# A Look at 2003

Nationally, 2003 was a good year for ozone air quality. Much of the good news can be attributed in part to favorable weather conditions across many parts of the nation. Most metropolitan areas experienced fewer poor ozone air quality days (i.e., days with ozone levels above the national standard) in 2003 compared to an average of poor ozone air quality days over the previous 5 years (1998–2002). Figure 1 shows the results for selected metropolitan areas, and Figure 2 compares temperature and precipitation levels of 2003 with historical levels. For the eastern half of the country, the height of the ozone season (June through August)

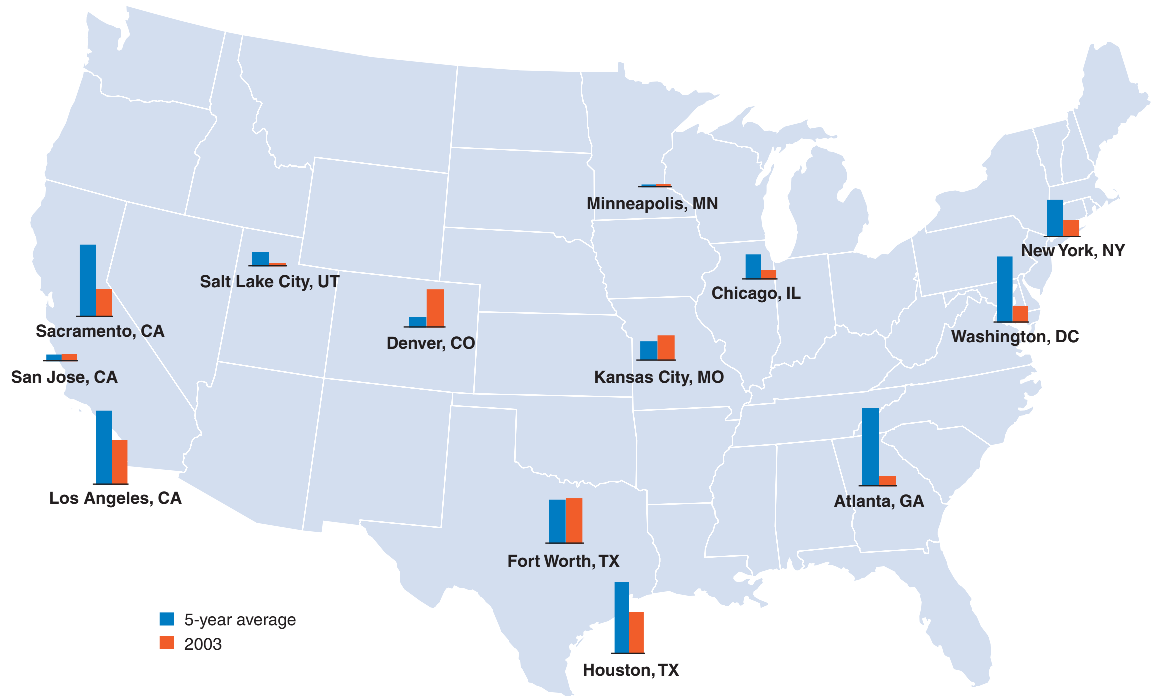



**Figure 1.** Comparison of Days with Ozone Levels above the National Standard, 2003 versus Average 1998–2002.

***Note:*** *In this graphic and throughout this report, metropolitan statistical area (MSA) boundaries, as defined by the U.S. Census Bureau, are used.*

