		
2000	21%	13%	8%	Yes
2001	19%	14%	5%	Yes
2002	21%	17%	4%	Yes
2003	21%	18%	3%	No
2004	15%	11%	4%	Yes
2005	23%	17%	6%	Yes
2006	28%	18%	10%	Yes
2007	18%	15%	3%	No
2008	19%	16%	3%	No
2009	24%	19%	5%	Yes

¹⁹ In terms of the individual air districts within the Sacramento Core Region, Sacramento Metropolitan AQMD showed significant differences in all years except 2003, 2007, 2008, and this year. Placer County APCD showed differences in only four of the ten years (2002, 2005, 2006, and 2009); and in Yolo-Solano AQMD there has been only one year in which the difference was significant (2002). Yolo-Solano AQMD generally experiences better air quality than any of the other air districts in the nonattainment area. The lack of a significant difference between Spare The Air and Control day responses could be due to a number of factors, including cleaner air, the type of media buy and the amount spent; the severity of the season, as well as the possibility that some respondents habitually drive less during the summer and therefore might not have further reduced their driving on Spare The Air days. Results should continue to be monitored.



Percentage of Purposeful Reducers

- 13 ➤ *During the summer of 2009, 1.6% of all respondent drivers in the entire Sacramento nonattainment area were classified “purposeful reducers” – they purposefully drove less on Spare The Air days because they heard the Spare The Air advisories and wanted to improve air quality in the region.*

Purposeful driving reduction is defined as the percentage of all drivers interviewed following Spare The Air days who not only said they drove less, but did so specifically for air quality reasons, and, further, were also aware of Spare The Air in general (using the ARB question²⁰). Results from each air quality district and for the weighted Sacramento regions (Sacramento Core Region as well as the entire nonattainment area) are presented in the next table. It can be seen that for the entire Sacramento nonattainment area, 1.6% of all Spare The Air respondent drivers (6 out of 380) met the strict ARB standard for purposeful driving reduction. Individually, Yolo-Solano AQMD and Placer County APCD had the highest percentages of purposeful reducers at 2.7% and 2.6%, respectively. Sacramento Metropolitan AQMD showed 1.2% reducers. There were no purposeful reducers found in El Dorado County AQMD.

<i>Spare The Air: Purposeful Reducers in 2009</i>	<i>Number of Respondents Who Reduced Driving For Air Quality Reasons and Were Aware of STA Advisories</i>	<i>Total Number of Respondents Interviewed on Days Following Spare The Air</i>	<i>% of Total Respondents Who Reduced Driving for Air Quality Reasons and Were Aware of STA Advisories</i>
Sacramento Metropolitan AQMD	3	251	1.2%
Yolo-Solano AQMD	5	187	2.7%
Placer County APCD	5	190	2.6%
Sacramento Core Region²¹	6	358	1.7%
El Dorado County AQMD	0	127	0.0%
Sacramento Nonattainment Area²²	6	380	1.6%

²⁰ There were two questions in the survey that measured awareness of Spare The Air. The one referred to here measured general awareness and was proposed by the ARB (i.e. “In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?”). It was introduced in 2002. Comparisons of reducers with years prior to 2002 used another question to measure awareness, which was more specific (i.e. “Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?”) It has been included in all evaluations since 1999. Typically, more respondents indicate general awareness of Spare The Air than specific awareness of the request not to drive the previous day.

²¹ Weighted, excludes El Dorado County AQMD.

²² Weighted, includes El Dorado County AQMD.



Percentage of Purposeful Reducers: Year-To-Year Comparisons

- 14 ➤ *The percentage of purposeful reducers in the Sacramento Core Region is higher this year than last year, although the difference is not statistically significant. This year's percentage is also similar to the ten-year average of 1.6% of all drivers who purposefully reduced driving on Spare The Air days in order to help improve air quality.*

Annual proportions of purposeful reducers in the three individual air districts within the Sacramento Core Region (excluding El Dorado County AQMD) as well as in the weighted core region from 2000²³ to the present are presented in the next table. Tests of proportion compared year-to-year results. It can be seen, first of all, that in terms of the Sacramento Metropolitan AQMD and the Core Region as a whole, although results were higher this year than last year, the differences were not statistically significant. Secondly, annual results varied slightly, but the percentage of reducers has not changed significantly from one year to the next. Thirdly, it can also be seen that, **averaged over ten years, 1.6% of all drivers in the Sacramento Core Region purposefully reduced driving on Spare The Air days, specifically in order to help improve air quality.**

In Yolo-Solano AQMD the percentage of reducers was significantly higher in 2002 than in most other years, and this year's results were higher than in 2001. In fact, 2002 was an exceptional year with high temperatures and multiple-day Spare The Air episodes. [The percentage of reducers in Sacramento Metropolitan AQMD was also higher in 2002 than in other years; however, the differences were not statistically significant.] In Placer County APCD, the percentages of reducers were significantly higher in 2002 and 2006 than in most other years; and this year's results were higher than in 2007.

Spare The Air: Purposeful Reducers	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Significant Difference Between Years?	10-year Average
Sacramento Metropolitan AQMD	2.0%	2.1%	2.3%	1.2%	1.6%	1.5%	1.9%	1.3%	0.5%	1.2%	No	1.6%
Yolo-Solano AQMD	1.3%	0.2%	3.5%	1.2%	1.1%	1.3%	1.9%	1.6%	0.5%	2.7%	Yes – 2002 significantly higher than 2001, 2003, 2004, 2005, 2007, and 2008; 2009 higher than 2001	1.5%
Placer County APCD	1.0%	0.9%	3.9%	2.3%	1.4%	1.5%	4.3%	0.4%	1.6%	2.6%	Yes – 2002 and 2006 significantly higher than 2000, 2001, 2004, 2005, and 2007; 2009 higher than 2007	2.0%
Sacramento Core Region	1.8%	1.7%	2.7%	1.4%	1.5%	1.4%	2.2%	1.2%	0.7%	1.7%	No	1.6%

²³ Results from 2000 and 2001 were recalculated but still are not directly comparable, as two of the questions were not the same. The measure of STA awareness was the stricter specific question (see footnote 8 above) and the number of round trips avoided was asked rather than single trips avoided. Single trips were therefore calculated by doubling responses from those two years. Results should therefore be treated with some caution.



Estimated Number of Purposeful Reducers

- 15 ➤ *When extrapolated to the population, **23,132** drivers in the entire Sacramento nonattainment area purposefully made fewer trips on average each Spare The Air day in 2009, specifically in order to reduce air pollution.*

In the summer of 2009 there were an estimated 1,445,778 drivers in the Sacramento nonattainment area.²⁴ Extrapolating to the population of drivers, the 1.6% of reducers means that approximately **23,132 drivers** purposefully made fewer trips on Spare The Air days for air quality reasons. Estimates for the individual air districts as well as for the region (both excluding and including El Dorado County AQMD) are presented in the next table.

<i>Air District</i>	<i>Total Number of Drivers</i>	<i>Percent of Purposeful Reducers</i>	<i>Estimated Number of Purposeful Reducers in 2009</i>
Sacramento Metropolitan AQMD	922,117	1.2%	11,065
Yolo-Solano AQMD	203,604	2.7%	5,497
Placer County APCD	223,380	2.6%	5,808
Sacramento Core Region	1,349,101	1.7%	22,935
El Dorado County AQMD	96,678	0.0%	0
Sacramento Nonattainment Area²⁵	1,445,778	1.6%	23,132²⁶ <i>purposeful reducers</i>

Estimated Number of Single Trips Avoided by Purposeful Reducers

- 16 ➤ *Those drivers in the nonattainment area who were classified as purposeful reducers avoided an average of 3.2 single trips on Spare The Air days, translating into a total of **74,022 trips** purposefully avoided on each Spare The Air day during the summer season of 2009.*

Those respondents who were classified as purposeful reducers were asked how many single vehicle trips they had avoided on the Spare The Air day. The mean number of single trips avoided in the entire Sacramento nonattainment area was **3.2**.²⁷ Multiplying by the estimated 23,132 drivers who

²⁴ The number of drivers in the Sacramento nonattainment area for 2009 was estimated, using the number of driver licenses by county for 2008, obtained from the California Department of Motor Vehicles database at http://www.dmv.ca.gov/about/profile/dl_outs_by_county.pdf, and calculating the percentage increase, based on county population figure increases from 2008 to 2009 listed at: (<http://www.dof.ca.gov/research/demographic/reports/estimates/e-1/2008-09/documents/E-1%202009%20Internet%20Version.xls>). The estimated number of licensed drivers for the total Sacramento nonattainment area in 2009, therefore, was 1,445,778: Sacramento Metropolitan AQMD: total 922,117 + Yolo-Solano: total of 203,604 (124,281 in Yolo County + Solano County: 273,524 * 29% for the proportion located within the Air Quality district = 79,322) + Placer County: total of 223,380 (256,759 * 87% for Air Quality district) + El Dorado County: total of 96,678 (142,173 * 68% for Air Quality district).

