



# Danger in the Air:

Unhealthy Air Days in 2010 and 2011

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# Table of Contents

Executive Summary .....	1
Smog Pollution Threatens Public Health .....	4
Sources of Smog Pollution .....	6
Standards Must Be Set to Protect Public Health .....	7
National Health Standard for Ozone .....	7
Alerting the Public: Air Quality Index .....	7
Report Findings .....	9
The Smoggiest Metropolitan Areas in 2010 .....	9
National Rankings .....	9
Rankings By Population Size .....	10
Rankings by Geography .....	13
The Smoggiest Metropolitan Areas So Far in 2011 .....	16
Worse Than We Thought: Additional Days of Unhealthy Air in 2010 and 2011.....	17
Policy Recommendations .....	18
Methodology .....	20
Appendices .....	21
Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010 .....	21
Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size .....	29
Smog Days in 2010 in Large Metropolitan Areas .....	29
Smog Days in 2010 in Mid-Sized Metropolitan Areas .....	31
Smog Days in 2010 in Small Metropolitan Areas .....	34
Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State .....	37
Appendix D. Smog Days in 2011 by Combined Statistical Areas, through August 21, 2011 .....	48
Appendix E. Smog Days in 2010 by State .....	51
Endnotes .....	53



# Executive Summary

All Americans should be able to breathe clean air. But pollution from power plants and vehicles puts the health of our nation's children and families at risk. Ground-level ozone, the main component of smog, is one of the most harmful and one of the most pervasive air pollutants. According to the American Lung Association, nearly half of all Americans – 48 percent – still live in areas with unhealthy levels of smog pollution. Studies show that on days with high concentrations of smog pollution in the air, children and adults suffer more asthma attacks, increased respiratory difficulty, and reduced lung function. Exposure to smog pollution can exacerbate respiratory illness and even cause premature death. Sensitive populations including children, the elderly, and people with respiratory illness are particularly at risk of the adverse health effects of air pollution.

Though air quality has improved significantly in the last decade as a result of policies at the state and federal level, there is still much to be done, as there are millions of people living in metropolitan areas around the country exposed to multiple days each summer when the air is unhealthy to breathe. This report ranks metropolitan areas for their unhealthy air days in 2010 and 2011.

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*There are millions of people living in metropolitan areas around the country exposed to multiple days each summer when the air is unhealthy to breathe.*

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This report also presents data indicating that the problem may have been even worse than we thought. Because the national health standard for smog pollution set in 2008 was set at a level that scientists agree is not protective of public health, people across the country have been exposed to days of poor air quality each summer without even knowing it. We have calculated the additional days on which the air was unhealthy to breathe, according to a pollution threshold that is more consistent with what scientists say is necessary to protect public health. But because the 2008 standard was set too loosely, the public was not alerted to these days of unhealthy air.

The major data and findings of our report are broken down into the following categories:

**National rankings of the smoggiest metropolitan areas across the country in 2010:** The top five smoggiest metropolitan areas in the country in 2010 were in California. Riverside-San Bernardino, CA ranked as the smoggiest metropolitan area in the country with 110 smog days – meaning that the area, home to more than 3 million residents, had unhealthy air on one out of three days in 2010. Baltimore, MD; Washington, DC-MD-VA-WV; Philadelphia, PA-NJ; Houston, TX; and Atlanta, GA made up the rest of the top-ten smoggiest metropolitan areas list for 2010.

#### **Rankings of smoggiest cities across the country by population size:**

- Of large metropolitan areas, or those with populations over 1 million people, Riverside-San Bernardino, California suffered the worst smog pollution in 2010 by far, with 41 more days than the area in second place: Los Angeles-Long Beach, CA. The top five continue with Baltimore, MD; Washington, DC-VA-MD-WV; and Philadelphia, PA-NJ. Two metropolitan areas in each of the following states were among the top 20 smoggiest large areas for 2010: New Jersey, New York, North Carolina, Ohio, Pennsylvania, and Texas.
- Among mid-sized metropolitan areas, or those with populations between 250,000 and 1 million people, areas in California again topped the list for worst smog pollution, followed by areas in Tennessee, Delaware, New Jersey, Louisiana, Alabama and Ohio. The top twenty smoggiest mid-sized metropolitan areas include three areas in both Ohio and Pennsylvania and two areas each in Louisiana, Texas and Connecticut.
- San Luis Obispo-Atascadero-Paso Robles, California was the smoggiest small metropolitan area (population less than 250,000) in 2010. Three places in Wisconsin were among the top 10 smoggiest small metropolitan areas.

**State-by-state rankings of smog in 2010:** Across the state of California, there were 135 days in 2010, or more than a third of the year, when at least part of the state experienced smog levels exceeding the health standard. California, Texas, Utah, Maryland, Pennsylvania, New Jersey, Ohio and New York each had at least 30 days in 2010 when part of the state experienced smog levels exceeding the health standard – as many as a month’s worth of days when breathing the air could put people’s health at risk. Seventeen states experienced at least one “red alert” day for unhealthy air, indicating pollution levels high enough in a particular area so that anyone could start experiencing adverse health effects. Nine states did not record any days in 2010 on which levels of smog pollution exceeded the standard: Alaska, Hawaii, Idaho, Montana, Nebraska, North Dakota, South Dakota, Vermont and Wyoming.

**National rankings of the smoggiest metropolitan areas across the country in 2011, through August 21:** The areas of Los Angeles-Long Beach-Riverside, CA; Atlanta-Sandy Springs-Gainesville, GA-AL; Fresno-Madera, CA; Washington-Baltimore-Northern Virginia, DC-MD-VA-WV; and New York-Newark-Bridgeport, NY-NJ-CT-PA are the top five areas with the most smog days so far this summer, through August 21, 2011.

**The air was unhealthy to breathe many more times in 2010 and in 2011 than the public was alerted to because the 2008 standard was not set at a level to protect public health.** To demonstrate the discrepancy between the ozone standard set in 2008 (75 parts per billion) and a level that scientists agree is more protective of public health (60-70 parts per billion), this report also looks at the number of times that air monitors recorded a level of 71-75 ppb in 2010, and calculates how many additional days in each metropolitan area the public was exposed to unhealthy air according to a more protective level of 70 ppb. For example, in the Riverside-San Bernardino, CA area, there were 110 days when pollution levels exceeded the existing health standard, but there were an additional 25 days on which pollution levels exceeded a level that scientists agree is more protective of public health.





credit: "Los Angeles Smog," Ben Amstutz, Creative Commons.

## Policy Recommendations

To protect the health of our children and people across the country, many steps can be taken both at the state and federal level to reduce dangerous pollution.

First, EPA must set a National Ambient Air Quality Standard for ground-level ozone within the range of 60 to 70 parts per billion averaged over eight hours, as unanimously recommended by the independent board of air experts and scientists created under the Clean Air Act to provide periodic review and recommendations on air quality standards. The Obama administration considered updating the 2008 standard, but decided in early September 2011 to abandon this effort and update the standard in 2013.

Pollution from cars and trucks, which accounts for a third of smog-forming nitrogen oxide emissions in the United States, must be cleaned up by developing cleaner and more efficient vehicles and by improving and expanding public transportation systems.

State and federal governments should accelerate the transition away from fossil fuels and toward a clean energy economy, by passing policies to ensure we get more of our energy from clean, renewable sources such as wind and solar power.

Lastly, Congress should eliminate subsidies that help keep our nation dependent on polluting fossil fuels that put our health and environment at risk.

# Smog Pollution Threatens Public Health

Outdoor or “ambient” air pollution in the United States is a direct threat to public health. Ground-level ozone, the primary component of smog, is one of the most harmful air pollutants and is also one of the most pervasive. According to the American Lung Association, nearly half of all Americans - 48 percent - live in areas with unhealthy levels

of smog pollution.<sup>i</sup> Children, older adults, and people with respiratory illness are particularly vulnerable to the health effects of smog pollution.

Repeated exposure to smog pollution can cause permanent lung damage and even premature death. Smog pollution reacts with airway tissues and pro-

## **On days with high levels of smog pollution:**

- Deaths from cardiovascular and respiratory causes increase, according to a 14-year study conducted in 95 U.S. cities.<sup>iv</sup>
- Hospitals admit increased numbers of patients for respiratory and cardiovascular disease.<sup>v</sup> Scientists have estimated that typical summertime smog pollution is responsible for up to half of all respiratory hospital admissions on bad air days.<sup>vi</sup>
- More people visit hospital emergency rooms for asthma, pneumonia and upper respiratory infections.<sup>vii</sup> According to a RAND Corporation health study, in California alone, high levels of smog pollution contributed to nearly 30,000 emergency room visits and hospital admissions and \$193 million in hospital medical care expenses from 2005 to 2007.<sup>viii</sup>
- Children and adults suffer more asthma attacks, increased respiratory difficulty and reduced lung function.<sup>ix</sup> Approximately 3.2 million children and nearly 9.5 million adults with asthma live in regions with very high levels of smog pollution.<sup>x</sup> According to the U.S. Department of Health and Human Services, approximately 5,000 asthma-related deaths occur each year in the United States.<sup>xi</sup>
- Even healthy adults can experience a reduction in lung function of between 15 percent and more than 20 percent from exposure to low levels of ozone over several hours of moderate exercise.<sup>xii</sup>
- More adults miss work and more children miss school due to illness.<sup>xiii</sup>



credit: "Inhalation," Vladislav Gajic, Shutterstock

duces inflammation similar to sunburn on the inside of the lungs. This inflammation makes lung tissues less elastic, more sensitive to allergens, and less able to ward off infections.<sup>ii</sup> Exposure to smog can cause coughing, wheezing and throat irritation. Constant exposure to smog over time permanently damages lung tissues, decreases the ability to breathe normally, and exacerbates or even causes chronic diseases like asthma.<sup>iii</sup> Studies show that on days with high concentrations of smog pollution in the air, children and adults suffer more asthma attacks, increased respiratory difficulty and reduced lung function.

Damaging health effects from smog pollution can occur without any noticeable signs. People who live in areas with frequently high smog levels *may* find that their initial symptoms go away over time – particularly when exposure to high smog levels continues for several days;<sup>xiv</sup> yet smog pollution still causes lung damage even when acute symptoms are not noticeable. Smog exposure can also impact prenatal health, with research finding that in-utero exposure to smog pollution is associated with lower birth weight and intrauterine growth retardation.<sup>xv</sup>

Children, older adults, people who are active outdoors and people with existing respiratory system ailments suffer most from smog pollution. The American Lung Association estimates that more than 54 million people under the age of 18 or over the age of 65 live in counties in the United States with unhealthy levels of smog pollution.<sup>xvi</sup> Because children's respiratory systems are still developing, children who grow up in areas with high levels of smog pollution are at risk for developing permanently diminished lung capacity, increasing the risk of lung disease later in life.<sup>xvii</sup> Additionally, older adults exposed to high levels of smog pollution may experience an accelerated decline in lung function.<sup>xviii</sup>

For individuals suffering from asthma, exposure to smog pollution can make the lungs more sensitive to allergens and/or trigger a narrowing of the pathways of the lungs, so that breathing becomes like trying to suck a thick milkshake through a straw.<sup>xix</sup>

Additionally, smog pollution poses greater risks to people suffering from chronic bronchitis, emphysema, cardiovascular disease and diabetes.<sup>xx</sup>

# Sources of Smog Pollution

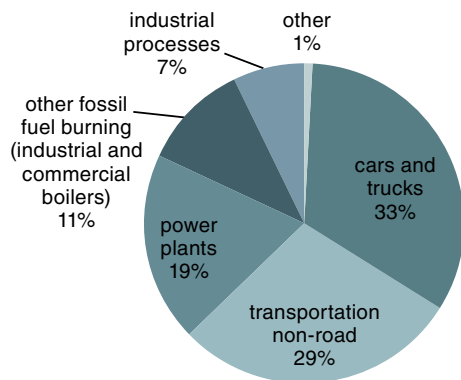
Ozone is a clear gas composed of three oxygen atoms that occurs both in the Earth's upper atmosphere and at ground level. Ozone that occurs in the upper atmosphere is generally natural in origin and forms a protective layer that shields life on Earth from the sun's harmful ultra-violet rays. This "good" ozone layer extends upward from approximately 6 to 30 miles above the Earth's surface.<sup>xxi</sup> At ground level, however, ozone can cause serious health problems.

Ground-level ozone, the primary component of smog, is not emitted directly from pollution sources but rather forms when nitrogen oxide (NOx) emissions and volatile organic compounds (VOCs) react in

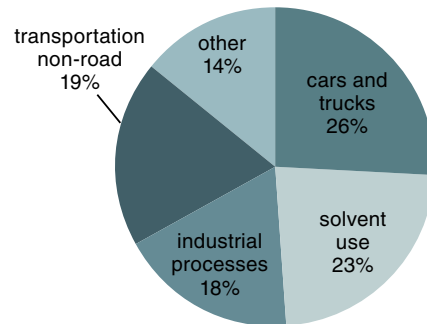
the presence of heat and sunlight. Smog pollution is of particular concern during the summer months, from May to October, because higher temperatures and more abundant sunlight result in the build-up of higher ozone concentrations, putting public health at risk from smog pollution.

NOx and VOCs are produced by a variety of industrial and transportation sources. Burning fossil fuels to power our transportation sector, generate electricity, and power other industry produces 92 percent of all U.S. NOx emissions (see Figure 1)<sup>xxii</sup>. VOCs come from a range of sources, including transportation and industrial facilities (see Figure 2)<sup>xxiii</sup>.

**Figure 1. U.S. NOx Emissions by Sector, 2008**



**Figure 2. U.S. VOC Emissions by Sector, 2008**



2008 is the most recent year for which complete emissions data are available. While EPA estimates emissions data annually, the agency inventories sources only every three years.

# Standards Must Be Set to Protect Public Health

## **NATIONAL HEALTH STANDARD FOR OZONE**

Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) for several pollutants, including ground-level ozone pollution. The primary health-based standards are required by law to be set at levels that are protective of public health with an adequate margin of safety, reflecting the latest science on the health impacts of the pollutant being regulated. Under the law, these standards must be re-evaluated and revised as necessary every five years. EPA is not permitted to take costs of implementation into account in setting NAAQS for a pollutant. Areas with high levels of pollution exceeding the standards must implement clean-up measures to protect public health.