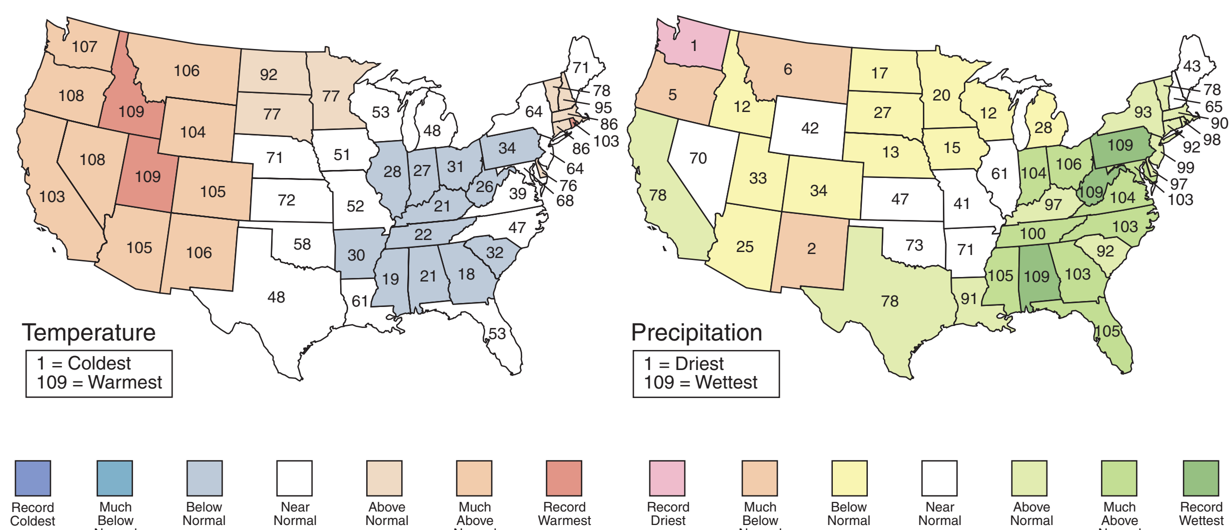



**Figure 2.** June–August 2003 Statewide Ranks of Temperature and Precipitation Compared to Past 109 Years (National Climatic Data Center/NESDIS/NOAA).

was cooler and wetter than normal; therefore, it was less conducive to the formation of ozone than in past years. Despite being warmer than normal between June and August, California experienced a wetter-than-normal summer, which likely contributed to lower ozone levels. Some areas, such as Denver, where the weather in 2003 was warmer and drier than usual, had more poor air quality days in 2003 than they did on average during each of the previous 5 years.

Not only were weather conditions generally good last year, but emissions of ozone precursors were also lower in 2003. Trends show that VOCs and $NO_x$, the pollutants that contribute to ozone formation, were at their lowest levels since 1970 (see "Measuring Progress" on page 8). Determining exactly how much of the improvement in ozone air quality is a result of weather conditions rather than lower emissions is difficult because the formation of ozone is such a complex process. This question is explored further in later sections of this report.

The number of counties with poor ozone air quality was also lower in 2003. In fact, the number of counties with poor air quality in 2003 was the lowest for both the 1-hour standard and the 8-hour standard compared to the previous 5 years, as shown in Figure 3. By comparison, in 2002, a large number of counties reported measuring poor ozone air quality, in part because of warm, dry conditions that were conducive to ozone formation.

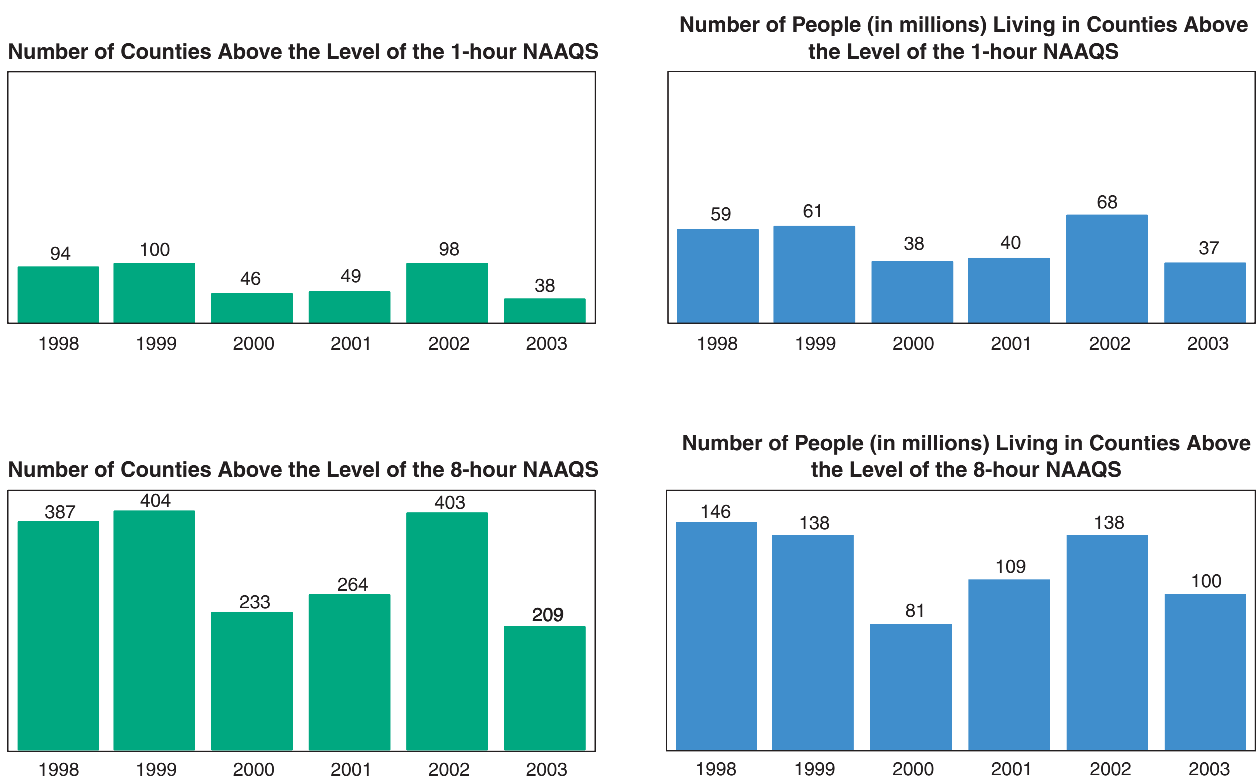



**Figure 3.** Annual Counts of Counties with Ozone Values Above the Level of the National Ozone Standards and Number of People Living in Those Counties.