²⁵ Includes El Dorado County AQMD.

²⁶ The total number of drivers estimated in the Sacramento Core Region and the Sacramento nonattainment area are not the simple sums of drivers in the individual air districts: the percentage of reducers was calculated using weighted results, adjusted proportionally to the population within each air district: Sacramento Metropolitan AQMD represents 66% of the entire population, Yolo-Solano AQMD is 15%, Placer County APCD is 13%, and El Dorado County AQMD is 6%.

²⁷ The mean was 3.2, the median was 3.7, and the range was 1 to 5 trips avoided.



purposefully reduced their driving on Spare The Air days, this translates into an estimated **74,022 single trips** that drivers avoided making on Spare The Air days during the summer of 2009, specifically to help reduce air pollution in the region. Results for the individual air districts as well as for the weighted regions are presented in the next table.

<i>Air District</i>	<i>Estimated Number of Purposeful Reducers</i>	<i>Mean # of Trips Avoided for Air Quality Reasons</i>	<i>Estimated Number of Single Trips Reduced</i>
Sacramento Metropolitan AQMD	11,065	3.3	36,515
Yolo-Solano AQMD	5,497	3.2	17,590
Placer County APCD	5,808	2.8	16,262
Sacramento Core Region²⁸	22,935	3.2	73,392
El Dorado County AQMD	0	0	0
Sacramento Nonattainment Area²⁹	23,132	3.2	74,022 trips

Percentage of Purposeful Reducers: Spare The Air Days vs. Control Days

17 > Control day interview results indicated no drivers who specifically avoided making trips for air quality reasons on non Spare The Air days.

Control day respondents were also asked if they had reduced the number of trips the day before, and if so, why. If the same percentage of drivers claimed to have reduced their driving on Control days for air quality reasons as on Spare The Air days, it would be difficult to credit the Spare The Air program as the cause of driving reduction. Control day interviewing can, therefore, be once again used as a validation check.

Results indicated **no (0%) respondents** interviewed on Control days who said they drove less the previous day for air quality reasons. This means that all the trips avoided on Spare The Air days can be used in the calculation of emissions reduced in a later report.

²⁸ Excludes El Dorado County AQMD.

²⁹ Includes El Dorado County AQMD.



ESTIMATED EMISSION REDUCTIONS

Objective

The main objective of the current section is to estimate how many tons of ozone precursor emissions [Reactive Organic Gas (ROG) and Nitrogen Oxides (NOx)] were reduced during the 2009 season that could be attributed directly to the Spare The Air program. In order not to overestimate possible reductions, a correction factor based on Control day interviewing has been applied. Results, therefore, are conservative.

Results

Calculation of Estimated Emission Reductions

- 18 ➤ *Applying a correction factor from results from Control day interviews, the 2009 Spare The Air program was successful in reducing air pollution in the entire Sacramento nonattainment area by an estimated 0.39 tons of ozone precursors (ROG and NOx) per day. Drivers specifically reduced the number of trips they took on Spare The Air days to improve air quality in the region.*

The emission reduction estimate attributed to voluntary driving reduction because of the Spare The Air program is conservative. Seasonal reducers who normally make fewer trips during the summer to help improve air quality are not included³⁰ nor are those who reduced the number of trips they made on Spare The Air days for reasons other than air quality, nor are those who drove less but had not heard the Spare The Air advisory. In addition, any purposeful driving reduction for air quality reasons on non Spare The Air days (i.e. Control day interviews) is subtracted from the emission reduction estimate. Finally, emission reductions are only calculated in those air districts where significantly more respondents said they drove less "less" on Spare The Air days than on Control days.³¹

Results from the Sacramento nonattainment area as a whole are used to illustrate the procedure for estimating emission reductions according to the following steps:

1. Calculate the percentage of purposeful reducers, that is, drivers who said they were aware of the Spare The Air advisories,³² and who also said they drove less than usual on Spare The Air days, specifically for air quality reasons. For the nonattainment area as a whole, this was **1.6%** (6 / 380³³) of all respondents interviewed following Spare The Air days.

³⁰ These respondents will be examined in a later report on Seasonal Driving Reduction.

³¹ This has been considered a prerequisite for the calculation of emission reductions in each air district and was introduced into the methodology in 2000 by Jude Lamare, Ph.D.; formerly with the Cleaner Air Partnership. However the air districts might want to reconsider whether this prerequisite is necessary, given the fact that Control day interviewing already acts as a correction factor, and that the sampling design change in 2008 of fewer completed interviews means that the margins of error in each air district are increased. In 2009 a significant difference was found in the weighted Sacramento nonattainment area as a whole as well as in Placer County APCD, but not in Sacramento Metropolitan AQMD, or Yolo-Solano AQMD, or El Dorado County AQMD. Emission reductions have nevertheless been calculated for Sacramento Metropolitan AQMD as it is the largest air district within the nonattainment area.

³² Using the ARB-worded question for measuring general awareness of Spare The Air: "In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?"

³³ The total number of completed interviews was weighted. Since the beginning evaluation in 1995, the methodology for weighting has been to set Sacramento County interviews as 1, and down-weight interviews from all other counties appropriately, depending on the size of their populations. This is why the weighted total of completed interviews (380) is less than the sum of the total number of interviews of all air districts (755).



2. Record the mean (average) number of single trips they avoided for air quality reasons on Spare The Air Days. These purposeful reducers were asked to estimate the number of single trips they avoided making on the Spare The Air day. For the nonattainment area, the mean was **3.2** single trips avoided.³⁴
3. Extrapolate to the total number of drivers in the region³⁵ this year: the percentage of Spare The Air reducers therefore represents **23,132** drivers in the Sacramento nonattainment area, and the number of single trips avoided was **74,022** (23,132 drivers x 3.2 trips avoided on average).
4. Multiply the number of trips avoided by a per trip emission reduction average of **4.82 grams of ozone precursors**.³⁶ [This includes a total of Reactive Organic Gas (ROG) emissions (2.75 grams per trip for light duty passenger cars plus two categories of light duty trucks) plus Oxides of Nitrogen (NOx) emissions (2.07 grams per trip for light duty passenger cars and light duty trucks) emissions, based on 2009 models of EMFAC2007 V2.3.] EMFAC2007 V2.3 is the latest update to the EMFAC model. It is used by California state and local governments to meet Clean Air Act (CAA) requirements. EMFAC2007 defines trips as vehicle starts and calculates them separately as a function of vehicle population (derived from vehicle registration data), based on ARB and US EPA instrumented vehicle studies. For the Sacramento nonattainment area, this amounts to **356,786 grams** of ozone precursors (74,022 single trips avoided x 4.82 grams per trip).
5. Convert to tons.³⁷ For the Sacramento nonattainment area as a whole, this translates to an estimated total of **0.39 tons of pollutants reduced** per Spare The Air day.
6. Repeat the process for Control day interviews: record the mean number of trips avoided by the respondents who drove less for air quality reasons on Control days. In the weighted Sacramento nonattainment area, there were no (**0**) individuals³⁸, and therefore **0** trips were reduced as well. This is a rare finding and has only occurred twice in the last ten years of evaluations (last year and this year).
7. Apply the correction factor. To ensure that only purposeful driving reduction due to the Spare The Air program is counted in the estimate of emission reduction, we subtract the Control day air quality emission reduction from the Spare The Air day reduction. The correction for the Control days in this instance is 0.0 tons of ozone precursors, which, when subtracted from the 0.39 tons reduced on Spare The Air days, yields:
8. Result: **0.39 tons of ozone precursors reduced per Spare The Air day in 2009.**

³⁴ The mean was 3.2, the median was 3.7, and the range was 1 to 5 trips avoided.