In 2008, EPA updated the ozone standard from 80 parts per billion (ppb) averaged over an 8-hour period (set in 1997) to 75 ppb, to increase public health protections. However, this 75 ppb standard, set by then Administrator Stephen L. Johnson, was weaker than the recommendation of the independent board of air experts and scientists, the Clean Air Scientific Advisory Committee (CASAC), created by the Clean Air Act to provide recommendations to EPA's periodic review of the NAAQS. After reviewing more than 1,700 studies of the health impacts of ozone, the CASAC

unanimously recommended that the 2008 primary ozone standard be set within the range of 60-70 ppb averaged over eight hours, to protect public health. Scientists thus agree that the 2008 standard of 75 ppb is not adequate to protect public health.

In January 2010, EPA Administrator Lisa P. Jackson formally decided to reconsider the 2008 primary standard for ozone. In March 2011, the CASAC again reiterated its position that the science supports a tighter standard within 60-70 ppb in order to protect public health. However, in early September 2011, the Obama administration announced that it would not update the standard until 2013.

## **ALERTING THE PUBLIC: AIR QUALITY INDEX**

EPA's Air Quality Index (AQI) is based on the national health-based ambient air quality standards and is meant to help people understand what local air quality means to their health. Local news outlets report air quality by the AQI to inform the public of the best ways to protect their health at varying levels of air pollution.

The AQI has color-coded categories ranging from green (good air quality) to purple (very unhealthy air quality). The "orange-alert" level indicates to the pub-

lic that air pollution levels are high enough to affect sensitive populations, including children, older adults, and people with respiratory or cardiovascular illness. At the “red-alert” level, anyone may begin to experience some adverse health effects, and members of sensitive groups may experience more serious effects. The AQI is standardized across pollutants on a 0-300 scale,

where 100 equals the current air quality standard for each pollutant.

See Figure 3 for a detailed look at EPA’s Air Quality Index for ground-level ozone and what it means for public health.

**Figure 3. EPA’s Air Quality Index for Ground-Level Ozone<sup>xxiv</sup>**

AQI	Level of Health Concern	8-Hour Ozone Concentration (parts per billion)	EPA’s Recommendations to Protect Health
0-50	Green (good)	0-59 ppb	None.
51-100	Yellow (moderate)	60-75 ppb	Unusually sensitive people should consider reducing prolonged or heavy exertion.
101-150	Orange (Unhealthy for Sensitive Groups)	76-95 ppb	The following groups should <u>reduce prolonged</u> or <u>heavy</u> outdoor exertion: people with lung disease, such as asthma; children and older adults; people who are active outdoors.
151-200	Red (Unhealthy)	96-115 ppb	The following groups should <u>avoid prolonged</u> or <u>heavy</u> outdoor exertion: people with lung disease, such as asthma; children and older adults; people who are active outdoors. Everyone else should limit prolonged outdoor exertion.
201-300	Purple (Very Unhealthy)	116-374 ppb	The following groups should <u>avoid all</u> outdoor exertion: people with lung disease, such as asthma; children and older adults; people who are active outdoors. Everyone else should limit outdoor exertion.



# Report Findings

This report examines smog pollution levels in 2010 and 2011 from the nation's networks of ozone air quality monitors, as reported to the U.S. EPA from the states. Though air quality has improved significantly in the last decade, there is still much to be done, as there are millions of people living in metropolitan areas around the country exposed to multiple days each summer when the air is unhealthy to breathe.

This report documents the number of days that smog pollution levels exceeded the 2008 national ozone standard for the calendar year 2010 and for 2011 through Aug 21, 2011, by metropolitan area. Metropolitan areas have varying numbers of air quality monitors, so we've analyzed air quality primarily by the number of "smog days," or days on which at least one air quality monitor in the given area exceeded the national primary ozone standard. We've used U.S. Census-designated Metropolitan Statistical Areas and Primary Metropolitan Statistical Areas for the geographic breakdown of metropolitan areas for 2010, and larger Combined Statistical Areas that encompass multiple cities for 2011.

This report also presents data indicating that the problem may have been worse than we thought. We've calculated the number of additional days that the air was unhealthy to breathe according to the latest scientific studies, but that the public was not

alerted to because the 2008 standard was set outside of scientific recommendations.

## **THE SMOGGIEST METROPOLITAN AREAS IN 2010**

### **National Rankings**

The top five smoggiest metropolitan areas in the country in 2010 were in California. Riverside-San Bernardino, CA ranked as the smoggiest city in the country with 110 smog days – meaning that the area, home to more than 3 million residents, had unhealthy air on one out of three days in 2010. Twenty-four of those days were categorized as "red-alert days," meaning that air quality was so poor that anyone could experience adverse health effects, and that sensitive populations – children, the elderly, and people with respiratory illness – could experience worse effects. The Riverside-San Bernardino area also experienced the only two "purple-alert" days recorded in a metropolitan area in 2010, where the air was so unhealthy that everyone was alerted to limit their outdoor exertion, and sensitive groups were alerted to avoid all outdoor exertion.

Areas along the East Coast and in Texas made up the rest of the top ten smoggiest areas list for 2010. See Table 1 for the top twenty smoggiest metropolitan areas in the country, and Appendix A for a full ranking of metropolitan areas across the country.

**Table 1. Top Smoggiest Areas in the United States, 2010**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Exceedance (ppb)
1	Riverside-San Bernardino, CA	3,254,821	110	24	2	123
2	Visalia-Tulare-Porterville, CA	368,021	78	6	0	104
3	Bakersfield, CA	661,645	69	10	0	107
3	Los Angeles-Long Beach, CA	9,519,338	69	3	0	105
5	Fresno, CA	922,516	42	6	0	104
6	Baltimore, MD	2,552,994	33	6	0	115
6	Washington, DC-MD-VA-WV	4,923,153	33	3	0	100
8	Philadelphia, PA-NJ	5,100,931	29	3	0	101
9	Houston, TX	4,177,646	27	1	0	97
10	Atlanta, GA	4,112,198	23	1	0	98
10	Sacramento, CA	1,628,197	23	4	0	112
10	St. Louis, MO-IL	2,603,607	23	0	0	91
13	Knoxville, TN	687,249	20	0	0	84
14	Louisville, KY-IN	1,025,598	19	1	0	96
15	Monmouth-Ocean, NJ	1,126,217	18	0	0	95
15	Wilmington-Newark, DE-MD	586,216	18	0	0	90
17	Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	96
17	Middlesex-Somerset-Hunterdon, NJ	1,169,641	17	0	0	94
17	San Luis Obispo-Atascadero-Paso Robles, CA	246,681	17	0	0	90
20	Cleveland-Lorain-Elyria, OH	2,250,871	15	0	0	90
20	Fort Worth-Arlington, TX	1,702,625	15	0	0	94
20	Trenton, NJ	350,761	15	0	0	95

### Rankings By Population Size

In addition to the national rankings, we ranked metropolitan areas based on smog days in two other ways to draw comparisons among areas of similar size and geography, since smog pollution levels can vary highly across both spectrums. For example, larger cities may experience more smog pollution than smaller cities due to increased vehicle and industrial emissions. In order to compare cities of similar sizes, we divided metropolitan areas into three categories, and ranked them by the number of smog days within those size categories: large metropolitan areas with populations above 1 million, mid-sized metropolitan areas with populations between 250,000 and 1 million, and small metropolitan areas with populations under 250,000. Second, since smog pollution varies by geography as well, we've ranked metropolitan areas within each state for smog days. The top areas in each of these

categories is discussed below, and for the full ranking of metropolitan areas by size, see Appendix B; for the full list of metropolitan areas ranked by smog days within each state, see Appendix C.

Of large metropolitan areas, or those with populations over 1 million people, Riverside-San Bernardino, California suffered the worst smog pollution in 2010 by far, with 41 more smog days than the area in second place: Los Angeles-Long Beach, CA. The top five continue with Baltimore, MD; Washington, DC-VA-MD-WV; and Philadelphia, PA-NJ. Two metropolitan areas in each of the following states were among the top 20 smoggiest large areas: New Jersey, New York, North Carolina, Ohio, Pennsylvania and Texas. A list of the top 30 large metropolitan areas with the worst smog pollution in 2010 can be found in Table 2.



**Table 2. Top Smoggiest Large Metropolitan Areas, 2010**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Exceedance (ppb)
1	Riverside-San Bernardino, CA	3,254,821	110	24	2	123
2	Los Angeles-Long Beach, CA	9,519,338	69	3	0	105
3	Baltimore, MD	2,552,994	33	6	0	115
3	Washington, DC-MD-VA-WV	4,923,153	33	3	0	100
5	Philadelphia, PA-NJ	5,100,931	29	3	0	101
6	Houston, TX	4,177,646	27	1	0	97
7	Atlanta, GA	4,112,198	23	1	0	98
7	Sacramento, CA	1,628,197	23	4	0	112
7	St. Louis, MO-IL	2,603,607	23	0	0	91
10	Louisville, KY-IN	1,025,598	19	1	0	96
11	Monmouth-Ocean, NJ	1,126,217	18	0	0	95
12	Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	96
12	Middlesex-Somerset-Hunterdon, NJ	1,169,641	17	0	0	94
14	Cleveland-Lorain-Elyria, OH	2,250,871	15	0	0	90
14	Fort Worth-Arlington, TX	1,702,625	15	0	0	94
16	Cincinnati, OH-KY-IN	1,646,395	14	0	0	94
16	New York, NY	9,314,235	14	1	0	113
16	San Diego, CA	2,813,833	14	0	0	90
19	Greensboro-Winston Salem-High Point, NC	1,251,509	13	0	0	93
19	Memphis, TN-AR-MS	1,135,614	13	0	0	91
19	Nassau-Suffolk, NY	2,753,913	13	0	0	92
19	Pittsburgh, PA	2,358,695	13	1	0	105
23	Dallas, TX	3,519,176	12	0	0	87
23	Detroit, MI	4,441,551	12	0	0	89
25	Denver, CO	2,109,282	11	0	0	89
26	Chicago, IL	8,272,768	10	0	0	88
26	Nashville, TN	1,231,311	10	0	0	88
26	Phoenix-Mesa, AZ	3,251,876	10	0	0	85
29	Las Vegas, NV-AZ	1,563,282	9	0	0	84
29	Newark, NJ	2,032,989	9	0	0	94

Among mid-sized metropolitan areas, or those with populations between 250,000 and 1 million people, areas in California again topped the list for worst smog pollution, followed by areas in Tennessee, Delaware, New Jersey, Louisiana, Alabama and Ohio. See Table 3 for the top twenty rankings among mid-sized metropolitan areas, which include three areas in both Ohio and Pennsylvania and two areas each in Louisiana, Texas and Connecticut.

**Table 3. Top Smoggiest Mid-Sized Metropolitan Areas, 2010**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Highest Exceedance (ppb)
1	Visalia-Tulare-Porterville, CA	368,021	78	6	104
2	Bakersfield, CA	661,645	69	10	107
3	Fresno, CA	922,516	42	6	104
4	Knoxville, TN	687,249	20	0	84
5	Wilmington-Newark, DE-MD	586,216	18	0	90
6	Trenton, NJ	350,761	15	0	95
7	Baton Rouge, LA	602,894	14	0	89
7	Birmingham, AL	921,106	14	0	88
7	Hamilton-Middletown, OH	332,807	14	0	86
10	Beaumont-Port Arthur, TX	385,090	13	0	91
10	Lancaster, PA	470,658	13	0	95
10	Ventura, CA	753,197	13	0	90
13	Allentown-Bethlehem-Easton, PA	637,958	12	0	94
14	Dayton-Springfield, OH	950,558	11	0	82
14	Modesto, CA	446,997	11	1	96
14	Stamford-Norwalk, CT	353,556	11	0	91
17	Richmond-Petersburg, VA	996,512	10	2	98
18	Bridgeport, CT	459,479	9	0	80
18	Shreveport-Bossier City, LA	392,302	9	0	90
20	Canton-Massillon, OH	406,934	8	0	88
20	Galveston-Texas City, TX	250,158	8	0	91
20	Greenville-Spartanburg-Anderson, SC	962,441	8	0	82
20	Reading, PA	373,638	8	0	87

San Luis Obispo-Atascadero-Paso Robles, California was the smoggiest small metropolitan area (population less than 250,000) in 2010. Three places in Wisconsin were among the top 10 (see Table 4).

**Table 4. Top Smoggiest Small Metropolitan Areas, 2010**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Highest Exceedance (ppb)
1	San Luis Obispo-Atascadero-Paso Robles, CA	246,681	17	0	90
2	Brazoria, TX	241,767	11	0	94
2	Merced, CA	210,554	11	1	96
4	Danbury, CT	217,980	7	1	97
4	Kenosha, WI	149,577	7	0	89
4	Sheboygan, WI	112,646	7	0	92
7	Jamestown, NY	139,750	6	0	89
7	Longview-Marshall, TX	208,780	6	0	80
7	Racine, WI	188,831	6	0	84
7	Vineland-Millville-Bridgeton, NJ	146,438	6	0	83
11	Dover, DE	126,697	5	0	92
11	Hagerstown, MD	131,923	5	0	90
11	Lake Charles, LA	183,577	5	0	84
11	New Bedford, MA	175,198	5	0	81
11	Parkersburg-Marietta, WV-OH	151,237	5	0	79
16	Chico-Paradise, CA	203,171	4	0	78
16	Sharon, PA	120,293	4	0	82
16	Steubenville-Weirton, OH-WV	132,008	4	0	83
16	Wheeling, WV-OH	153,172	4	0	82
16	Yuma, AZ	160,026	4	0	84
21	Altoona, PA	129,144	3	0	84
21	Charlottesville, VA	159,576	3	0	79

## Rankings by Geography

Smog pollution varies by geography, as well. Some states create more pollution than others, and other states are subject to air pollution blowing into their borders from upwind states. Some states also have geography and weather patterns that make them inherently more subject to the development of smog than others. We've both ranked metropolitan areas within each state for smog days (see Table 5 for the smoggiest area in each state and Appendix C for a full list of metropolitan areas by state) and calculated the number of smog days for each state as a whole (Table 6). The numbers presented for full states include all the ozone-monitoring stations in the state, including monitoring stations not in metropolitan statistical areas.

Across the state of California, there were 135 days in 2010, or more than a third of the year, when at least part of the state experienced smog levels exceeding the health standard. California, Texas, Utah, Maryland, Pennsylvania, New Jersey, Ohio and New York each experienced at least 30 days in 2010 when part of the state experienced smog levels exceeding the health standard – as many as a month's worth of days when breathing the air could put people's health at risk. Seventeen states experienced at least one "red alert" day for unhealthy air, indicating pollution levels high enough in a particular area so that anyone could start experiencing adverse health effects. Nine states did not record any days on which levels of smog pollution exceeded the standard in 2010: Alaska, Hawaii, Idaho, Montana, Nebraska, North Dakota, South Dakota, Vermont and Wyoming.