***Note:*** *These graphs illustrate ozone trends on an annual basis rather than the multi-year period used in determining compliance with the 1-hour and 8-hour standards. Only counties containing at least one ozone monitor are included. Ozone nonattainment designations generally include counties with violating monitors and the nearby counties that contribute to those violations.*

Still, in 2003 alone, more than 100 million people lived in 209 counties with poor ozone air quality based on the 8-hour ozone standard. Most of these counties are located in the Northeast, Mid-Atlantic, Midwest, and California, with smaller numbers of areas in the South and south-central United States (Figure 4). For the 1-hour standard, unhealthy ozone levels in 2003 occurred in 38 counties, where 37 million people live, primarily in the Northeast, Midwest, south-central United States, and California (Figure 5). Although 2003 was generally a good year in terms of ozone air quality, clearly more remains to be done to address this persistent health and environmental problem.

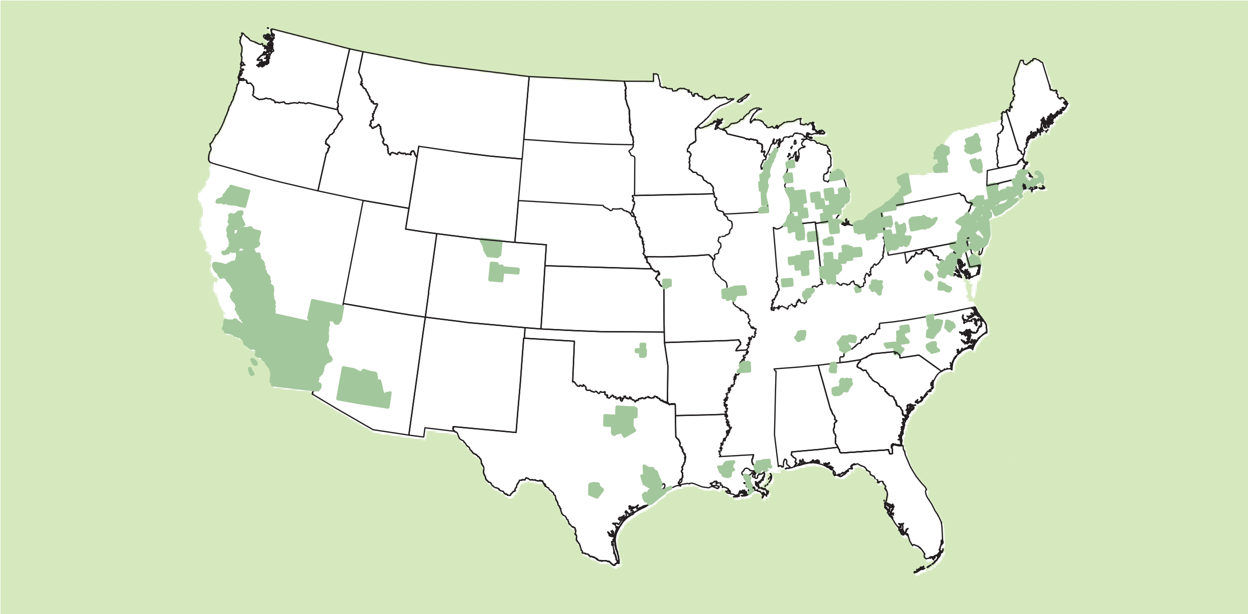


**Figure 4.** Counties Where Fourth Highest Daily Maximum 8-Hour Ozone Concentration Is Above the Level of the 8-Hour Standard in 2003.