³⁵ The number of drivers in the Sacramento nonattainment area for 2009 was estimated, using the number of driver licenses by county for 2008, obtained from the California Department of Motor Vehicles database at http://www.dmv.ca.gov/about/profile/dl_outs_by_county.pdf, and calculating the percentage increase, based on county population figure increases from 2008 to 2009 listed at: (<http://www.dof.ca.gov/research/demographic/reports/estimates/e-1/2008-09/documents/E-1%202009%20Internet%20Version.xls>). The estimated number of licensed drivers for the total Sacramento nonattainment area in 2009, therefore, was 1,445,778: Sacramento Metropolitan AQMD: total 922,117 + Yolo-Solano: total of 203,604 (124,281 in Yolo County + Solano County: 273,524 * 29% for the proportion located within the Air Quality district = 79,322) + Placer County: total of 223,380 (256,759 * 87% for Air Quality district) + El Dorado County: total of 96,678 (142,173 * 68% for Air Quality district).

³⁶ Estimates for the summer of 2009 were based on EMFAC2007 V2.3 figures provided and confirmed by Bruce Katayama, SMAQMD, November 17, 2009. The total ROG tons for a combined total of light duty passenger cars and two categories of light duty trucks (8.8 + 2.18 + 4.44) were converted to pounds (multiplied by 2,000) and then to grams (multiplied by 454) before dividing by the combined total number of trips (i.e. 3,081,700 for light duty passenger cars + 639,881 for light duty trucks1 + 1,377,730 for light duty trucks2) in order to obtain the average grams per trip. The same process was used to calculate NOx grams per trip (5.48 + 1.62 + 4.54) x 2000 x 454 / (. 3,081,700 + 639,881 + 1,377,730). ROG grams and NOx grams were then combined (2.75 + 2.07) to obtain 4.82 grams per trip of emission precursors in the region as a whole. These are the figures considered most accurate at the time this report was written.

³⁷ There are 907,200 grams in a ton.

³⁸ There was one Control day respondent in Placer County APCD who reduced driving for air quality reasons, but that individual did not appear in the weighted results for the entire area.



The procedure just described is summarized in the following table:

Sacramento Nonattainment Area	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons ³⁹	X Number of Licensed Drivers in Sacramento Nonattainment Area (1,445,778 Total)	X Mean Number of Single Trips Reduced Per Day	X 4.82 Grams of Ozone Precursors Per Trip (EMFAC 2007 V2.3) 2009 Estimate	= Estimated Tons per Day of Ozone Precursors Reduced
Spare The Air Days	1.6% (6 / 380 ⁴⁰)	23,132	x 3.2 = 74,022	356,786 grams	0.39 tons
Control Days	0.0% (0 / 456)	0	0	0 grams	0 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions – Control Day Reductions)					0.39 tons

2009 Emissions Reduction Estimate: Sacramento Metropolitan AQMD

19 ➤ Air pollution in Sacramento Metropolitan AQMD were reduced by an estimated 0.19 tons of ozone precursors per Spare The Air day.

Sacramento Metropolitan AQMD	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons	X Number of Licensed Drivers in Sacramento Metropolitan AQMD (922,117 Total)	X Mean Number of Single Trips Reduced Per Day	X 4.82 Grams of Ozone Precursors Per Trip (EMFAC 2007 V2.3) 2009 est.	= Estimated Tons Per Day of Ozone Precursors Reduced
Spare The Air Days	1.2% (3 / 251)	11,065	x 3.3 = 36,515	24,479 grams	0.19 tons
Control Days	0.0% (0 / 301)	0	0	0 grams	0tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions – Control Day Reductions)					0.19 tons

³⁹ In addition, in the case of Spare The Air respondents, these drivers had to say they had heard the Spare The Air advisory (the ARB general awareness question).

⁴⁰ Please note that the weighted total number of completed interviews for the Sacramento nonattainment area as a whole (i.e. 312) is less than the total number of completed interviews within all air districts (705 unweighted). Since the beginning evaluation in 1995, the methodology for weighting has been to set Sacramento Metropolitan AQMD interviews as 1, and down-weight interviews from all other counties appropriately, depending on the size of their populations. The Sacramento Metropolitan AQMD represents the largest percentage of the nonattainment area population at 66%, followed by Yolo-Solano AQMD (15% of area population), Placer County APCD (13%), El Dorado County AQMD (6%). In other words, the number of completed interviews for the entire Sacramento nonattainment area is not the simple sum of the number of completed interviews in each individual air district.



2009 Emissions Reduction Estimate: Placer County APCD

20 ➤ In Placer County APCD, an estimated 0.08 tons of ozone precursors were reduced per Spare The Air day.

Placer County APCD	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons	X Number of Licensed Drivers in Placer County APCD (223,380 Total)	X Mean Number of Single Trips Reduced Per Day	x 4.82 Grams of Ozone Precursors Per Trip (EMFAC 2007 V2.3) 2009 Estimate	= Estimated Tons Per Day of Ozone Precursors Reduced
Spare The Air Days	2.6% (5 / 190)	5,808	x 2.8 = 16,262	78,383 grams	0.086 tons
Control Days	0.3% (1 / 302)	670	x 2.0 = 1,340	6,459 grams	0.007 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions – Control Day Reductions)					0.079 tons

Comparison with Previous Years: Sacramento Metropolitan AQMD (only)

A comparison of estimated emission reductions⁴¹ from 2001 to the present in the Sacramento Metropolitan AQMD⁴² (only) are presented in the next table. It is important to point out that the factors that contribute to the estimates (i.e. differences in yearly estimated ROG and NOx emission factors per trip, changes in the number of drivers, the percentage of purposeful reducers, the average number of trips reduced, the severity of conditions and the number of Spare The Air days experienced during each summer season) vary from one year to the next.

It can be seen that the average estimated emission reductions per Spare The Air day ranged from a low of .03 tons in 2008 to a high of 1.32 tons in 2001. **Looking across the years, it can be seen that the Spare The Air program has been successful in reducing the amount of ozone precursors in the air each year.**

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sacramento Metropolitan AQMD: Average emission reductions attributed to Spare The Air (tons)	1.32	0.99	0.26	0.42	0.25	0.26	0.06	0.03	0.19

⁴¹ The estimated emissions reductions shown in the current table were based on accepted EMFAC models for each year. This year, estimates were based on the EMFAC 2007 v 2.3 model, 2009 estimate, provided by Bruce Katayama, SMAQMD.

⁴² Over the years, reductions could often not be calculated for Placer County APCD, Yolo-Solano AQMD, and El Dorado County AQMD as there were often no significant differences between Spare The Air and Control day drivers who said they drove less. (See footnote 2.) Once again, the air quality districts might want to consider dropping this prerequisite.



SUMMER 2009 HEALTH ISSUES

Objectives

The main objective of the current section is to document the relationship between air quality and the health effects experienced by households in the Sacramento nonattainment area during the summer of 2009. More specific objectives are to:

- k. compare levels of perceived health effects due to poor air quality between respondents interviewed following Spare The Air days and those interviewed on Control (non Spare The Air) days,
- l. estimate the number of households in the Sacramento nonattainment area whose health was affected by poor air quality specifically due to ozone air pollution on Spare The Air days in 2009,
- m. determine if levels of reported health problems during summer Spare The Air seasons have increased, decreased, or stayed the same from 2000 to the present in the Sacramento Core Region (excluding El Dorado County AQMD), and
- n. compare the incidence of reported health problems among the four air quality districts in the Sacramento nonattainment area (Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD).