**Table 5. Smoggiest Metropolitan Area in Each State, 2010**

State	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Exceedance (ppb)
Alabama	Birmingham, AL	921,106	14	0	0	88
Arizona	Phoenix-Mesa, AZ	3,251,876	10	0	0	85
Arkansas	Memphis, TN-AR-MS	1,135,614	13	0	0	91
California	Riverside-San Bernardino, CA	3,254,821	110	24	2	123
Colorado	Denver, CO	2,109,282	11	0	0	89
Connecticut	Stamford-Norwalk, CT	353,556	11	0	0	91
DC	Washington, DC-MD-VA-WV	4,923,153	33	3	0	100
Delaware	Wilmington-Newark, DE-MD	586,216	18	0	0	90
Florida	Pensacola, FL	412,153	3	0	0	88
Georgia	Atlanta, GA	4,112,198	23	1	0	98
Illinois	St. Louis, MO-IL	2,603,607	23	0	0	91
Indiana	Louisville, KY-IN	1,025,598	19	1	0	96
Kansas	Kansas City, MO-KS	1,776,062	6	0	0	84
Kentucky	Louisville, KY-IN	1,025,598	19	1	0	96
Louisiana	Baton Rouge, LA	602,894	14	0	0	89
Maine	Portland, ME	243,537	2	1	0	96
	Portsmouth-Rochester, NH-ME	240,698	2	0	0	81
Maryland	Baltimore, MD	2,552,994	33	6	0	115
	Washington, DC-MD-VA-WV	4,923,153	33	3	0	100
Massachusetts	New Bedford, MA	175,198	5	0	0	81
	Springfield, MA	591,932	5	0	0	91
Michigan	Detroit, MI	4,441,551	12	0	0	89
Mississippi	Memphis, TN-AR-MS	1,135,614	13	0	0	91
Missouri	St. Louis, MO-IL	2,603,607	23	0	0	91

**Table 5. Smoggiest Metropolitan Area in Each State, 2010, Continued**

State	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Exceedance (ppb)
Nevada	Las Vegas, NV-AZ	1,563,282	9	0	0	84
New Hampshire	Boston, MA-NH	3,406,829	3	0	0	83
New Jersey	Philadelphia, PA-NJ	5,100,931	29	3	0	101
New Mexico	Las Cruces, NM	174,682	2	0	0	84
New York	New York, NY	9,314,235	14	1	0	113
North Carolina	Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	96
Ohio	Cleveland-Lorain-Elyria, OH	2,250,871	15	0	0	90
Oklahoma	Oklahoma City, OK	1,083,346	3	0	0	79
Oregon	Portland-Vancouver, OR-WA	1,918,009	1	0	0	94
	Salem, OR	347,214	1	0	0	78
Pennsylvania	Philadelphia, PA-NJ	5,100,931	29	3	0	101
Rhode Island	New London-Norwich, CT-RI	293,566	3	0	0	78
	Providence-Fall River-Warwick, RI-MA	1,188,613	3	0	0	86
South Carolina	Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	96
Tennessee	Knoxville, TN	687,249	20	0	0	84
Texas	Houston, TX	4,177,646	27	1	0	97
Utah	Salt Lake City-Ogden, UT	1,333,914	4	0	0	91
Virginia	Washington, DC-MD-VA-WV	4,923,153	33	3	0	100
Washington	Portland-Vancouver, OR-WA	1,918,009	1	0	0	94
	Seattle-Bellevue-Everett, WA	2,414,616	1	0	0	77
West Virginia	Washington, DC-MD-VA-WV	4,923,153	33	3	0	100
Wisconsin	Kenosha, WI	149,577	7	0	0	89
	Sheboygan, WI	112,646	7	0	0	92

**Table 6. States Ranked by Smog Days, 2010**

State	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
California	135	37	2	123
Texas	48	1		97
Utah*	45	15	5	123
Maryland	43	7		115
New Jersey	35	2		111
Pennsylvania	35	3		105
Ohio	33			94
New York	30	1		113
Tennessee	29			88
Georgia	28	1		98
North Carolina	26	1		96
Illinois	25			88
Missouri	25			91
Virginia	25	3		98
Connecticut	24	1		101
Louisiana	23			93
Kentucky	21	1		96
Colorado	19			89
DC	18	1		100
Delaware	18	2		98
Indiana	18			86
Alabama	15			88
Arizona	14			85
Massachusetts	14	1		100
Michigan	14			91
Wisconsin	11			95

State	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
Nevada	10			84
West Virginia	10			89
Florida	9			88
Arkansas	8			91
Maine	8	1		96
New Hampshire	8			82
Oklahoma	8			86
South Carolina	8			82
Washington	8	2		110
Kansas	7			83
Mississippi	7			84
Rhode Island	6			86
New Mexico	4			84
Oregon	2			94
Iowa	1			77
Minnesota	1			76
Alaska	0			53
Hawaii	0			52
Idaho	0			73
Montana	0			65
Nebraska	0			71
North Dakota	0			70
South Dakota	0			69
Vermont	0			71
Wyoming	0			72

\*In Utah, all but 5 of the smog days recorded occurred in Jan-Mar at monitoring stations in the desert, likely as a result of natural gas exploration, and not from the usual culprits of vehicles and power plants. Smog days are more likely during summer months because pollution from vehicles and power plants reacts with heat and sunlight to form smog.

## The Smoggiest Metropolitan Areas So Far in 2011

This report also documents preliminary data on smog pollution for the summer of 2011, through August 21, 2011. As this data is preliminary from EPA, it is not broken down into the distinct metropolitan areas through which the 2010 data was reported. Rather, the data is presented for broader Combined Statistical Areas, which are larger geographic areas that encompass multiple cities, as designated by the U.S.

Census. The areas of Los Angeles-Long Beach-Riverside, CA; Atlanta-Sandy Springs-Gainesville, GA-AL; Fresno-Madera, CA; Washington-Baltimore-Northern Virginia, DC-MD-VA-WV; and New York-Newark-Bridgeport, NY-NJ-CT-PA are the top five areas with the most smog days so far this summer. A list of the top 25 areas for smog pollution in 2011 can be found in Table 7, and a full list of all areas can be found in Appendix D.

**Table 7. Top Smoggiest Combined Statistical Areas, 2011 through Aug 21 - Preliminary**

Rank	Combined Statistical Area	Smog Days in 2011	Red-Alert Days	Purple-Alert Days	Highest Exceedance (ppb)
1	Los Angeles-Long Beach-Riverside, CA	85	21	3	136
2	Atlanta-Sandy Springs-Gainesville, GA-AL	34			94
3	Fresno-Madera, CA	28	1		104
3	Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	28	7		114
5	New York-Newark-Bridgeport, NY-NJ-CT-PA	27	7		114
6	Sacramento--Arden-Arcade--Yuba City, CA-NV	23	1		97
6	St. Louis-St. Charles-Farmington, MO-IL	23	2		102
8	Charlotte-Gastonia-Salisbury, NC-SC	21			91
9	Cincinnati-Middletown-Wilmington, OH-KY-IN	20	1		97
10	Dallas-Fort Worth, TX	19			95
11	Philadelphia-Camden-Vineland, PA-NJ-DE-MD	18	3		101
12	Denver-Aurora-Boulder, CO	17	1		106

Rank	Combined Statistical Area	Smog Days in 2011	Red-Alert Days	Purple-Alert Days	Highest Exceedance (ppb)
12	Oklahoma City-Shawnee, OK	17			86
14	Birmingham-Hoover-Cullman, AL	15	1		98
14	Chicago-Naperville-Michigan City, IL-IN-WI	15			93
14	Houston-Baytown-Huntsville, TX	15	2		112
14	Knoxville-Sevierville-La Follette, TN	15	1		98
14	Louisville/Jefferson County-Elizabethtown-Scottsburg, KY-IN	15	2		100
14	Tulsa-Bartlesville, OK	15			95
20	Baton Rouge-Pierre Part, LA	12			90
20	Kansas City-Overland Park-Kansas City, MO-KS	12			90
22	Cleveland-Akron-Elyria, OH	11			90
22	Pittsburgh-New Castle, PA	11			84
24	Detroit-Warren-Flint, MI	10			88
24	Little Rock-North Little Rock-Pine Bluff, AR	10			84

## Worse Than We Thought: Additional Days of Unhealthy Air in 2010 and 2011

A strong science-based public health standard is critical to limit dangerous air pollution, but also to alert the public to unhealthy air and ways to protect health. When the standard is set outside of the boundaries of the latest scientific recommendations, as it was in 2008, it means the public may be unknowingly exposed to unhealthy levels of air pollution.

To demonstrate the discrepancy between the ozone standard set in 2008 (75 parts per billion) and a level that scientists agree is more protective of public health (60-70 parts per billion), this report also looks at the number of times that air monitors recorded smog pollution levels of 71-75 ppb in 2010, and calculates how many additional days in each metropolitan area the public was exposed to unhealthy air according to a more protective level of 70 ppb. **These numbers illustrate that the air was unhealthy to breathe many more times in 2010 and 2011 than was reported to the public.**

We've calculated additional days of unhealthy air for all metropolitan areas in 2010, states as a whole in 2010, and for Combined Statistical Areas in 2011. For example, in the Riverside-San Bernardino, CA area, there were 110 days when pollution levels exceeded the existing health standard, but there were an additional 25 days on which pollution levels exceeded a level that scientists agree is more protective of public health. The top 25 metropolitan areas with the most total days on which the area's air was unhealthy to breathe according to a more protective standard can be found in Table 8, with a side-by-side comparison between the area's smog days in 2010 and additional days of unhealthy air, with three metropolitan areas experiencing 100 or more days of unhealthy air. The additional days of unhealthy air for each metropolitan area in 2010 can be found in Appendix A, listed according to smog day rankings, and in Appendix C, listed by state.

The additional days of unhealthy air for each state in 2010 can be found in Appendix E, and the additional days for each Combined Statistical Area in 2011 can be found in Appendix D, each with a side-by-side comparison to smog days in 2010.

**Table 8. Top Metropolitan Areas with the Most Total Days the Air was Unhealthy to Breathe According to a More Protective Standard, 2010**

Rank	Metropolitan Area	Population	Total Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Smog Days in 2010	Additional Days the Air Was Unhealthy to Breathe
1	Riverside-San Bernardino, CA	3,254,821	135	110	25
2	Los Angeles-Long Beach, CA	9,519,338	101	69	32
3	Visalia-Tulare-Porterville, CA	368,021	100	78	22
4	Bakersfield, CA	661,645	93	69	24
5	Fresno, CA	922,516	59	42	17
6	Baltimore, MD	2,552,994	50	33	17
6	Washington, DC-MD-VA-WV	4,923,153	50	33	17
8	Knoxville, TN	687,249	47	20	27
9	St. Louis, MO-IL	2,603,607	41	23	18
10	Atlanta, GA	4,112,198	39	23	16
11	Sacramento, CA	1,628,197	38	23	15
12	Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	37	17	20
13	Philadelphia, PA-NJ	5,100,931	36	29	7
14	Louisville, KY-IN	1,025,598	35	19	16
15	Houston, TX	4,177,646	34	27	7
16	Middlesex-Somerset-Hunterdon, NJ	1,169,641	33	17	16
17	San Luis Obispo-Atascadero-Paso Robles, CA	246,681	32	17	15
18	Las Vegas, NV-AZ	1,563,282	31	9	22
19	Birmingham, AL	921,106	30	14	16
19	Cincinnati, OH-KY-IN	1,646,395	30	14	16
19	Wilmington-Newark, DE-MD	586,216	30	18	12
22	Greensboro-Winston Salem-High Point, NC	1,251,509	29	13	16
22	Trenton, NJ	350,761	29	15	14
24	Nashville, TN	1,231,311	28	10	18
24	New York, NY	9,314,235	28	14	14

# Policy Recommendations

Thanks to the steps EPA has already taken, air quality standards and emission controls are reducing emissions of dangerous smog-forming pollution from power plants and cars, and pollution levels have decreased in recent years. In addition, this summer EPA finalized its Cross-State Air Pollution Rule to reduce emissions of nitrogen oxides and sulfur dioxides from power plants in the eastern half of the country in order to protect families and communities downwind of dangerous smog and soot pollution. This rule is expected to save as many as 34,000 lives in 2014, and will help downwind communities meet national smog and soot standards to keep their residents safe.

However, the science is clear that the national primary standard for ozone set in 2008 at 75 parts per billion is not sufficiently protective of public health. As a result, emissions from power plants and vehicles are still too high and the public is breathing unhealthy air far too often. The primary national health standard is also what informs the Air Quality Index, EPA's tool for communicating to the public and communities that ambient air pollution levels are high enough to put public health at risk. The public has a right to know when the air is unhealthy to breathe, and having a standard that does not adhere to what the science says is sufficiently protective means that the public is sometimes unaware of unhealthy pollution levels, and

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*However, the science is clear that the national primary standard for ozone set in 2008 at 75 parts per billion is not sufficiently protective of public health.*

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as such, may not be prepared to take precautionary measures to protect their health or the health of their families.

**To protect public health, EPA must set a National Ambient Air Quality Standard for ground-level ozone within the range of 60-70 parts per billion averaged over eight hours.** This range was unanimously recommended to EPA prior to the 2008 rulemaking by the Clean Air Scientific Advisory Committee – the independent board of air experts and scientists created under the Clean Air Act to provide periodic review and recommendations on air quality standards – after they reviewed more than 1,700 studies on the health effects of smog pollution. The Clean Air Act requires that the standard be set based on protecting public health, and therefore must be set to meet the scientific recommendations.





credit: Lina Hayes, Creative Commons

**Pollution from cars and trucks accounts for a third of smog-forming nitrogen oxide emissions in the United States, and steps should be taken to reduce that pollution.** Vehicles should have the most up-to-date pollution control technology, and public transportation systems should be improved and expanded to enable people to drive less in their daily lives.

**State and federal governments should accelerate the transition away from fossil fuels and toward a clean energy economy.** Clean, renewable energy sources such as wind and solar power don't pollute our air and will never run out. Twenty-nine states already require a portion of their energy to be generated from clean, renewable sources; those states should increase their clean energy standards, and other states and the

federal government should adopt policies to ensure we get more of our energy from clean, renewable sources.