Results

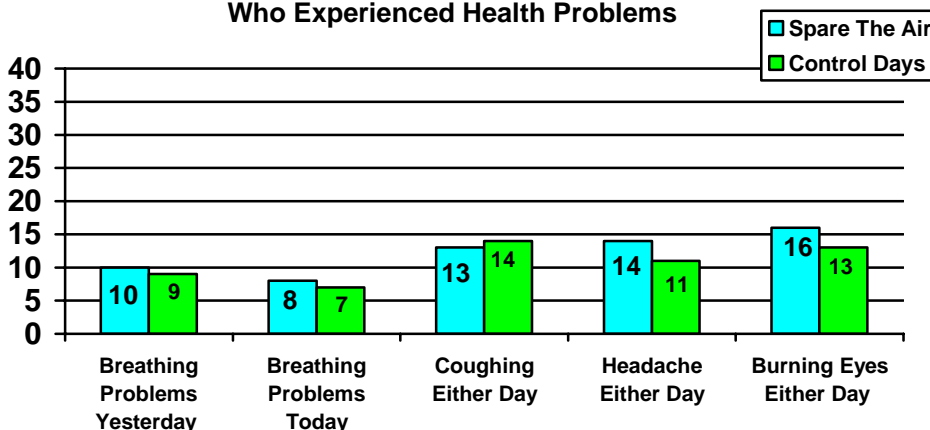
Perceived Health Effects: Spare The Air Days vs. Control Days

21 ➤ *In the Sacramento nonattainment area as a whole, 10% of households reported breathing difficulties on Spare The Air days in 2009. This was not significantly higher than the 9% of households interviewed on Control days. Nevertheless, correcting for Control day responses, this translates into 8,570 additional households that were affected specifically by ozone pollution on Spare The Air days during the summer of 2009.*

All respondents were asked whether they or someone in their household had experienced breathing difficulties the day before the interview or the day of the interview. In addition they were asked if anyone experienced coughing, headaches, or burning eyes either day. Results from the weighted Sacramento nonattainment area as a whole for those interviewed following Spare The Air as well as those interviewed on Control days are presented in the next chart. It can be seen that although Spare The Air respondents tended to experience more health problems (with the exception of coughing) than did Control respondents, none of the differences were statistically significant. Ten percent (10%) of Spare The Air respondents experienced breathing problems the previous day, compared with 9% of Control respondents. It can also be seen that all households were more likely to experience burning eyes than breathing problems: 16% on Spare The Air days and 13% on Control days.



**Spare The Air vs. Control Groups:
 Percent of Households in Sacramento Nonattainment Area
 Who Experienced Health Problems**



There are an estimated 856,972 households in the Sacramento nonattainment area⁴³; therefore, the 10% of respondents who claimed that someone in their household experienced breathing problems on a Spare The Air day translates into 85,697 households. The 9% of respondents who reported breathing problems on Control days translates into 77,127 households. Correcting for Control days through subtraction, this means that **8,570 households experienced breathing problems due specifically to ozone air pollution on Spare The Air days.**

Year-To-Year Comparisons

22 ➤ Summer air quality appears to be improving: the number of households experiencing breathing difficulties in the Sacramento Core Region on Spare The Air days has declined to 10% from a high of 15% in 2000.

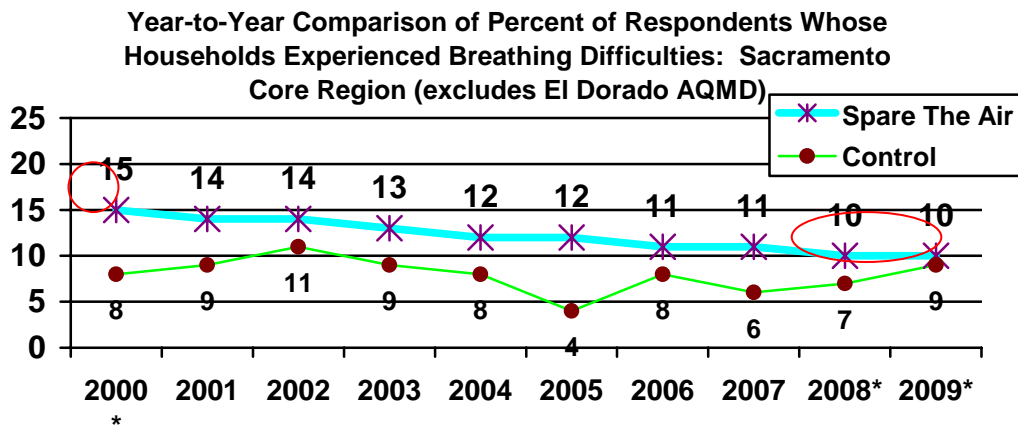
The annual percentages of respondents in the Sacramento Core Region (excluding El Dorado County AQMD respondents because they were not interviewed each survey year) who said someone in their household had trouble breathing⁴⁴ on Spare The Air and Control days from 2000 to the present are plotted in the next graph. It can be seen that ten years ago (in 2000), 15% of households interviewed about Spare The Air days had difficulty breathing, followed by two years where 14% experienced problems, followed by 13% in 2003; 12% in 2004 and 2005; and 11% in 2006 and 2007. Last year's and this year's 10% is statistically significantly lower than the 15% in 2000, but not significantly lower than the 10-year average of 12%. In terms of Control day interviewing, the percent of households who reported breathing difficulties has remained relatively stable and consistently lower, with annual results not differing from the 10-year average of 8%, except in 2005, considered an anomalous result.

⁴³ The measure used for households was the number of housing units. Reference: State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2009, with 2000 Benchmark. Sacramento, California, May 2009. Source: <http://www.dof.ca.gov/research/demographic/reports/estimates/e-5/2009/documents/2009%20E-5a%20Internet%20Version.xls>. The estimated number of households for the entire Sacramento nonattainment area is 856,972 ((Sacramento Metropolitan AQMD: 553,916) + (Placer County APCD: 149,265 * 87% = 129,861) + (Yolo-Solano AQMD: 116,163 (Yolo: 73,811; Solano (Dixon, Rio Vista & Vacaville): 42,352)) + (El Dorado County AQMD: 83,871 * 68% = 57,032)).

⁴⁴ The additional health-related questions of breathing today, coughing, headache, and burning eyes have only been asked since 2004.



What is different this year from most of the other years is that the gap between Spare The Air and Control households is the narrowest ever. This might be the result of cleaner air – in the sense that the summer of 2009 was relatively good as far as air quality was concerned – only five Spare The Air days were called. Further, when we examined the daily maximum Air Quality Index (AQI), we found that the recorded actual AQI for ozone did **not** exceed 150⁴⁵ on any of the five Spare The Air days in the air quality districts. This is because alerts about Spare The Air days are based on forecasted estimates. In other words, Spare The Air alerts were issued for days when the actual air quality turned out not to have been as poor as was expected.



* significant difference from 2000 compared to 2008 & 2009 Spare The Air households

Individual Air Quality Districts

23 ➤ *In general, there were no significant differences in the individual air districts between Spare The Air and Control households in terms of health problems.*

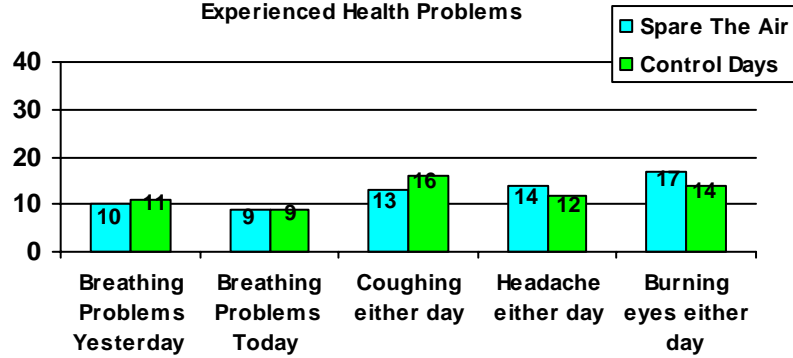
Results of the percent of household health problems experienced by Spare The Air and Control day respondents in each air quality district are presented in the next four graphs. With only a couple of exceptions, there tended to be no significant differences between Spare The Air and Control households in any of the air quality districts. The exceptions occurred in Yolo-Solano AQMD, where significantly more households experienced coughing and headaches on Spare The Air days than on Control days.

It can also be seen that in Sacramento Metropolitan AQMD more households reported burning eyes (17%) than breathing problems (10%) on Spare The Air days. This was also the case in Placer County APCD: 13% reporting burning eyes versus 7% reporting breathing difficulties on Spare The Air days. El Dorado County AQMD households experienced the fewest health difficulties this past summer.

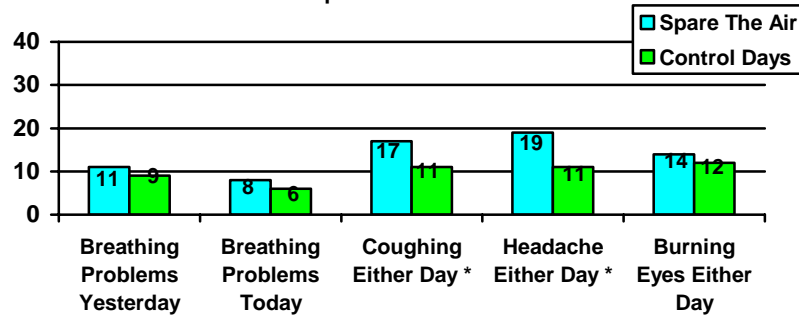
⁴⁵ The trigger for alerting the population of a Spare The Air day for the next day is based on forecasted estimates of the Air Quality Index (AQI) by Sonoma Technology Inc. Estimates are derived by using mathematical predictive modeling procedures on actual measurements obtained by local air districts and the California Air Resources Board at air quality monitoring sites throughout the region. If it is estimated that the AQI will be 150 or higher the next day, a Spare The Air advisory is issued. The Spare The Air season runs from May through October of each year.



Spare The Air vs. Control Groups: Percent of Sacramento Metropolitan AQMD Respondents Whose Households Experienced Health Problems

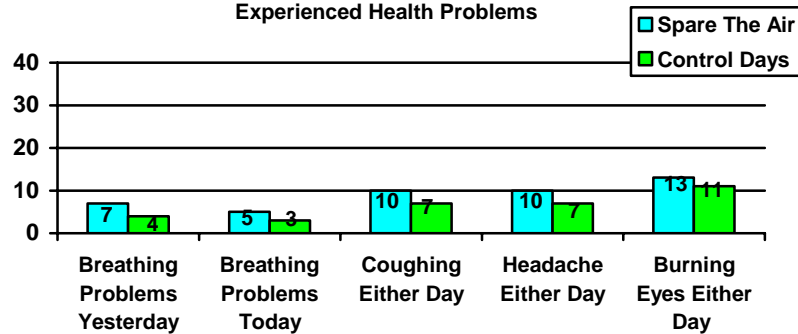


Spare The Air vs. Control Groups: Percent of Yolo-Solano AQMD Respondents Whose Households Experienced Health Problems



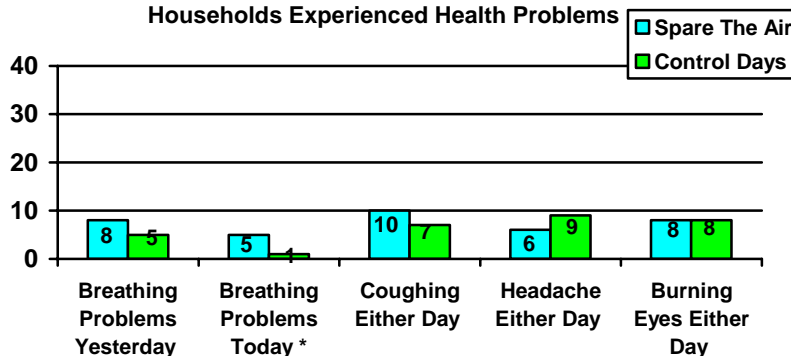
* Indicates a statistically significant difference

Spare The Air vs. Control Groups: Percent of Placer County APCD Respondents Whose Households Experienced Health Problems





Spare The Air vs. Control Groups:
 Percent of El Dorado County AQMD Respondents Whose
 Households Experienced Health Problems



* Indicates a statistically significant difference

Air Quality Districts: Year-To-Year Comparisons

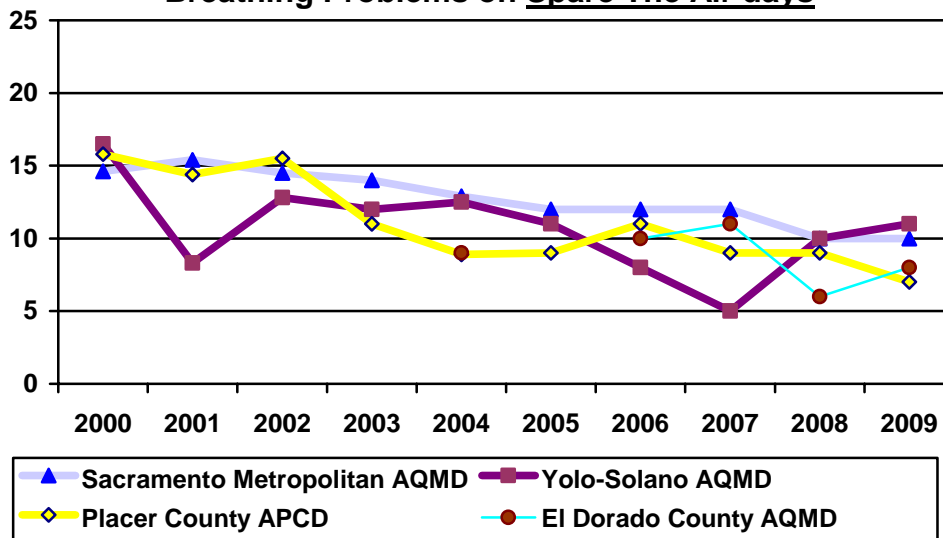
24 ➤ *There are fewer households experiencing breathing problems on Spare The Air days now than ten years ago. This could be a reflection of improved air quality in the region.*

The percentages of households in the individual air quality districts reporting breathing problems on Spare The Air days from 2000 to the present are presented in the next chart. El Dorado County AQMD results are only available for five years. Results indicate an overall decline in the percentage of households experiencing breathing difficulties, although year-to-year comparisons are often not significant. This could be a reflection of improving air quality in the region.

In SMAQMD, the 10% with problems this year is significantly lower than the 15% in 2000 and 2001. Similarly, in Yolo-Solano AQMD the 11% of breathing difficulties this year is significantly lower than the 17% reported in 2000. (However, results in Yolo-Solano AQMD tend to fluctuate the most from year to year.) In Placer County APCD, the 7% of breathing difficulties reported this year is significantly lower than the 16% in 2000.



Year-to-Year Comparison of Percent of Respondents Whose Households Experienced Breathing Problems on Spare The Air days



EMPLOYER PARTICIPATION IN 2009 SPARE THE AIR

Objectives

The objectives of the current section are to:

- o. assess employer participation in Spare The Air through the percentage of employed drivers who say their employer encourages them to drive less on days of poor air quality,
- p. measure participation by information channel – e-mail, signs, or asking employees to sign up for Air Alert notifications, and
- q. test whether employer participation has increased, decreased, or stayed the same since 2003 (when we first started to track it).

Results

Employer Encouragement

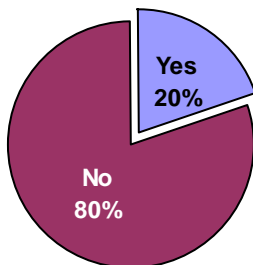
- 25 ➤ *Twenty percent (20%) of employed respondents in the Sacramento nonattainment area said their employer encourages them to drive less on days of poor air quality.*

Respondents were identified by the county in which they lived, not where they worked and because it is quite likely that many respondents live in one air district but work in another, employer participation results will be discussed only for the Sacramento nonattainment area as a whole and not for each individual air district. All respondents, those interviewed on Spare The Air as well as on Control days, were asked if they were employed, and if so, whether their employer encourages them to drive less on poor air quality days. Results indicated that 66% of respondents interviewed during the summer of 2009 were employed, the lowest level in 10 years, and significantly lower than the 73% of



respondents who were employed in 2005. The following pie chart indicates that 20% of those employed said their employer encourages them to drive less on poor air quality days.⁴⁶

Does Your Employer Encourage You To Drive Less On Poor Air Quality Days?