**Lastly, Congress should eliminate subsidies that help keep our nation dependent on polluting fossil fuels.** For decades, the coal and oil industry have been given hand-outs from the federal government. A 2009 report by the Environmental Law Institute found that traditional fossil fuels received more than five times more federal subsidies—including direct spending and tax breaks—than traditional renewables received during 2002-2008.<sup>xxv</sup> Electricity production incentives should target energy sources that provide benefits to our environment and our economy and that don't put our health at risk.

# Methodology

We obtained data on exceedances of the primary National Ambient Air Quality Standard for ozone, set in 2008 at 75 parts per billion averaged over eight hours, from the U.S. EPA for 2010, and for 2011 through August 21, 2011. We obtained the 2010 data from EPA's AirExplorer online tool, accessed the weeks of August 17-28, 2011. The 2011 data cited here is preliminary data compiled by EPA from multiple EPA sources and has not yet been verified; EPA does not use unverified data for regulatory purposes.

For each ozone-monitoring site, we obtained the maximum daily 8-hour ozone concentrations exceeding 75 parts per billion (ppb). We define a "smog day" as a day on which at least one monitor in a given metropolitan area exceeded the 8-hour ozone standard. We also obtained maximum daily 8-hour ozone concentrations of 71-75 ppb and calculated additional days of unhealthy air that each metropolitan area experienced, as the scientific community has recommended a standard within the range of 60-70 ppb to better protect public health. We calculated this data for 2010 for each metropolitan area and for each state. The numbers for each metropolitan area may not add up to the numbers for the particular state, because some ozone-monitoring stations are located outside of metropolitan areas. We calculated this data for 2011 for Combined Statistical Areas, which are broader geographic regions that encompass multiple cities.

A state can mark an exceedance of a standard as an

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*We define a "smog day" as a day on which at least one monitor in a given metropolitan area exceeded the 8-hour ozone standard.*

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"exceptional event" when it is caused by an unusual or naturally occurring event that is not reasonably controlled, such as a fire or fireworks. The data for 2010 does not include exceptional events; however, the data for 2011 may include exceptional events, as it is preliminary from EPA.

Metropolitan Statistical Areas (MSA) and Combined Statistical Areas (CSAs) are defined by the Office of Management and Budget. EPA compiles air quality data by MSA and CSA, as well as by county, state, and individual air quality monitors. We chose to present data by MSA and CSA to highlight pollution problems that put the public at risk in cities across the country.

The populations presented in this report for MSAs are from the 2000 decennial U.S. Census. This is because the U.S. Census only compiles population data by MSA every ten years and the data for MSA populations from the 2010 decennial census will not be ready until 2013.

# Appendices

## Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
1	Riverside-San Bernardino, CA	3,254,821	110	24	2	25	123
2	Visalia-Tulare-Porterville, CA	368,021	78	6	0	22	104
3	Bakersfield, CA	661,645	69	10	0	24	107
3	Los Angeles-Long Beach, CA	9,519,338	69	3	0	32	105
5	Fresno, CA	922,516	42	6	0	17	104
6	Baltimore, MD	2,552,994	33	6	0	17	115
6	Washington, DC-MD-VA-WV	4,923,153	33	3	0	17	100
8	Philadelphia, PA-NJ	5,100,931	29	3	0	7	101
9	Houston, TX	4,177,646	27	1	0	7	97
10	Atlanta, GA	4,112,198	23	1	0	16	98
10	Sacramento, CA	1,628,197	23	4	0	15	112
10	St. Louis, MO-IL	2,603,607	23	0	0	18	91
13	Knoxville, TN	687,249	20	0	0	27	84
14	Louisville, KY-IN	1,025,598	19	1	0	16	96
15	Monmouth-Ocean, NJ	1,126,217	18	0	0	9	95
15	Wilmington-Newark, DE-MD	586,216	18	0	0	12	90
17	Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	20	96
17	Middlesex-Somerset-Hunterdon, NJ	1,169,641	17	0	0	16	94
17	San Luis Obispo-Atascadero-Paso Robles, CA	246,681	17	0	0	15	90
20	Cleveland-Lorain-Elyria, OH	2,250,871	15	0	0	10	90

## Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010, Continued

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
20	Fort Worth-Arlington, TX	1,702,625	15	0	0	3	94
20	Trenton, NJ	350,761	15	0	0	14	95
23	Baton Rouge, LA	602,894	14	0	0	9	89
23	Birmingham, AL	921,106	14	0	0	16	88
23	Cincinnati, OH-KY-IN	1,646,395	14	0	0	16	94
23	Hamilton-Middletown, OH	332,807	14	0	0	9	86
23	New York, NY	9,314,235	14	1	0	14	113
23	San Diego, CA	2,813,833	14	0	0	7	90
29	Beaumont-Port Arthur, TX	385,090	13	0	0	11	91
29	Greensboro-Winston Salem-High Point, NC	1,251,509	13	0	0	16	93
29	Lancaster, PA	470,658	13	0	0	9	95
29	Memphis, TN-AR-MS	1,135,614	13	0	0	11	91
29	Nassau-Suffolk, NY	2,753,913	13	0	0	12	92
29	Pittsburgh, PA	2,358,695	13	1	0	6	105
29	Ventura, CA	753,197	13	0	0	5	90
36	Allentown-Bethlehem-Easton, PA	637,958	12	0	0	9	94
36	Dallas, TX	3,519,176	12	0	0	12	87
36	Detroit, MI	4,441,551	12	0	0	6	89
39	Brazoria, TX	241,767	11	0	0	7	94
39	Dayton-Springfield, OH	950,558	11	0	0	10	82
39	Denver, CO	2,109,282	11	0	0	16	89
39	Merced, CA	210,554	11	1	0	14	96
39	Modesto, CA	446,997	11	1	0	8	96
39	Stamford-Norwalk, CT	353,556	11	0	0	2	91
45	Chicago, IL	8,272,768	10	0	0	10	88
45	Nashville, TN	1,231,311	10	0	0	18	88
45	Phoenix-Mesa, AZ	3,251,876	10	0	0	15	85
45	Richmond-Petersburg, VA	996,512	10	2	0	15	98
49	Bridgeport, CT	459,479	9	0	0	9	80
49	Las Vegas, NV-AZ	1,563,282	9	0	0	22	84
49	Newark, NJ	2,032,989	9	0	0	9	94
49	Shreveport-Bossier City, LA	392,302	9	0	0	8	90
53	Canton-Massillon, OH	406,934	8	0	0	10	88
53	Galveston-Texas City, TX	250,158	8	0	0	6	91
53	Greenville-Spartanburg-Anderson, SC	962,441	8	0	0	13	82
53	New Orleans, LA	1,337,726	8	0	0	7	93

**Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010, Continued**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
53	Reading, PA	373,638	8	0	0	15	87
58	Bergen-Passaic, NJ	1,373,167	7	0	0	10	94
58	Danbury, CT	217,980	7	1	0	8	97
58	Fort Collins-Loveland, CO	251,494	7	0	0	14	82
58	Hartford, CT	1,183,110	7	0	0	2	89
58	Kenosha, WI	149,577	7	0	0	5	89
58	San Jose, CA	1,682,585	7	0	0	2	91
58	Sheboygan, WI	112,646	7	0	0	5	92
65	Atlantic-Cape May, NJ	354,878	6	0	0	3	85
65	Chattanooga, TN-GA	465,161	6	0	0	11	82
65	Columbus, OH	1,540,157	6	0	0	14	88
65	Jamestown, NY	139,750	6	0	0	10	89
65	Jersey City, NJ	608,975	6	1	0	5	111
65	Kansas City, MO-KS	1,776,062	6	0	0	16	84
65	Longview-Marshall, TX	208,780	6	0	0	12	80
65	Milwaukee-Waukesha, WI	1,500,741	6	0	0	5	92
65	Norfolk-Virginia Beach-Newport News, VA-NC	1,569,541	6	1	0	9	97
65	Racine, WI	188,831	6	0	0	0	84
65	Vineland-Millville-Bridgeton, NJ	146,438	6	0	0	5	83
76	Dover, DE	126,697	5	0	0	7	92
76	Evansville-Henderson, IN-KY	296,195	5	0	0	13	77
76	Hagerstown, MD	131,923	5	0	0	6	90
76	Lake Charles, LA	183,577	5	0	0	4	84
76	New Bedford, MA	175,198	5	0	0	0	81
76	Parkersburg-Marietta, WV-OH	151,237	5	0	0	7	79
76	Raleigh-Durham-Chapel Hill, NC	1,187,941	5	0	0	9	83
76	Springfield, MA	591,932	5	0	0	4	91
84	Akron, OH	694,960	4	0	0	9	82
84	Albany-Schenectady-Troy, NY	875,583	4	0	0	5	84
84	Chico-Paradise, CA	203,171	4	0	0	9	78
84	Dutchess County, NY	280,150	4	0	0	2	92
84	Grand Rapids-Muskegon-Holland, MI	1,088,514	4	0	0	7	79
84	Harrisburg-Lebanon-Carlisle, PA	629,401	4	0	0	5	87
84	Huntington-Ashland, WV-KY-OH	315,538	4	0	0	8	79
84	Mobile, AL	540,258	4	0	0	6	85

**Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010, Continued**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
84	Oakland, CA	2,392,557	4	1	0	4	97
84	Salt Lake City-Ogden, UT	1,333,914	4	0	0	7	91
84	San Antonio, TX	1,592,383	4	0	0	7	87
84	Santa Barbara-Santa Maria-Lompoc, CA	399,347	4	0	0	3	83
84	Sharon, PA	120,293	4	0	0	5	82
84	Steubenville-Weirton, OH-WV	132,008	4	0	0	7	83
84	Stockton-Lodi, CA	563,598	4	0	0	4	95
84	Vallejo-Fairfield-Napa, CA	518,821	4	0	0	0	89
84	Wheeling, WV-OH	153,172	4	0	0	3	82
84	York, PA	381,751	4	0	0	12	88
84	Youngstown-Warren, OH	594,746	4	0	0	4	89
84	Yuma, AZ	160,026	4	0	0	4	84
104	Altoona, PA	129,144	3	0	0	5	84
104	Austin-San Marcos, TX	1,249,763	3	0	0	7	80
104	Boston, MA-NH	3,406,829	3	0	0	5	83
104	Charlottesville, VA	159,576	3	0	0	1	79
104	El Paso, TX	679,622	3	0	0	5	87
104	Erie, PA	280,843	3	0	0	5	83
104	Hickory-Morganton-Lenoir, NC	341,851	3	0	0	4	82
104	Indianapolis, IN	1,607,486	3	0	0	13	83
104	New London-Norwich, CT-RI	293,566	3	0	0	5	78
104	Oklahoma City, OK	1,083,346	3	0	0	8	79
104	Orange County, CA	2,846,289	3	1	0	3	96
104	Pensacola, FL	412,153	3	0	0	5	88
104	Providence-Fall River-Warwick, RI-MA	1,188,613	3	0	0	3	86
104	Scranton-Wilkes-Barre-Hazleton, PA	624,776	3	0	0	5	82
104	Syracuse, NY	732,117	3	0	0	3	82
104	Toledo, OH	618,203	3	0	0	3	91
104	Worcester, MA-CT	511,389	3	0	0	2	83
121	Athens, GA	153,444	2	0	0	3	84
121	Augusta-Aiken, GA-SC	477,441	2	0	0	4	81
121	Biloxi-Gulfport-Pascagoula, MS	363,988	2	0	0	10	82
121	Clarksville-Hopkinsville, TN-KY	207,033	2	0	0	6	77
121	Columbia, SC	536,691	2	0	0	4	81
121	Corpus Christi, TX	380,783	2	0	0	6	78
121	Fayetteville, NC	302,963	2	0	0	5	86

**Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010, Continued**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
121	Fort Walton Beach, FL	170,498	2	0	0	1	84
121	Gary, IN	631,362	2	0	0	4	80
121	Greeley, CO	180,936	2	0	0	5	78
121	Johnson City-Kingsport-Bristol, TN-VA	480,091	2	0	0	4	80
121	Johnstown, PA	232,621	2	0	0	3	85
121	Joplin, MO	157,322	2	0	0	4	82
121	Lafayette, LA	385,647	2	0	0	8	79
121	Las Cruces, NM	174,682	2	0	0	1	84
121	Lima, OH	155,084	2	0	0	3	78
121	Little Rock-North Little Rock, AR	583,845	2	0	0	6	80
121	Macon, GA	322,549	2	0	0	2	80
121	Montgomery, AL	333,055	2	0	0	6	79
121	Nashua, NH	190,949	2	0	0	0	81
121	Newburgh, NY-PA	387,669	2	0	0	6	87
121	Orlando, FL	1,644,561	2	0	0	6	81
121	Panama City, FL	148,217	2	0	0	3	82
121	Portland, ME	243,537	2	1	0	2	96
121	Portsmouth-Rochester, NH-ME	240,698	2	0	0	1	81
121	Redding, CA	163,256	2	0	0	12	76
121	State College, PA	135,758	2	0	0	4	78
121	Tampa-St. Petersburg-Clearwater, FL	2,395,997	2	0	0	8	87
121	Topeka, KS	169,871	2	0	0	0	82
121	Tulsa, OK	803,235	2	0	0	6	78
121	Wichita, KS	545,220	2	0	0	10	77
152	Albuquerque, NM	712,738	1	0	0	2	78
152	Asheville, NC	225,965	1	0	0	3	76
152	Benton Harbor, MI	162,453	1	0	0	4	79
152	Boulder-Longmont, CO	291,288	1	0	0	5	82
152	Buffalo-Niagara Falls, NY	1,170,111	1	0	0	7	77
152	Charleston, WV	251,662	1	0	0	2	87
152	Columbus, GA-AL	274,624	1	0	0	1	79
152	Elmira, NY	91,070	1	0	0	2	77
152	Flagstaff, AZ-UT	122,366	1	0	0	3	81
152	Fort Smith, AR-OK	207,290	1	0	0	0	79
152	Fort Wayne, IN	502,141	1	0	0	0	76
152	Greenville, NC	133,798	1	0	0	2	81
152	Houma, LA	194,477	1	0	0	7	79

**Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010, Continued**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
152	Huntsville, AL	342,376	1	0	0	3	81
152	Jacksonville, FL	1,100,491	1	0	0	3	84
152	Kalamazoo-Battle Creek, MI	452,851	1	0	0	0	76
152	Lakeland-Winter Haven, FL	483,924	1	0	0	1	77
152	Lawrence, MA-NH	396,230	1	0	0	3	76
152	Lawton, OK	114,996	1	0	0	1	81
152	Manchester, NH	198,378	1	0	0	0	77
152	Miami, FL	2,253,362	1	0	0	2	85
152	New Haven-Meriden, CT	542,149	1	0	0	1	76
152	Owensboro, KY	91,545	1	0	0	6	80
152	Pittsfield, MA	84,699	1	0	0	5	80
152	Portland-Vancouver, OR-WA	1,918,009	1	0	0	1	94
152	Provo-Orem, UT	368,536	1	0	0	6	84
152	Reno, NV	339,486	1	0	0	2	77
152	Roanoke, VA	235,932	1	0	0	5	76
152	Rocky Mount, NC	143,026	1	0	0	3	81
152	Salem, OR	347,214	1	0	0	0	78
152	San Francisco, CA	1,731,183	1	0	0	0	77
152	Sarasota-Bradenton, FL	589,959	1	0	0	4	80
152	Seattle-Bellevue-Everett, WA	2,414,616	1	0	0	2	77
152	St. Joseph, MO	102,490	1	0	0	5	81
152	West Palm Beach-Boca Raton, FL	1,131,184	1	0	0	1	76
152	Williamsport, PA	120,044	1	0	0	5	76
152	Wilmington, NC	233,450	1	0	0	0	79
	Anchorage, AK	260,283	0	0	0	0	50
	Ann Arbor, MI	578,736	0	0	0	1	74
	Appleton-Oshkosh-Neehan, WI	358,365	0	0	0	1	72
	Bellingham, WA	166,814	0	0	0	0	52
	Bismarck, ND	94,719	0	0	0	0	64
	Bloomington-Normal, IL	150,433	0	0	0	1	72
	Boise City, ID	432,345	0	0	0	1	73
	Brownsville-Harlingen-San Benito, TX	335,227	0	0	0	2	72
	Cedar Rapids, IA	191,701	0	0	0	1	73
	Champaign-Urbana, IL	179,669	0	0	0	0	62
	Charleston-North Charleston, SC	549,033	0	0	0	2	74
	Colorado Springs, CO	516,929	0	0	0	2	73
	Columbia, MO	135,454	0	0	0	2	71



## Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010, Continued

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
	Davenport-Moline-Rock Island, IA-IL	359,062	0	0	0	1	71
	Daytona Beach, FL	493,175	0	0	0	1	71
	Decatur, AL	145,867	0	0	0	3	73
	Decatur, IL	114,706	0	0	0	0	69
	Des Moines, IA	456,022	0	0	0	0	66
	Dothan, AL	137,916	0	0	0	2	75
	Duluth-Superior, MN-WI	243,815	0	0	0	1	71
	Elkhart-Goshen, IN	182,791	0	0	0	0	69
	Eugene-Springfield, OR	322,959	0	0	0	1	74
	Fargo-Moorhead, ND-MN	174,367	0	0	0	0	67
	Fayetteville-Springdale-Rogers, AR	311,121	0	0	0	1	74
	Flint, MI	436,141	0	0	0	3	75
	Florence, AL	142,950	0	0	0	1	72
	Fort Lauderdale, FL	1,623,018	0	0	0	1	72
	Fort Myers-Cape Coral, FL	440,888	0	0	0	1	71
	Fort Pierce-Port St. Lucie, FL	319,426	0	0	0	0	68
	Gadsden, AL	103,459	0	0	0	0	68
	Gainesville, FL	217,955	0	0	0	1	71
	Grand Junction, CO	116,255	0	0	0	0	70
	Green Bay, WI	226,778	0	0	0	1	73
	Honolulu, HI	876,156	0	0	0	0	52
	Jackson, MS	440,801	0	0	0	1	73
	Janesville-Beloit, WI	152,307	0	0	0	1	71
	Killeen-Temple, TX	312,952	0	0	0	6	75
	La Crosse, WI-MN	126,838	0	0	0	0	69
	Lansing-East Lansing, MI	447,728	0	0	0	1	75
	Laredo, TX	193,117	0	0	0	0	70
	Lexington, KY	479,198	0	0	0	5	75
	Lincoln, NE	250,291	0	0	0	0	59
	Madison, WI	426,526	0	0	0	0	70
	McAllen-Edinburg-Mission, TX	569,463	0	0	0	0	66
	Medford-Ashland, OR	181,269	0	0	0	0	68
	Melbourne-Titusville-Palm Bay, FL	476,230	0	0	0	0	66
	Minneapolis-St. Paul, MN-WI	2,968,806	0	0	0	3	75
	Missoula, MT	95,802	0	0	0	0	57
	Monroe, LA	147,250	0	0	0	3	71

**Appendix A. National Ranking of Metropolitan Areas by Smog Days in 2010, Continued**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
	Muncie, IN	118,769	0	0	0	1	73
	Naples, FL	251,377	0	0	0	0	64
	Ocala, FL	258,916	0	0	0	2	74
	Olympia, WA	207,355	0	0	0	0	60
	Omaha, NE-IA	716,998	0	0	0	2	71
	Peoria-Pekin, IL	347,387	0	0	0	3	72
	Rochester, MN	124,277	0	0	0	0	65
	Rochester, NY	1,098,201	0	0	0	6	74
	Rockford, IL	371,236	0	0	0	0	66
	Salinas, CA	401,762	0	0	0	0	70
	Santa Cruz-Watsonville, CA	255,602	0	0	0	0	59
	Santa Fe, NM	147,635	0	0	0	1	71
	Santa Rosa, CA	458,614	0	0	0	0	68
	Savannah, GA	293,000	0	0	0	0	70
	Sioux Falls, SD	172,412	0	0	0	0	68
	South Bend, IN	265,559	0	0	0	0	65
	Spokane, WA	417,939	0	0	0	0	67
	Springfield, IL	201,437	0	0	0	1	72
	Springfield, MO	325,721	0	0	0	0	70
	St. Cloud, MN	167,392	0	0	0	0	70
	Tacoma, WA	700,820	0	0	0	0	69
	Tallahassee, FL	284,539	0	0	0	0	69
	Terra Haute, IN	149,192	0	0	0	0	66
	Tucson, AZ	843,746	0	0	0	3	75
	Tuscaloosa, AL	164,875	0	0	0	0	63
	Tyler, TX	174,706	0	0	0	6	75
	Utica-Rome, NY	299,896	0	0	0	1	72
	Victoria, TX	84,088	0	0	0	1	73
	Waco, TX	213,517	0	0	0	2	75
	Wausau, WI	125,834	0	0	0	0	64
	Yolo, CA	168,660	0	0	0	2	72
	Yuba City, CA	139,149	0	0	0	3	75

## Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size

### Smog Days in 2010 in Large Metropolitan Areas

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
1	Riverside-San Bernardino, CA	3,254,821	110	24	2	123
2	Los Angeles-Long Beach, CA	9,519,338	69	3	0	105
3	Baltimore, MD	2,552,994	33	6	0	115
3	Washington, DC-MD-VA-WV	4,923,153	33	3	0	100
5	Philadelphia, PA-NJ	5,100,931	29	3	0	101
6	Houston, TX	4,177,646	27	1	0	97
7	Atlanta, GA	4,112,198	23	1	0	98
7	Sacramento, CA	1,628,197	23	4	0	112
7	St. Louis, MO-IL	2,603,607	23	0	0	91
10	Louisville, KY-IN	1,025,598	19	1	0	96
11	Monmouth-Ocean, NJ	1,126,217	18	0	0	95
12	Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	96
12	Middlesex-Somerset-Hunterdon, NJ	1,169,641	17	0	0	94
14	Cleveland-Lorain-Elyria, OH	2,250,871	15	0	0	90
14	Fort Worth-Arlington, TX	1,702,625	15	0	0	94
16	Cincinnati, OH-KY-IN	1,646,395	14	0	0	94
16	New York, NY	9,314,235	14	1	0	113
16	San Diego, CA	2,813,833	14	0	0	90
19	Greensboro-Winston Salem-High Point, NC	1,251,509	13	0	0	93
19	Memphis, TN-AR-MS	1,135,614	13	0	0	91
19	Nassau-Suffolk, NY	2,753,913	13	0	0	92
19	Pittsburgh, PA	2,358,695	13	1	0	105
23	Dallas, TX	3,519,176	12	0	0	87
23	Detroit, MI	4,441,551	12	0	0	89
25	Denver, CO	2,109,282	11	0	0	89
26	Chicago, IL	8,272,768	10	0	0	88
26	Nashville, TN	1,231,311	10	0	0	88
26	Phoenix-Mesa, AZ	3,251,876	10	0	0	85
29	Las Vegas, NV-AZ	1,563,282	9	0	0	84
29	Newark, NJ	2,032,989	9	0	0	94
31	New Orleans, LA	1,337,726	8	0	0	93
32	Bergen-Passaic, NJ	1,373,167	7	0	0	94
32	Hartford, CT	1,183,110	7	0	0	89
32	San Jose, CA	1,682,585	7	0	0	91
35	Columbus, OH	1,540,157	6	0	0	88
35	Kansas City, MO-KS	1,776,062	6	0	0	84
35	Milwaukee-Waukesha, WI	1,500,741	6	0	0	92
35	Norfolk-Virginia Beach-Newport News, VA-NC	1,569,541	6	1	0	97

## Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size, Continued

### Smog Days in 2010 in Large Metropolitan Areas

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
39	Raleigh-Durham-Chapel Hill, NC	1,187,941	5	0	0	83
40	Grand Rapids-Muskegon-Holland, MI	1,088,514	4	0	0	79
40	Oakland, CA	2,392,557	4	1	0	97
40	Salt Lake City-Ogden, UT	1,333,914	4	0	0	91
40	San Antonio, TX	1,592,383	4	0	0	87
44	Austin-San Marcos, TX	1,249,763	3	0	0	80
44	Boston, MA-NH	3,406,829	3	0	0	83
44	Indianapolis, IN	1,607,486	3	0	0	83
44	Oklahoma City, OK	1,083,346	3	0	0	79
44	Orange County, CA	2,846,289	3	1	0	96
44	Providence-Fall River-Warwick, RI-MA	1,188,613	3	0	0	86
50	Orlando, FL	1,644,561	2	0	0	81
50	Tampa-St. Petersburg-Clearwater, FL	2,395,997	2	0	0	87
52	Buffalo-Niagara Falls, NY	1,170,111	1	0	0	77
52	Jacksonville, FL	1,100,491	1	0	0	84
52	Miami, FL	2,253,362	1	0	0	85
52	Portland-Vancouver, OR-WA	1,918,009	1	0	0	94
52	San Francisco, CA	1,731,183	1	0	0	77
52	Seattle-Bellevue-Everett, WA	2,414,616	1	0	0	77
52	West Palm Beach-Boca Raton, FL	1,131,184	1	0	0	76
	Fort Lauderdale, FL	1,623,018	0	0	0	72
	Minneapolis-St. Paul, MN-WI	2,968,806	0	0	0	75
	Rochester, NY	1,098,201	0	0	0	74

## Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size

### Smog Days in 2010 in Mid-Sized Metropolitan Areas

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
1	Visalia-Tulare-Porterville, CA	368,021	78	6	0	104
2	Bakersfield, CA	661,645	69	10	0	107
3	Fresno, CA	922,516	42	6	0	104
4	Knoxville, TN	687,249	20	0	0	84
5	Wilmington-Newark, DE-MD	586,216	18	0	0	90
6	Trenton, NJ	350,761	15	0	0	95
7	Baton Rouge, LA	602,894	14	0	0	89
7	Birmingham, AL	921,106	14	0	0	88
7	Hamilton-Middletown, OH	332,807	14	0	0	86
10	Beaumont-Port Arthur, TX	385,090	13	0	0	91
10	Lancaster, PA	470,658	13	0	0	95
10	Ventura, CA	753,197	13	0	0	90
13	Allentown-Bethlehem-Easton, PA	637,958	12	0	0	94
14	Dayton-Springfield, OH	950,558	11	0	0	82
14	Modesto, CA	446,997	11	1	0	96
14	Stamford-Norwalk, CT	353,556	11	0	0	91
17	Richmond-Petersburg, VA	996,512	10	2	0	98
18	Bridgeport, CT	459,479	9	0	0	80
18	Shreveport-Bossier City, LA	392,302	9	0	0	90
20	Canton-Massillon, OH	406,934	8	0	0	88
20	Galveston-Texas City, TX	250,158	8	0	0	91
20	Greenville-Spartanburg-Anderson, SC	962,441	8	0	0	82
20	Reading, PA	373,638	8	0	0	87
24	Fort Collins-Loveland, CO	251,494	7	0	0	82
25	Atlantic-Cape May, NJ	354,878	6	0	0	85
25	Chattanooga, TN-GA	465,161	6	0	0	82
25	Jersey City, NJ	608,975	6	1	0	111
28	Evansville-Henderson, IN-KY	296,195	5	0	0	77
28	Springfield, MA	591,932	5	0	0	91
30	Akron, OH	694,960	4	0	0	82
30	Albany-Schenectady-Troy, NY	875,583	4	0	0	84
30	Dutchess County, NY	280,150	4	0	0	92
30	Harrisburg-Lebanon-Carlisle, PA	629,401	4	0	0	87
30	Huntington-Ashland, WV-KY-OH	315,538	4	0	0	79
30	Mobile, AL	540,258	4	0	0	85
30	Santa Barbara-Santa Maria-Lompoc, CA	399,347	4	0	0	83
30	Stockton-Lodi, CA	563,598	4	0	0	95
30	Vallejo-Fairfield-Napa, CA	518,821	4	0	0	89
30	York, PA	381,751	4	0	0	88

**Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size, Continued**

**Smog Days in 2010 in Mid-Sized Metropolitan Areas**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
30	Youngstown-Warren, OH	594,746	4	0	0	89
41	El Paso, TX	679,622	3	0	0	87
41	Erie, PA	280,843	3	0	0	83
41	Hickory-Morganton-Lenoir, NC	341,851	3	0	0	82
41	New London-Norwich, CT-RI	293,566	3	0	0	78
41	Pensacola, FL	412,153	3	0	0	88
41	Scranton-Wilkes-Barre-Hazleton, PA	624,776	3	0	0	82
41	Syracuse, NY	732,117	3	0	0	82
41	Toledo, OH	618,203	3	0	0	91
41	Worcester, MA-CT	511,389	3	0	0	83
50	Augusta-Aiken, GA-SC	477,441	2	0	0	81
50	Biloxi-Gulfport-Pascagoula, MS	363,988	2	0	0	82
50	Columbia, SC	536,691	2	0	0	81
50	Corpus Christi, TX	380,783	2	0	0	78
50	Fayetteville, NC	302,963	2	0	0	86
50	Gary, IN	631,362	2	0	0	80
50	Johnson City-Kingsport-Bristol, TN-VA	480,091	2	0	0	80
50	Lafayette, LA	385,647	2	0	0	79
50	Little Rock-North Little Rock, AR	583,845	2	0	0	80
50	Macon, GA	322,549	2	0	0	80
50	Montgomery, AL	333,055	2	0	0	79
50	Newburgh, NY-PA	387,669	2	0	0	87
50	Tulsa, OK	803,235	2	0	0	78
50	Wichita, KS	545,220	2	0	0	77
64	Albuquerque, NM	712,738	1	0	0	78
64	Boulder-Longmont, CO	291,288	1	0	0	82
64	Charleston, WV	251,662	1	0	0	87
64	Columbus, GA-AL	274,624	1	0	0	79
64	Fort Wayne, IN	502,141	1	0	0	76
64	Huntsville, AL	342,376	1	0	0	81
64	Kalamazoo-Battle Creek, MI	452,851	1	0	0	76
64	Lakeland-Winter Haven, FL	483,924	1	0	0	77
64	Lawrence, MA-NH	396,230	1	0	0	76
64	New Haven-Meriden, CT	542,149	1	0	0	76
64	Provo-Orem, UT	368,536	1	0	0	84
64	Reno, NV	339,486	1	0	0	77
64	Salem, OR	347,214	1	0	0	78
64	Sarasota-Bradenton, FL	589,959	1	0	0	80
	Anchorage, AK	260,283	0	0	0	50

## Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size, Continued

### Smog Days in 2010 in Mid-Sized Metropolitan Areas

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
	Ann Arbor, MI	578,736	0	0	0	74
	Appleton-Oshkosh-Neehan, WI	358,365	0	0	0	72
	Boise City, ID	432,345	0	0	0	73
	Brownsville-Harlingen-San Benito, TX	335,227	0	0	0	72
	Charleston-North Charleston, SC	549,033	0	0	0	74
	Colorado Springs, CO	516,929	0	0	0	73
	Davenport-Moline-Rock Island, IA-IL	359,062	0	0	0	71
	Daytona Beach, FL	493,175	0	0	0	71
	Des Moines, IA	456,022	0	0	0	66
	Eugene-Springfield, OR	322,959	0	0	0	74
	Fayetteville-Springdale-Rogers, AR	311,121	0	0	0	74
	Flint, MI	436,141	0	0	0	75
	Fort Myers-Cape Coral, FL	440,888	0	0	0	71
	Fort Pierce-Port St. Lucie, FL	319,426	0	0	0	68
	Honolulu, HI	876,156	0	0	0	52
	Jackson, MS	440,801	0	0	0	73
	Killeen-Temple, TX	312,952	0	0	0	75
	Lansing-East Lansing, MI	447,728	0	0	0	75
	Lexington, KY	479,198	0	0	0	75
	Lincoln, NE	250,291	0	0	0	59
	Madison, WI	426,526	0	0	0	70
	McAllen-Edinburg-Mission, TX	569,463	0	0	0	66
	Melbourne-Titusville-Palm Bay, FL	476,230	0	0	0	66
	Naples, FL	251,377	0	0	0	64
	Ocala, FL	258,916	0	0	0	74
	Omaha, NE-IA	716,998	0	0	0	71
	Peoria-Pekin, IL	347,387	0	0	0	72
	Rockford, IL	371,236	0	0	0	66
	Salinas, CA	401,762	0	0	0	70
	Santa Cruz-Watsonville, CA	255,602	0	0	0	59
	Santa Rosa, CA	458,614	0	0	0	68
	Savannah, GA	293,000	0	0	0	70
	South Bend, IN	265,559	0	0	0	65
	Spokane, WA	417,939	0	0	0	67
	Springfield, MO	325,721	0	0	0	70
	Tacoma, WA	700,820	0	0	0	69
	Tallahassee, FL	284,539	0	0	0	69
	Tucson, AZ	843,746	0	0	0	75
	Utica-Rome, NY	299,896	0	0	0	72

## Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size

### Smog Days in 2010 in Small Metropolitan Areas

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
1	San Luis Obispo-Atascadero-Paso Robles, CA	246,681	17	0	0	90
2	Brazoria, TX	241,767	11	0	0	94
2	Merced, CA	210,554	11	1	0	96
4	Danbury, CT	217,980	7	1	0	97
4	Kenosha, WI	149,577	7	0	0	89
4	Sheboygan, WI	112,646	7	0	0	92
7	Jamestown, NY	139,750	6	0	0	89
7	Longview-Marshall, TX	208,780	6	0	0	80
7	Racine, WI	188,831	6	0	0	84
7	Vineland-Millville-Bridgeton, NJ	146,438	6	0	0	83
11	Dover, DE	126,697	5	0	0	92
11	Hagerstown, MD	131,923	5	0	0	90
11	Lake Charles, LA	183,577	5	0	0	84
11	New Bedford, MA	175,198	5	0	0	81
11	Parkersburg-Marietta, WV-OH	151,237	5	0	0	79
16	Chico-Paradise, CA	203,171	4	0	0	78
16	Sharon, PA	120,293	4	0	0	82
16	Steubenville-Weirton, OH-WV	132,008	4	0	0	83
16	Wheeling, WV-OH	153,172	4	0	0	82
16	Yuma, AZ	160,026	4	0	0	84
21	Altoona, PA	129,144	3	0	0	84
21	Charlottesville, VA	159,576	3	0	0	79
23	Athens, GA	153,444	2	0	0	84
23	Clarksville-Hopkinsville, TN-KY	207,033	2	0	0	77
23	Fort Walton Beach, FL	170,498	2	0	0	84
23	Greeley, CO	180,936	2	0	0	78
23	Johnstown, PA	232,621	2	0	0	85
23	Joplin, MO	157,322	2	0	0	82
23	Las Cruces, NM	174,682	2	0	0	84
23	Lima, OH	155,084	2	0	0	78
23	Nashua, NH	190,949	2	0	0	81
23	Panama City, FL	148,217	2	0	0	82
23	Portland, ME	243,537	2	1	0	96
23	Portsmouth-Rochester, NH-ME	240,698	2	0	0	81
23	Redding, CA	163,256	2	0	0	76
23	State College, PA	135,758	2	0	0	78
23	Topeka, KS	169,871	2	0	0	82
38	Asheville, NC	225,965	1	0	0	76
38	Benton Harbor, MI	162,453	1	0	0	79



**Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size, Continued**

**Smog Days in 2010 in Small Metropolitan Areas**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
38	Elmira, NY	91,070	1	0	0	77
38	Flagstaff, AZ-UT	122,366	1	0	0	81
38	Fort Smith, AR-OK	207,290	1	0	0	79
38	Greenville, NC	133,798	1	0	0	81
38	Houma, LA	194,477	1	0	0	79
38	Lawton, OK	114,996	1	0	0	81
38	Manchester, NH	198,378	1	0	0	77
38	Owensboro, KY	91,545	1	0	0	80
38	Pittsfield, MA	84,699	1	0	0	80
38	Roanoke, VA	235,932	1	0	0	76
38	Rocky Mount, NC	143,026	1	0	0	81
38	St. Joseph, MO	102,490	1	0	0	81
38	Williamsport, PA	120,044	1	0	0	76
38	Wilmington, NC	233,450	1	0	0	79
	Bellingham, WA	166,814	0	0	0	52
	Bismarck, ND	94,719	0	0	0	64
	Bloomington-Normal, IL	150,433	0	0	0	72
	Cedar Rapids, IA	191,701	0	0	0	73
	Champaign-Urbana, IL	179,669	0	0	0	62
	Columbia, MO	135,454	0	0	0	71
	Decatur, AL	145,867	0	0	0	73
	Decatur, IL	114,706	0	0	0	69
	Dothan, AL	137,916	0	0	0	75
	Duluth-Superior, MN-WI	243,815	0	0	0	71
	Elkhart-Goshen, IN	182,791	0	0	0	69
	Fargo-Moorhead, ND-MN	174,367	0	0	0	67
	Florence, AL	142,950	0	0	0	72
	Gadsden, AL	103,459	0	0	0	68
	Gainesville, FL	217,955	0	0	0	71
	Grand Junction, CO	116,255	0	0	0	70
	Green Bay, WI	226,778	0	0	0	73
	Janesville-Beloit, WI	152,307	0	0	0	71
	La Crosse, WI-MN	126,838	0	0	0	69
	Laredo, TX	193,117	0	0	0	70
	Medford-Ashland, OR	181,269	0	0	0	68
	Missoula, MT	95,802	0	0	0	57
	Monroe, LA	147,250	0	0	0	71
	Muncie, IN	118,769	0	0	0	73
	Olympia, WA	207,355	0	0	0	60

**Appendix B. Metropolitan Areas Ranked by Smog Days in 2010 by Population Size, Continued**

**Smog Days in 2010 in Small Metropolitan Areas**

Rank	Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)
	Rochester, MN	124,277	0	0	0	65
	Santa Fe, NM	147,635	0	0	0	71
	Sioux Falls, SD	172,412	0	0	0	68
	Springfield, IL	201,437	0	0	0	72
	St. Cloud, MN	167,392	0	0	0	70
	Terra Haute, IN	149,192	0	0	0	66
	Tuscaloosa, AL	164,875	0	0	0	63
	Tyler, TX	174,706	0	0	0	75
	Victoria, TX	84,088	0	0	0	73
	Waco, TX	213,517	0	0	0	75
	Wausau, WI	125,834	0	0	0	64
	Yolo, CA	168,660	0	0	0	72
	Yuba City, CA	139,149	0	0	0	75

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State

### Alabama

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Birmingham, AL	921,106	14	0	0	88	16
Mobile, AL	540,258	4	0	0	85	6
Montgomery, AL	333,055	2	0	0	79	6
Columbus, GA-AL	274,624	1	0	0	79	1
Huntsville, AL	342,376	1	0	0	81	3
Decatur, AL	145,867	0	0	0	73	3
Dothan, AL	137,916	0	0	0	75	2
Florence, AL	142,950	0	0	0	72	1
Gadsden, AL	103,459	0	0	0	68	0
Tuscaloosa, AL	164,875	0	0	0	63	0

### Alaska

Anchorage, AK	260,283	0	0	0	50	0
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### Arizona

Phoenix-Mesa, AZ	3,251,876	10	0	0	85	15
Las Vegas, NV-AZ	1,563,282	9	0	0	84	22
Yuma, AZ	160,026	4	0	0	84	4
Flagstaff, AZ-UT	122,366	1	0	0	81	3
Tucson, AZ	843,746	0	0	0	75	3

### Arkansas

Memphis, TN-AR-MS	1,135,614	13	0	0	91	11
Little Rock-North Little Rock, AR	583,845	2	0	0	80	6
Fort Smith, AR-OK	207,290	1	0	0	79	0
Fayetteville-Springdale-Rogers, AR	311,121	0	0	0	74	1

### California

Riverside-San Bernardino, CA	3,254,821	110	24	2	123	25
Visalia-Tulare-Porterville, CA	368,021	78	6	0	104	22
Bakersfield, CA	661,645	69	10	0	107	24
Los Angeles-Long Beach, CA	9,519,338	69	3	0	105	32
Fresno, CA	922,516	42	6	0	104	17
Sacramento, CA	1,628,197	23	4	0	112	15
San Luis Obispo-Atascadero-Paso Robles, CA	246,681	17	0	0	90	15
San Diego, CA	2,813,833	14	0	0	90	7
Ventura, CA	753,197	13	0	0	90	5
Merced, CA	210,554	11	1	0	96	14

**Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued**

**California**

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Modesto, CA	446,997	11	1	0	96	8
San Jose, CA	1,682,585	7	0	0	91	2
Chico-Paradise, CA	203,171	4	0	0	78	9
Oakland, CA	2,392,557	4	1	0	97	4
Santa Barbara-Santa Maria-Lompoc, CA	399,347	4	0	0	83	3
Stockton-Lodi, CA	563,598	4	0	0	95	4
Vallejo-Fairfield-Napa, CA	518,821	4	0	0	89	0
Orange County, CA	2,846,289	3	1	0	96	3
Redding, CA	163,256	2	0	0	76	12
San Francisco, CA	1,731,183	1	0	0	77	0
Salinas, CA	401,762	0	0	0	70	0
Santa Cruz-Watsonville, CA	255,602	0	0	0	59	0
Santa Rosa, CA	458,614	0	0	0	68	0
Yolo, CA	168,660	0	0	0	72	2
Yuba City, CA	139,149	0	0	0	75	3

**Colorado**

Denver, CO	2,109,282	11	0	0	89	16
Fort Collins-Loveland, CO	251,494	7	0	0	82	14
Greeley, CO	180,936	2	0	0	78	5
Boulder-Longmont, CO	291,288	1	0	0	82	5
Colorado Springs, CO	516,929	0	0	0	73	2
Grand Junction, CO	116,255	0	0	0	70	0

**Connecticut**

Stamford-Norwalk, CT	353,556	11	0	0	91	2
Bridgeport, CT	459,479	9	0	0	80	9
Danbury, CT	217,980	7	1	0	97	8
Hartford, CT	1,183,110	7	0	0	89	2
New London-Norwich, CT-RI	293,566	3	0	0	78	5
Worcester, MA-CT	511,389	3	0	0	83	2
New Haven-Meriden, CT	542,149	1	0	0	76	1

**Washington, DC**

Washington, DC-MD-VA-WV	4,923,153	33	3	0	100	17
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**Delaware**