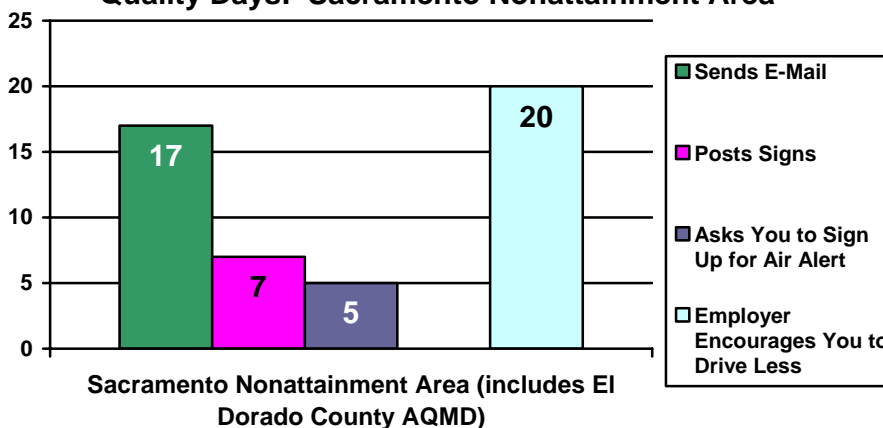


Employer Participation by Information Channel

- 26 ➤ *Employers are more likely to notify their employees about Spare The Air days via e-mail (17%) than by posting signs (7%), or by asking them to sign up for Air Alert notifications (5%).*

All employed respondents were asked how their employers notified them about Spare The Air days. Results indicated that 17% of regional employers use e-mail and 7% percent post signs about poor air quality days. Only 5% of respondents said their employer encouraged to sign up for Air Alert notifications.

Employer Channels of Communicating Poor Air Quality Days: Sacramento Nonattainment Area



Employer Participation: Year-To-Year Comparison

- 27 ➤ *Employer participation in Spare The Air has remained stable at 20% for the past four years. More employers are sending e-mails about poor air quality in the last three years than in 2003 and 2004. The percent who post signs has not changed since 2003, and the percent that asks*

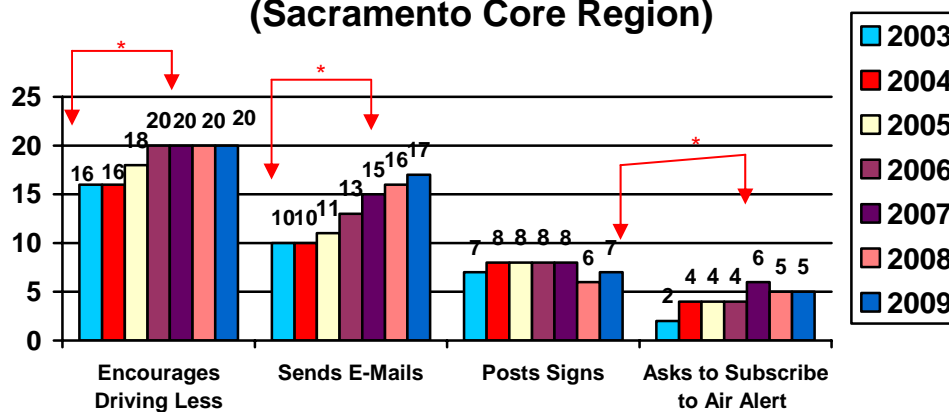
⁴⁶ For this analysis, self-employed respondents and those who were undecided or refused to answer were excluded.



its employees to register to receive Air Alert notifications also remains stable and relatively low at 5%.

Employer participation in the Spare The Air program has been tracked since 2003. Annual results for the Sacramento Core Region (excluding El Dorado County AQMD as it was not surveyed every year) are presented in the next graph. It can be seen that employer participation seems to have stabilized at 20% for the past four years. Significantly more employers are sending e-mails about poor air quality days to their employees now than in 2003 to 2005. The percent who post signs has not changed substantially from one year to the next. The 5% percent of employers that asked its employees to subscribe to Air Alert notifications, although significantly higher than the 2% in 2003, is still a relatively low percentage.

Employer Participation Since 2003 (Sacramento Core Region)



* indicates a statistically significant difference

2009 SUMMERTIME SEASONAL TRIP REDUCTIONS

Objectives

There is a group of residents who usually drive less to help improve air quality in the region during the summer months who are not necessarily included in emission reduction estimates as they may have not driven less on a Spare The Air day because they have already reduced their driving behavior. Specific objectives of the current report are to:

- r. test whether those drivers who say they usually reduce the amount of driving they do during the summer to avoid adding to air pollution actually do report making fewer trips than those who say they do not seasonally reduce driving,
- s. compare the percentage of seasonal trip reducers and the mean number of trips they have avoided over the past ten years, and
- t. estimate emission reductions from these voluntary driving reducers.



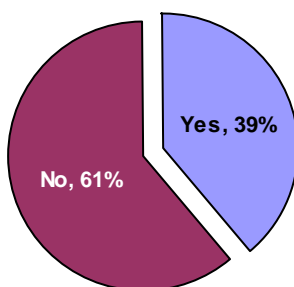
Results

Seasonal Driving Reducers

- 28 ➤ *Approximately four-in-ten (39%) of all respondents in the Sacramento nonattainment area are seasonal reducers – that is, they say they usually reduce the amount of driving they do during the summer to avoid adding to air pollution.*

Respondents who say they habitually reduce the amount of driving they do during the summer months are considered to be seasonal driving reducers. Respondents were asked: “Do you usually reduce the amount of driving you do during the summer to avoid adding to air pollution?” It can be seen in the next pie chart that, in the entire Sacramento nonattainment area as a whole, 39% of all⁴⁷ respondents in 2009 could be classified as seasonal driving reducers.

**Percent Who Reduce Driving in the Summer for Air Quality Reasons: 2009
Results for the Sacramento Nonattainment Area**



Number of Reduced Trips

- 29 ➤ *Respondents who said they usually reduce the number of trips they make during the summer months actually entered their cars fewer times than those who do not usually reduce driving during the summer: on average, they made .8 fewer trips per day.*

Those respondents who habitually drive less during the summer because of air quality reasons (seasonal driving reducers) reported entering their cars the previous day an average of 2.6 times. Those who said they did not usually reduce the amount of driving they do during the summer reported entering their cars an average of 3.4 times. An analysis of variance indicated that these means were significantly different from each other.⁴⁸ In other words, drivers who said they usually drive less in the summer actually made fewer trips than those who did not. **On average, seasonal driving reducers made .8 fewer trips per day** than non-reducers (3.4 – 2.6 = 0.8 trips).

⁴⁷ For the purpose of this report, results from respondents interviewed following Spare The Air days have been combined with those interviewed on Control days as the issue under discussion applies equally to both groups of respondents.

⁴⁸ F (1,819) = 7.92, p < .005.



	<i>Seasonal Driving Reducers: Mean # Times Entered Vehicle</i>	<i>Non-Reducers: Mean # Times Entered Vehicle</i>	<i>Statistically Significant Difference?</i>
<i>Sacramento Nonattainment Area</i>	2.6	3.4	Yes

Seasonal Trip Reduction: Estimated Emission Reductions

30 ➤ *Seasonal driving reduction for the summer of 2009 translates into a reduction of 2.4 tons per day of ozone precursors, representing substantial emission reductions due to public concern about summertime air quality.*

These seasonal driving reducers represent a substantial proportion of the general population who are helping to improve air quality in the region by reducing emissions. Although not officially recognized, it is possible to estimate the amount of ozone precursors that have been reduced due to respondents habitually driving less during the summer for air quality reasons. The methodology is the same as that used to estimate emission reductions on Spare The Air days⁴⁹ and is summarized in the next table. **It can be seen that the average of .8 of a trip per day that seasonal reducers avoided translates into an estimated 2.4 tons of ozone precursors reduced per summer day in 2009.**

Sacramento Nonattainment Area	Percent of Respondent Drivers Who Usually Drive Less During the Summer for Air Quality Reasons	x Number of Licensed Drivers in Sacramento Nonattainment Area (1,445,778 Total⁵⁰)	x Mean Number of Trips Reduced Per Day Compared to Non-Reducers	x 4.82 Grams of Ozone Precursors Per Trip (EMFAC 2007 V2.3) 2009 Model⁵¹	= Estimated Tons⁵² Per Day of Ozone Precursors Reduced
STA & Control Day Interviews Combined	39%	563,853	x 0.8 = 451,083	2,174,219 grams	2.4 tons

⁴⁹ For a full explanation of the methodology, see report titled "Estimated Emission Reductions during the 2009 Spare The Air Season", Naomi E. Holobow & Dawn Morley-Chavero, November 2009.

⁵⁰ The number of drivers in the Sacramento nonattainment area for 2009 was estimated, using the number of driver licenses by county for 2008, obtained from the California Department of Motor Vehicles database at http://www.dmv.ca.gov/about/profile/dl_outs_by_county.pdf, and calculating the percentage increase, based on county population figure increases from 2008 to 2009 listed at: <http://www.dof.ca.gov/research/demographic/reports/estimates/e-1/2008-09/documents/E-1%202009%20Internet%20Version.xls>. The estimated number of licensed drivers for the total Sacramento nonattainment area in 2009, therefore, was 1,445,778: Sacramento Metropolitan AQMD: total 922,117 + Yolo-Solano: total of 203,604 (124,281 in Yolo County + Solano County: 273,524 * 29% for the proportion located within the Air Quality district = 79,322) + Placer County: total of 223,380 (256,759 * 87% for Air Quality district) + El Dorado County: total of 96,678 (142,173 * 68% for Air Quality district).

⁵¹ Estimates for the summer of 2009 were based on EMFAC2007 V2.3 figures provided and confirmed by Bruce Katayama, SMAQMD, November 17, 2009. The total ROG tons for a combined total of light duty passenger cars and two categories of light duty trucks (8.8 + 2.18 + 4.44) were converted to pounds (multiplied by 2,000) and then to grams (multiplied by 454) before dividing by the combined total number of trips (i.e. 3,081,700 for light duty passenger cars + 639,881 for light duty trucks¹ + 1,377,730 for light duty trucks²) in order to obtain the average grams per trip. The same process was used to calculate NOx grams per trip (5.48 + 1.62 + 4.54) x 2000 x 454 / (. 3,081,700 + 639,881 + 1,377,730). ROG grams and NOx grams were then combined (2.75 + 2.07) to obtain 4.82 grams per trip of emission precursors in the region as a whole. These are the figures considered most accurate at the time this report was written.

⁵² There are 907,200 grams in a ton.

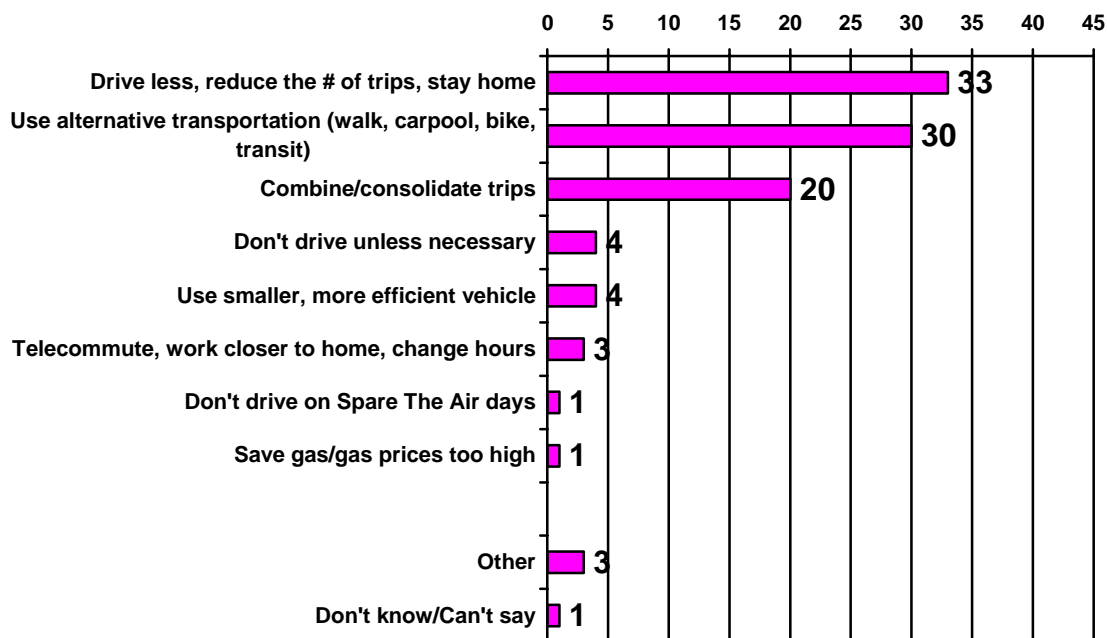


How They Reduce Driving

31 ➤ *The majority of seasonal reducers say they make fewer trips, stay home, use alternative transportation, or plan and consolidate errands in order to reduce the amount of driving they do during the summer months.*

Those who said they normally reduced the amount of driving they do during the summer were then asked to specify exactly how they reduced driving this summer. Comments were captured, then categorized, and the results are presented in the next graph. It can be seen that a third (33%) of these respondents said they made fewer trips or just stayed home. Thirty percent (30%) used alternative transportation to driving alone, which included carpooling, walking, cycling, or taking public transit. A further 20% said they regularly planned their days to consolidate trips and avoid multiple excursions. Four percent (4%) said they just didn't drive unless it was absolutely necessary; and the same percent said they used a more fuel efficient vehicle. One percent (1%) specifically mentioned that they avoided driving on Spare The Air days, 1% mentioned that gas prices kept them from driving, 3% gave "other" responses and 1% did not answer.

How Have You Reduced Driving This Summer?



A few representative comments⁵³ from those who said they drove less, reduced the number of trips, or stayed home are listed below.

- "Don't go anywhere, less driving."

⁵³ The complete transcripts of all responses are available in the statistical file.



- Because in the summer time I try and stay home and have nothing to do. I don't go outside. Especially on the hot days. Especially in the summer time, we don't want to put more air pollution outside. We have enough air pollution and don't want any more.
- Drive fewer miles. If I consume less I produce less waste. There's no other way. We turned in the gas guzzler and bought a more efficient vehicle a few years ago.
- Driving less. Try to stay away from driving a vehicle as much as possible.
- Fewer trips to the supermarket.
- Go to the store less or take a vacation that is closer so I drive less.
- I've decreased my driving by fifty percent this summer.
- I don't drive on the weekends or share the drive. That's about all I do, other than keep my cars maintained.
- I don't go to the store as much. I go once a week as opposed to twice a week. I make a list, well that way you don't go back and get things you don't need to.
- I've reduced my driving this year to avoid adding to air pollution by twenty five percent.
- I just don't go anywhere. I stay home.
- I just drive less, less frequently and less miles. Not really much to it more than that. My area's getting more congested; it causes me to drive less.
- I just try not to go out and about as much.
- I only go to the market once a week instead of three or four times. I manage to put all my errands in the same part of town. I've changed where I shop for different things, so they're all in one thing and park and then walk.
- Just made less trips. Air pollution and heat. They all kind of come together. I try to drive less to avoid the heat, which in turn avoids pollution.
- Not driving as much. Limiting our distances that we have to go to. Making consolidated trips.
- Not making a lot of trips. Thinking ahead. The things I was going to do, I'd put off until I can make one trip. More efficient mapping.
- Reduced the amount of trips per week for this summer to reduce air pollution.
- Staying home and staying out of the car.
- Take shorter trips.
- Try to not drive on one day a week, usually Sundays. Try to cut back on Saturday.
- We just shop once every couple day rather than every day. We don't drive that much, we just drive to work, no unnecessary roads.
- We stopped driving all together. We only drive half as much as we did. We drive an ATV now instead of the regular car.
- We take less trips. We combine the trips. The neighbors all kind of go together. We all make trips together or if one person is going to Costco. Our apartments are in groups of eight, and all eight of us will make a list, and the person with the biggest van will go and get it. Movie nights, doing things at home. Stuff like that."