Wilmington-Newark, DE-MD	586,216	18	0	0	90	12
Dover, DE	126,697	5	0	0	92	7

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### Florida

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Pensacola, FL	412,153	3	0	0	88	5
Fort Walton Beach, FL	170,498	2	0	0	84	1
Orlando, FL	1,644,561	2	0	0	81	6
Panama City, FL	148,217	2	0	0	82	3
Tampa-St. Petersburg-Clearwater, FL	2,395,997	2	0	0	87	8
Jacksonville, FL	1,100,491	1	0	0	84	3
Lakeland-Winter Haven, FL	483,924	1	0	0	77	1
Miami, FL	2,253,362	1	0	0	85	2
Sarasota-Bradenton, FL	589,959	1	0	0	80	4
West Palm Beach-Boca Raton, FL	1,131,184	1	0	0	76	1
Daytona Beach, FL	493,175	0	0	0	71	1
Fort Lauderdale, FL	1,623,018	0	0	0	72	1
Fort Myers-Cape Coral, FL	440,888	0	0	0	71	1
Fort Pierce-Port St. Lucie, FL	319,426	0	0	0	68	0
Gainesville, FL	217,955	0	0	0	71	1
Melbourne-Titusville-Palm Bay, FL	476,230	0	0	0	66	0
Naples, FL	251,377	0	0	0	64	0
Ocala, FL	258,916	0	0	0	74	2
Tallahassee, FL	284,539	0	0	0	69	0

### Georgia

Atlanta, GA	4,112,198	23	1	0	98	16
Chattanooga, TN-GA	465,161	6	0	0	82	11
Athens, GA	153,444	2	0	0	84	3
Augusta-Aiken, GA-SC	477,441	2	0	0	81	4
Macon, GA	322,549	2	0	0	80	2
Columbus, GA-AL	274,624	1	0	0	79	1
Savannah, GA	293,000	0	0	0	70	0

### Hawaii

Honolulu, HI	876,156	0	0	0	52	0
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### Idaho

Boise City, ID	432,345	0	0	0	73	1
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### Illinois

St. Louis, MO-IL	2,603,607	23	0	0	91	18
Chicago, IL	8,272,768	10	0	0	88	10

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### Illinois

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Bloomington-Normal, IL	150,433	0	0	0	72	1
Champaign-Urbana, IL	179,669	0	0	0	62	0
Davenport-Moline-Rock Island, IA-IL	359,062	0	0	0	71	1
Decatur, IL	114,706	0	0	0	69	0
Peoria-Pekin, IL	347,387	0	0	0	72	3
Rockford, IL	371,236	0	0	0	66	0
Springfield, IL	201,437	0	0	0	72	1

### Indiana

Louisville, KY-IN	1,025,598	19	1	0	96	16
Cincinnati, OH-KY-IN	1,646,395	14	0	0	94	16
Evansville-Henderson, IN-KY	296,195	5	0	0	77	13
Indianapolis, IN	1,607,486	3	0	0	83	13
Gary, IN	631,362	2	0	0	80	4
Fort Wayne, IN	502,141	1	0	0	76	0
Elkhart-Goshen, IN	182,791	0	0	0	69	0
Muncie, IN	118,769	0	0	0	73	1
South Bend, IN	265,559	0	0	0	65	0
Terra Haute, IN	149,192	0	0	0	66	0

### Iowa

Cedar Rapids, IA	191,701	0	0	0	73	1
Davenport-Moline-Rock Island, IA-IL	359,062	0	0	0	71	1
Des Moines, IA	456,022	0	0	0	66	0
Omaha, NE-IA	716,998	0	0	0	71	2

### Kansas

Kansas City, MO-KS	1,776,062	6	0	0	84	16
Topeka, KS	169,871	2	0	0	82	0
Wichita, KS	545,220	2	0	0	77	10

### Kentucky

Louisville, KY-IN	1,025,598	19	1	0	96	16
Cincinnati, OH-KY-IN	1,646,395	14	0	0	94	16
Evansville-Henderson, IN-KY	296,195	5	0	0	77	13
Huntington-Ashland, WV-KY-OH	315,538	4	0	0	79	8
Clarksville-Hopkinsville, TN-KY	207,033	2	0	0	77	6
Owensboro, KY	91,545	1	0	0	80	6
Lexington, KY	479,198	0	0	0	75	5

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### Louisiana

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Baton Rouge, LA	602,894	14	0	0	89	9
Shreveport-Bossier City, LA	392,302	9	0	0	90	8
New Orleans, LA	1,337,726	8	0	0	93	7
Lake Charles, LA	183,577	5	0	0	84	4
Lafayette, LA	385,647	2	0	0	79	8
Houma, LA	194,477	1	0	0	79	7
Monroe, LA	147,250	0	0	0	71	3

### Maine

Portland, ME	243,537	2	1	0	96	2
Portsmouth-Rochester, NH-ME	240,698	2	0	0	81	1

### Maryland

Baltimore, MD	2,552,994	33	6	0	115	17
Washington, DC-MD-VA-WV	4,923,153	33	3	0	100	17
Wilmington-Newark, DE-MD	586,216	18	0	0	90	12
Hagerstown, MD	131,923	5	0	0	90	6

### Massachusetts

New Bedford, MA	175,198	5	0	0	81	0
Springfield, MA	591,932	5	0	0	91	4
Boston, MA-NH	3,406,829	3	0	0	83	5
Providence-Fall River-Warwick, RI-MA	1,188,613	3	0	0	86	3
Worcester, MA-CT	511,389	3	0	0	83	2
Lawrence, MA-NH	396,230	1	0	0	76	3
Pittsfield, MA	84,699	1	0	0	80	5

### Michigan

Detroit, MI	4,441,551	12	0	0	89	6
Grand Rapids-Muskegon-Holland, MI	1,088,514	4	0	0	79	7
Benton Harbor, MI	162,453	1	0	0	79	4
Kalamazoo-Battle Creek, MI	452,851	1	0	0	76	0
Ann Arbor, MI	578,736	0	0	0	74	1
Flint, MI	436,141	0	0	0	75	3
Lansing-East Lansing, MI	447,728	0	0	0	75	1

### Minnesota

Duluth-Superior, MN-WI	243,815	0	0	0	71	1
Fargo-Moorhead, ND-MN	174,367	0	0	0	67	0

**Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued**

**Minnesota**

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
La Crosse, WI-MN	126,838	0	0	0	69	0
Minneapolis-St. Paul, MN-WI	2,968,806	0	0	0	75	3
Rochester, MN	124,277	0	0	0	65	0
St. Cloud, MN	167,392	0	0	0	70	0

**Mississippi**

Memphis, TN-AR-MS	1,135,614	13	0	0	91	11
Biloxi-Gulfport-Pascagoula, MS	363,988	2	0	0	82	10
Jackson, MS	440,801	0	0	0	73	1

**Missouri**

St. Louis, MO-IL	2,603,607	23	0	0	91	18
Kansas City, MO-KS	1,776,062	6	0	0	84	16
Joplin, MO	157,322	2	0	0	82	4
St. Joseph, MO	102,490	1	0	0	81	5
Columbia, MO	135,454	0	0	0	71	2
Springfield, MO	325,721	0	0	0	70	0

**Montana**

Missoula, MT	95,802	0	0	0	57	0
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**Nebraska**

Lincoln, NE	250,291	0	0	0	59	0
Omaha, NE-IA	716,998	0	0	0	71	2

**Nevada**

Las Vegas, NV-AZ	1,563,282	9	0	0	84	22
Reno, NV	339,486	1	0	0	77	2

**New Hampshire**

Boston, MA-NH	3,406,829	3	0	0	83	5
Nashua, NH	190,949	2	0	0	81	0
Portsmouth-Rochester, NH-ME	240,698	2	0	0	81	1
Lawrence, MA-NH	396,230	1	0	0	76	3
Manchester, NH	198,378	1	0	0	77	0

**New Jersey**

Philadelphia, PA-NJ	5,100,931	29	3	0	101	7
Monmouth-Ocean, NJ	1,126,217	18	0	0	95	9



## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### New Jersey

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Middlesex-Somerset-Hunterdon, NJ	1,169,641	17	0	0	94	16
Trenton, NJ	350,761	15	0	0	95	14
Newark, NJ	2,032,989	9	0	0	94	9
Bergen-Passaic, NJ	1,373,167	7	0	0	94	10
Atlantic-Cape May, NJ	354,878	6	0	0	85	3
Jersey City, NJ	608,975	6	1	0	111	5
Vineland-Millville-Bridgeton, NJ	146,438	6	0	0	83	5

### New Mexico

Las Cruces, NM	174,682	2	0	0	84	1
Albuquerque, NM	712,738	1	0	0	78	2
Santa Fe, NM	147,635	0	0	0	71	1

### New York

New York, NY	9,314,235	14	1	0	113	14
Nassau-Suffolk, NY	2,753,913	13	0	0	92	12
Jamestown, NY	139,750	6	0	0	89	10
Albany-Schenectady-Troy, NY	875,583	4	0	0	84	5
Dutchess County, NY	280,150	4	0	0	92	2
Syracuse, NY	732,117	3	0	0	82	3
Newburgh, NY-PA	387,669	2	0	0	87	6
Buffalo-Niagara Falls, NY	1,170,111	1	0	0	77	7
Elmira, NY	91,070	1	0	0	77	2
Rochester, NY	1,098,201	0	0	0	74	6
Utica-Rome, NY	299,896	0	0	0	72	1

### North Carolina

Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	96	20
Greensboro-Winston Salem-High Point, NC	1,251,509	13	0	0	93	16
Norfolk-Virginia Beach-Newport News, VA-NC	1,569,541	6	1	0	97	9
Raleigh-Durham-Chapel Hill, NC	1,187,941	5	0	0	83	9
Hickory-Morganton-Lenoir, NC	341,851	3	0	0	82	4
Fayetteville, NC	302,963	2	0	0	86	5
Asheville, NC	225,965	1	0	0	76	3
Greenville, NC	133,798	1	0	0	81	2
Rocky Mount, NC	143,026	1	0	0	81	3
Wilmington, NC	233,450	1	0	0	79	0

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### North Dakota

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Bismarck, ND	94,719	0	0	0	64	0
Fargo-Moorhead, ND-MN	174,367	0	0	0	67	0

### Ohio

Cleveland-Lorain-Elyria, OH	2,250,871	15	0	0	90	10
Cincinnati, OH-KY-IN	1,646,395	14	0	0	94	16
Hamilton-Middletown, OH	332,807	14	0	0	86	9
Dayton-Springfield, OH	950,558	11	0	0	82	10
Canton-Massillon, OH	406,934	8	0	0	88	10
Columbus, OH	1,540,157	6	0	0	88	14
Parkersburg-Marietta, WV-OH	151,237	5	0	0	79	7
Akron, OH	694,960	4	0	0	82	9
Huntington-Ashland, WV-KY-OH	315,538	4	0	0	79	8
Steubenville-Weirton, OH-WV	132,008	4	0	0	83	7
Wheeling, WV-OH	153,172	4	0	0	82	3
Youngstown-Warren, OH	594,746	4	0	0	89	4
Toledo, OH	618,203	3	0	0	91	3
Lima, OH	155,084	2	0	0	78	3

### Oklahoma

Oklahoma City, OK	1,083,346	3	0	0	79	8
Tulsa, OK	803,235	2	0	0	78	6
Fort Smith, AR-OK	207,290	1	0	0	79	0
Lawton, OK	114,996	1	0	0	81	1

### Oregon

Portland-Vancouver, OR-WA	1,918,009	1	0	0	94	1
Salem, OR	347,214	1	0	0	78	0
Eugene-Springfield, OR	322,959	0	0	0	74	1
Medford-Ashland, OR	181,269	0	0	0	68	0

### Pennsylvania

Philadelphia, PA-NJ	5,100,931	29	3	0	101	7
Lancaster, PA	470,658	13	0	0	95	9
Pittsburgh, PA	2,358,695	13	1	0	105	6
Allentown-Bethlehem-Easton, PA	637,958	12	0	0	94	9
Reading, PA	373,638	8	0	0	87	15
Harrisburg-Lebanon-Carlisle, PA	629,401	4	0	0	87	5
Sharon, PA	120,293	4	0	0	82	5

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### Pennsylvania

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
York, PA	381,751	4	0	0	88	12
Altoona, PA	129,144	3	0	0	84	5
Erie, PA	280,843	3	0	0	83	5
Scranton-Wilkes-Barre-Hazleton, PA	624,776	3	0	0	82	5
Johnstown, PA	232,621	2	0	0	85	3
Newburgh, NY-PA	387,669	2	0	0	87	6
State College, PA	135,758	2	0	0	78	4
Williamsport, PA	120,044	1	0	0	76	5

### Rhode Island

New London-Norwich, CT-RI	293,566	3	0	0	78	5
Providence-Fall River-Warwick, RI-MA	1,188,613	3	0	0	86	3

### South Carolina

Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	17	1	0	96	20
Greenville-Spartanburg-Anderson, SC	962,441	8	0	0	82	13
Augusta-Aiken, GA-SC	477,441	2	0	0	81	4
Columbia, SC	536,691	2	0	0	81	4
Charleston-North Charleston, SC	549,033	0	0	0	74	2

### South Dakota

Sioux Falls, SD	172,412	0	0	0	68	0
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### Tennessee

Knoxville, TN	687,249	20	0	0	84	27
Memphis, TN-AR-MS	1,135,614	13	0	0	91	11
Nashville, TN	1,231,311	10	0	0	88	18
Chattanooga, TN-GA	465,161	6	0	0	82	11
Clarksville-Hopkinsville, TN-KY	207,033	2	0	0	77	6
Johnson City-Kingsport-Bristol, TN-VA	480,091	2	0	0	80	4

### Texas

Houston, TX	4,177,646	27	1	0	97	7
Fort Worth-Arlington, TX	1,702,625	15	0	0	94	3
Beaumont-Port Arthur, TX	385,090	13	0	0	91	11
Dallas, TX	3,519,176	12	0	0	87	12
Brazoria, TX	241,767	11	0	0	94	7

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### Texas

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Galveston-Texas City, TX	250,158	8	0	0	91	6
Longview-Marshall, TX	208,780	6	0	0	80	12
San Antonio, TX	1,592,383	4	0	0	87	7
Austin-San Marcos, TX	1,249,763	3	0	0	80	7
El Paso, TX	679,622	3	0	0	87	5
Corpus Christi, TX	380,783	2	0	0	78	6
Brownsville-Harlingen-San Benito, TX	335,227	0	0	0	72	2
Killeen-Temple, TX	312,952	0	0	0	75	6
Laredo, TX	193,117	0	0	0	70	0
McAllen-Edinburg-Mission, TX	569,463	0	0	0	66	0
Tyler, TX	174,706	0	0	0	75	6
Victoria, TX	84,088	0	0	0	73	1
Waco, TX	213,517	0	0	0	75	2

### Utah

Salt Lake City-Ogden, UT	1,333,914	4	0	0	91	7
Flagstaff, AZ-UT	122,366	1	0	0	81	3
Provo-Orem, UT	368,536	1	0	0	84	6