A few of the comments from those who use alternative transportation (to driving alone) are listed below. Note specific reference to Spare The Air days in some of them:

- "Bicycling. I live in a bicycle friendly town so if I need to go somewhere I just get on my bike. I don't carpool or do anything like that.
- By riding my bicycle and carpooling.
- Carpool and another is walking, riding bike.
- Carpool. Bought a hybrid. Don't drive on **Spare The Air** days.
- Just walking, bicycling, carpooling, that's about it.
- Carpooled, we just got a bunch of us who work together we just carpooled together.
- I use a bike and public transportation.
- Either carpool or ride a bike if it's local.
- I am in an area where I can walk to the store and other places I need to get to.
- I car pool with my husband. To **Spare The Air** and help the environment. I don't drive once I get to work. I mean just limit and plan things so I don't have to make extra trips.
- I go to the station and take rail to work then back home. I do that five days a week. I only drive to the station, which is five minutes from the house.
- I ride the light rail to commute to work and I bike to work two days a week.



- I take public transportation to and from the office, and I bundle my chores. Bike.
 - I work in Sacramento, so I take the bus to work every day. I carpool a lot, too. If my friends and I, or my family and I, are going to the same place, we take one car.
 - Walking to places I would go to instead of driving there.
 - Public transportation and give others a ride to work.
 - Rode my bike more. That's what I was doing when you called. I was getting ready to step out and ride.
 - Used Amtrak and bicycle.
 - We have done our shopping ahead, we go out in the early mornings and walk instead of driving, and my husband carpools his employees, instead of them all driving alone he has his employees meet at our home, instead of them all driving to the work site.”

A few representative comments by those who combine trips include:

- “By combining errands and making one trip a week than four or five.
- Combine all my trips into one day and one area.
- By combining my stops when I go out make list of all the places I need to stop and where they are located so I know where they are. That's about it and that in itself reduces the amount of times I go out.
- Combined trips, for instance like shopping and picking up the kids. We're fortunate that we live not in a small town but all the services we need are very close, like less than a mile.
- Combining trips. I have two cars and I use my hybrid as much as possible and I usually don't drive during **Spare The Air** days.
- Consolidate trips, do more during trips.
- Consolidating trips and stop by on the way home while out instead of making a separate trip. I try to be as efficient as possible.
- I combine my errands so I don't have to run them individually. Less trips. I try to not drive during the heat of the day, usually either earlier in the day or later in the evening.
- I combine several objectives for one trip. I postpone a lot of errands until I have a lot to do in one trip. I choose the cooler part of the day to do things in my car.
- I just run better errands. More comprehensive errands. Well, you make a list and you decide where you're starting and where you're ending.
- Just consolidating errands. Just multiple trips that I normally do separately, I consolidate them. Don't drive as much.
- Mostly just conserve on trips, compact them together so you go out once and do four or five different things instead of going out four or five different times.
- Write a list and get everything I need on that one trip. Instead of oops I forgot something.”

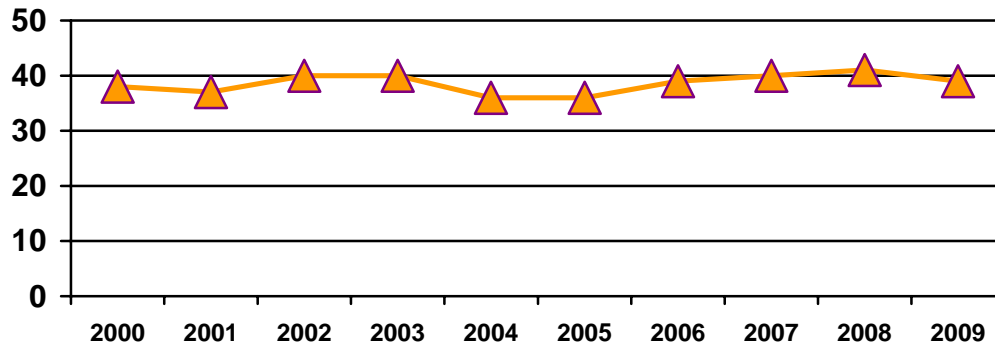
Year-To-Year Comparisons

- 32 ➤ *The percent of drivers who seasonally reduce the number of trips they make during the summer months has remained relatively stable over the past ten years (average is 39%). This is supported by the fact that these drivers have consistently made fewer trips than those who said they don't habitually reduce their driving during the summer.***

The ten year year-to-year analysis excludes respondents from El Dorado County AQMD as they were not interviewed in evaluations prior to 2004. Results from the Sacramento Core Region (SMAQMD, Yolo-Solano AQMD and Placer County APCD) have been appropriately re-weighted. As can be seen in the next graph, the percentage of respondents who said they usually reduce the amount of driving they do during the summer to avoid adding to air pollution has remained relatively stable at approximately four-in-ten from 2000 to the present. The ten-year average is actually 39%.



Year-To-Year Comparison of Percent of Respondents Who Seasonally Reduce Driving to Avoid Adding to Air pollution: Sacramento Core Region



33 ➤ *The ten-year average number of trips avoided on an average summer day by seasonal reducers was 0.7. This varied from a high of 1.1 trips in 2001 and 2003 to a low of .4 trips in 2008.*

The average numbers of self-reported trips made by respondents⁵⁴ the day before the interview for the last ten years are presented in the next table. In every year since 2000, seasonal reducers reported making significantly fewer trips than the group who said they do not usually reduce driving during the summer. It can be seen that the average number of additional trips avoided by seasonal reducers (that is, the difference between reducers and non-reducers) ranged from .4 of a trip per day to just over 1 trip per day. **In other words, a substantial subset of the population of respondents in the Spare The Air evaluations habitually reduce the amount of driving they do during the summer months.** Some of these individuals may not qualify as episodic reducers on specific Spare The Air days for methodological reasons (i.e. they may not have driven “less” on a specific Spare The Air day because they already had reduced their driving).

<i>Year</i>	<i>Seasonal Driving Reducers: Mean # Times Entered Vehicle</i>	<i>Non-Reducers: Mean # Times Entered Vehicle</i>	<i>Difference (Mean Number of Daily Single Trips Avoided by Seasonal Reducers)</i>	<i>Statistically Significant Difference?</i>
2000	3.6	4.1	0.5	Yes
2001	3.1	4.2	1.1	Yes
2002	3.1	4.1	1.0	Yes
2003	3.1	4.2	1.1	Yes

⁵⁴ Excludes El Dorado County AQMD results. The very first question of the survey asked respondents “Thinking just about yesterday, how many different TIMES did you get into a car, truck, or van to drive?” This was before any mention of air quality or Spare The Air or driving habits was asked and therefore is likely a fairly accurate self-report.



<i>Year</i>	<i>Seasonal Driving Reducers: Mean # Times Entered Vehicle</i>	<i>Non-Reducers: Mean # Times Entered Vehicle</i>	<i>Difference (Mean Number of Daily Single Trips Avoided by Seasonal Reducers)</i>	<i>Statistically Significant Difference?</i>
<i>2004</i>	<i>3.4</i>	<i>3.9</i>	<i>0.5</i>	<i>Yes</i>
<i>2005</i>	<i>3.0</i>	<i>3.5</i>	<i>0.5</i>	<i>Yes</i>
<i>2006</i>	<i>2.9</i>	<i>3.6</i>	<i>0.7</i>	<i>Yes</i>
<i>2007</i>	<i>3.2</i>	<i>3.8</i>	<i>0.6</i>	<i>Yes</i>
<i>2008</i>	<i>2.9</i>	<i>3.3</i>	<i>0.4</i>	<i>Yes</i>
<i>2009</i>	<i>2.6</i>	<i>3.4</i>	<i>0.8</i>	<i>Yes</i>