### Virginia

Washington, DC-MD-VA-WV	4,923,153	33	3	0	100	17
Richmond-Petersburg, VA	996,512	10	2	0	98	15
Norfolk-Virginia Beach-Newport News, VA-NC	1,569,541	6	1	0	97	9
Charlottesville, VA	159,576	3	0	0	79	1
Johnson City-Kingsport-Bristol, TN-VA	480,091	2	0	0	80	4
Roanoke, VA	235,932	1	0	0	76	5

### Washington

Portland-Vancouver, OR-WA	1,918,009	1	0	0	94	1
Seattle-Bellevue-Everett, WA	2,414,616	1	0	0	77	2
Bellingham, WA	166,814	0	0	0	52	0
Olympia, WA	207,355	0	0	0	60	0
Spokane, WA	417,939	0	0	0	67	0
Tacoma, WA	700,820	0	0	0	69	0

### West Virginia

Washington, DC-MD-VA-WV	4,923,153	33	3	0	100	17
Parkersburg-Marietta, WV-OH	151,237	5	0	0	79	7
Huntington-Ashland, WV-KY-OH	315,538	4	0	0	79	8

## Appendix C. Metropolitan Areas Ranked by Smog Days in 2010 Within Each State, Continued

### West Virginia

Metropolitan Area	Population	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Highest Concentration (ppb)	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard
Steubenville-Weirton, OH-WV	132,008	4	0	0	83	7
Wheeling, WV-OH	153,172	4	0	0	82	3
Charleston, WV	251,662	1	0	0	87	2

### Wisconsin

Kenosha, WI	149,577	7	0	0	89	5
Sheboygan, WI	112,646	7	0	0	92	5
Milwaukee-Waukesha, WI	1,500,741	6	0	0	92	5
Racine, WI	188,831	6	0	0	84	0
Appleton-Oshkosh-Neehan, WI	358,365	0	0	0	72	1
Duluth-Superior, MN-WI	243,815	0	0	0	71	1
Green Bay, WI	226,778	0	0	0	73	1
Janesville-Beloit, WI	152,307	0	0	0	71	1
La Crosse, WI-MN	126,838	0	0	0	69	0
Madison, WI	426,526	0	0	0	70	0
Minneapolis-St. Paul, MN-WI	2,968,806	0	0	0	75	3
Wausau, WI	125,834	0	0	0	64	0

## Appendix D. Smog Days in 2011 by Combined Statistical Areas, through August 21, 2011

Combined Statistical Area	Smog Days in 2011	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
Albany-Schenectady-Amsterdam, NY	1			1	82
Ames-Boone, IA	0			0	66
Appleton-Oshkosh-Neenah, WI	1			3	76
Asheville-Brevard, NC	2			2	77
Atlanta-Sandy Springs-Gainesville, GA-AL	34			18	94
Baton Rouge-Pierre Part, LA	12			13	90
Bend-Prineville, OR	0			0	56
Birmingham-Hoover-Cullman, AL	15	1		13	98
Boston-Worcester-Manchester, MA-RI-NH	8			7	91
Brownsville-Harlingen-Raymondville, TX	0			0	66
Buffalo-Niagara-Cattaraugus, NY	6			3	92
Charlotte-Gastonia-Salisbury, NC-SC	21			19	91
Chattanooga-Cleveland-Athens, TN-GA	4			2	79
Chicago-Naperville-Michigan City, IL-IN-WI	15			7	93
Cincinnati-Middletown-Wilmington, OH-KY-IN	20	1		10	97
Claremont-Lebanon, NH-VT	0			0	63
Cleveland-Akron-Elyria, OH	11			9	90
Columbia-Newberry, SC	7			10	85
Columbus-Auburn-Opelika, GA-AL	0			1	71
Columbus-Marion-Chillicothe, OH	7			10	88
Corpus Christi-Kingsville, TX	0			1	75
Dallas-Fort Worth, TX	19			17	95
Dayton-Springfield-Greenville, OH	8			10	85
Denver-Aurora-Boulder, CO	17	1		18	106
Des Moines-Newton-Pella, IA	0			0	68
Detroit-Warren-Flint, MI	10			3	88
Dothan-Enterprise-Ozark, AL	0			0	70
Fargo-Wahpeton, ND-MN	0			0	61
Fond du Lac-Beaver Dam, WI	2			3	82
Fort Wayne-Huntington-Auburn, IN	2			3	77
Fresno-Madera, CA	28	1		17	104
Grand Rapids-Muskegon-Holland, MI	6	3		2	104
Greensboro--Winston-Salem--High Point, NC	7			8	85
Greenville-Spartanburg-Anderson, SC	6			9	89
Gulfport-Biloxi-Pascagoula, MS	0			6	75
Harrisburg-Carlisle-Lebanon, PA	4			6	85
Hartford-West Hartford-Willimantic, CT	6			0	92
Houston-Baytown-Huntsville, TX	15	2		11	112
Huntsville-Decatur, AL	2			3	78
Indianapolis-Anderson-Columbus, IN	5			11	89
Jackson-Yazoo City, MS	3			0	85

**Appendix D. Smog Days in 2011 by Combined Statistical Areas, through August 21, 2011, Continued**

Combined Statistical Area	Smog Days in 2011	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
Johnson City-Kingsport-Bristol (Tri-Cities), TN-VA	2			3	80
Kansas City-Overland Park-Kansas City, MO-KS	12			13	90
Knoxville-Sevierville-La Follette, TN	15	1		19	98
Lafayette-Acadiana, LA	1			0	76
Lafayette-Frankfort, IN	1			0	77
Lake Charles-Jennings, LA	0			1	72
Lansing-East Lansing-Owosso, MI	0			0	52
Las Vegas-Paradise-Pahrump, NV	9			15	90
Lexington-Fayette--Frankfort--Richmond, KY	5			1	82
Lima-Van Wert-Wapakoneta, OH	2			6	76
Little Rock-North Little Rock-Pine Bluff, AR	10			4	84
Longview-Marshall, TX	4			6	89
Los Angeles-Long Beach-Riverside, CA	85	21	3	20	136
Louisville/Jefferson County-Elizabethtown-Scottsburg, KY-IN	15	2		13	100
Macon-Warner Robins-Fort Valley, GA	6			6	86
Madison-Baraboo, WI	0			0	70
Milwaukee-Racine-Waukesha, WI	4			4	87
Minneapolis-St. Paul-St. Cloud, MN-WI	1			0	80
Mobile-Daphne-Fairhope, AL	2			3	78
Monroe-Bastrop, LA	0			0	70
Montgomery-Alexander City, AL	0			2	73
Nashville-Davidson--Murfreesboro--Columbia, TN	9			4	86
New Orleans-Metairie-Bogalusa, LA	5			8	83
New York-Newark-Bridgeport, NY-NJ-CT-PA	27	7		5	114
Oklahoma City-Shawnee, OK	17			8	86
Omaha-Council Bluffs-Fremont, NE-IA	0			0	70
Orlando-Deltona-Daytona Beach, FL	7			4	81
Paducah-Mayfield, KY-IL	2			3	89
Peoria-Canton, IL	1			0	89
Philadelphia-Camden-Vineland, PA-NJ-DE-MD	18	3		9	101
Pittsburgh-New Castle, PA	11			10	84
Portland-Lewiston-South Portland, ME	2			3	90
Raleigh-Durham-Cary, NC	6			17	88
Reno-Sparks-Fernley, NV	2			0	81
Rochester-Batavia-Seneca Falls, NY	0			1	74
Rockford-Freeport-Rochelle, IL	0			1	75
Sacramento--Arden-Arcade--Yuba City, CA-NV	23	1		10	97
Salt Lake City-Ogden-Clearfield, UT	7			8	83
San Jose-San Francisco-Oakland, CA	2			2	84
San Juan-Caguas-Fajardo, PR	0			0	51

**Appendix D. Smog Days in 2011 by Combined Statistical Areas, through August 21, 2011, Continued**

Combined Statistical Area	Smog Days in 2011	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
Santa Fe-Espanola, NM	0			0	65
Sarasota-Bradenton-Punta Gorda, FL	3			2	83
Savannah-Hinesville-Fort Stewart, GA	0			0	67
Seattle-Tacoma-Olympia, WA	0			0	70
Shreveport-Bossier City-Minden, LA	2			7	78
Sioux City-Vermillion, IA-NE-SD	0			0	51
South Bend-Elkhart-Mishawaka, IN-MI	5			5	85
St. Louis-St. Charles-Farmington, MO-IL	23	2		13	102
Syracuse-Auburn, NY	2			0	78
Toledo-Fremont, OH	4			5	84
Tulsa-Bartlesville, OK	15			13	95
Tyler-Jacksonville, TX	0			5	73
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	28	7		15	114
Wausau-Merrill, WI	0			0	70
Wichita-Winfield, KS	4			7	83
Williamsport-Lock Haven, PA	0			1	71
York-Hanover-Gettysburg, PA	5			4	84
Youngstown-Warren-East Liverpool, OH-PA	4			4	85



## Appendix E. Smog Days in 2010 by State

State	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
Alabama	15			25	88
Alaska	0			0	53
Arizona	14			23	85
Arkansas	8			17	91
California	135	37	2	23	123
Colorado	19			24	89
Connecticut	24	1		13	101
DC	18	1		16	100
Delaware	18	2		20	98
Florida	9			17	88
Georgia	28	1		21	98
Hawaii	0			0	52
Idaho	0			1	73
Illinois	25			17	88
Indiana	18			19	86
Iowa	1			4	77
Kansas	7			14	83
Kentucky	21	1		26	96
Louisiana	23			21	93
Maine	8	1		1	96
Maryland	43	7		18	115
Massachusetts	14	1		11	100
Michigan	14			16	91
Minnesota	1			2	76
Mississippi	7			10	84
Missouri	25			24	91
Montana	0			0	65
Nebraska	0			2	71
Nevada	10			25	84
New Hampshire	8			5	82
New Jersey	35	2		13	111
New Mexico	4			6	84
New York	30	1		22	113
North Carolina	26	1		31	96
North Dakota	0			0	70
Ohio	33			23	94
Oklahoma	8			14	86
Oregon	2			0	94
Pennsylvania	35	3		18	105
Rhode Island	6			4	86

### Appendix E. Smog Days in 2010 by State, Continued

State	Smog Days in 2010	Red-Alert Days	Purple-Alert Days	Additional Days the Air Was Unhealthy to Breathe According to a More Protective Standard	Highest Concentration (ppb)
South Carolina	8			14	82
South Dakota	0			0	69
Tennessee	29			35	88
Texas	48	1		20	97
Utah*	45	15	5	25	123
Vermont	0			3	71
Virginia	25	3		27	98
Washington	8	2		2	110
West Virginia	10			12	89
Wisconsin	11			7	95
Wyoming	0			2	72

\*In Utah, all but 5 of the smog days recorded occurred in Jan-Mar at monitoring stations in the desert, likely as a result of natural gas exploration, and not from the usual culprits of vehicles and power plants. Of the 25 additional days of unhealthy air, 19 are during summer months. Smog days are more likely during summer months because pollution from vehicles and power plants reacts with heat and sunlight to form smog.

## Endnotes

<sup>i</sup> American Lung Association, *State of the Air 2011*

<sup>ii</sup> M. Lippman, "Health Effects of Ozone: A Critical Review," *Journal of the Air Pollution Control Association* 39: 672-695, 1989; I. Mudway and F. Kelley, "Ozone and the Lung: A Sensitive Issue," *Molecular Aspects of Medicine* 21: 1-48, 2000; M. Gilmour et al., "Ozone-Enhanced Pulmonary Infection with *Streptococcus Zooepidemicus* in Mice: The Role of Alveolar Macrophage Function and Capsular Virulence Factors," *American Review of Respiratory Disease* 147: 753-760.

<sup>iii</sup> Kendall Powell, "Ozone Exposure Throws Monkey Wrench Into Infant Lungs," *Nature Medicine*, Volume 9, Number 5, May 2003; R. McConnell et al., "Asthma in Exercising Children Exposed to Ozone: A Cohort Study," *The Lancet* 359: 386-391, 2002; N. Kunzli et al., "Association Between Lifetime Ambient Ozone Exposure and Pulmonary Function in College Freshmen – Results of a Pilot Study," *Environmental Research* 72: 8-16, 1997; I.B. Tager et al., "Chronic Exposure to Ambient Ozone and Lung Function in Young Adults," *Epidemiology* 16: 751-9, November 2005.

<sup>iv</sup> Bell, Michelle L., et al. "Ozone and Short-term Mortality in 95 Urban Communities, 1987-2000," 17 November 2004.

<sup>v</sup> Joel Schwartz, "Air Pollution and Hospital Admissions for the Elderly in Birmingham, Alabama," *American Journal of Epidemiology* 139: 589-98, 15 March 1994; Joel Schwartz, "Air Pollution and Hospital Admissions for the Elderly in Detroit, Michigan," *American Journal of Respiratory Critical Care Medicine* 150: 648-55, 1994; Joel Schwartz "PM10, Ozone, and Hospital Admissions for the Elderly in Minneapolis-St. Paul, Minnesota," *Archives of Environmental Health* 49: 366-374, 1994; Joel Schwartz, "Short-Term Fluctuations in Air Pollution and Hospital Admissions of the Elderly for Respiratory Disease," *Thorax* 50: 531-538, 1995; J. Schwartz and R. Morris, "Air Pollution and Hospital Admissions for Cardiovascular Disease in Detroit, Michigan," *American Journal of Epidemiology* 142: 23-25, 1995; Joel Schwartz, "Air Pollution and Hospital Admissions for Respiratory Disease," *Epidemiology* 7: 20-28, 1996; Joel Schwartz, "Air Pollution and Hospital Admissions for Cardiovascular Disease in Tucson," *Epidemiology* 8: 371-377, 1997.

<sup>vi</sup> George Thurston et al., "Respiratory Hospital Admissions and Summertime Haze Air Pollution in Toronto, Ontario: Consideration of the Role of Acid Aerosols," *Environmental Research* 65: 271-290, 1994; R. Burnett et al., "The Role of Particulate Size and Chemistry in the Association Between Summertime Ambient Air Pollution and Hospitalization for Cardio-respiratory Disease," *Environmental Health*

- Perspectives 105: 614-620, 1997; R. Burnett et al., "Association Between Ozone and Hospitalization for Respiratory Diseases in 16 Canadian Cities," *Environmental Research* 72: 24-31, 1997.
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