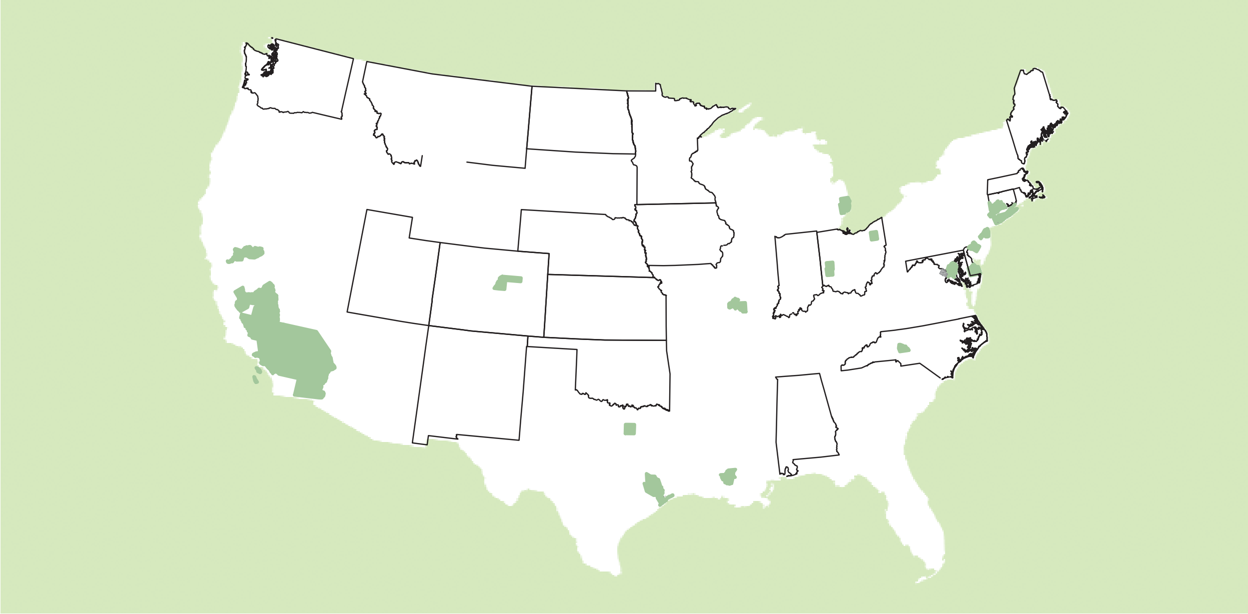


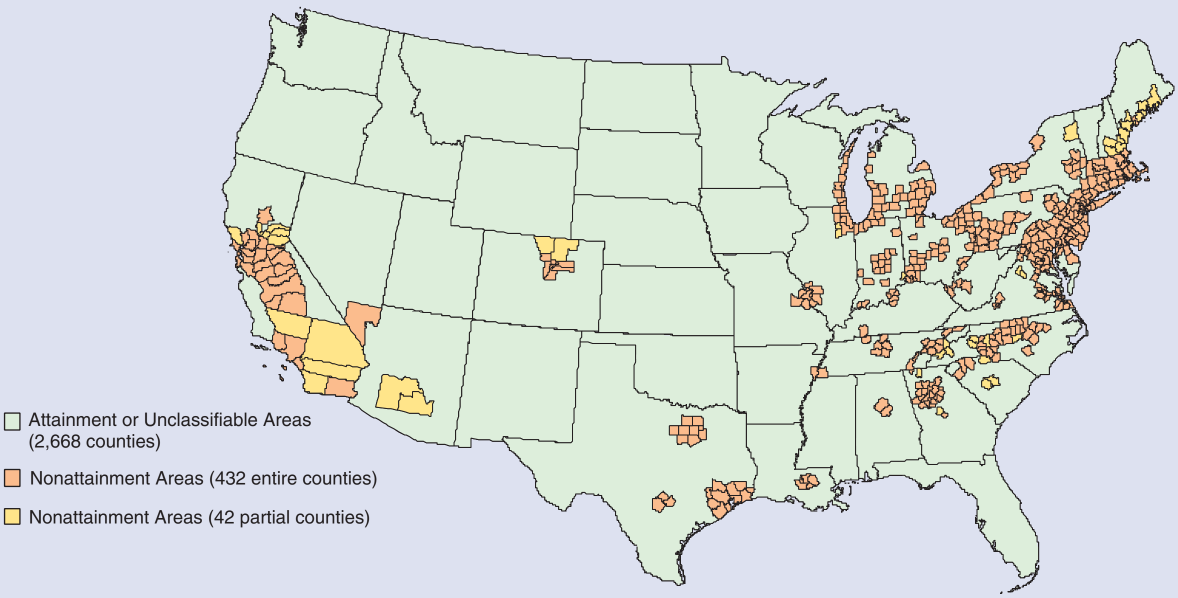
**Figure 5.** Counties Where Second Highest Daily Maximum 1-Hour Ozone Concentration Is Above the Level of the 1-Hour Standard in 2003.

***Note:*** *Figures 4 and 5 show single-year measurements for 2003. EPA's air quality standards for ozone are based on a 3-year average.*

## 8-hour Ozone Designations

On April 15, 2004, EPA identified, or designated, areas as "attainment" or "nonattainment" for the more protective national air quality standard for 8-hour ozone. EPA designates an area as nonattainment if it has violated the national 8-hour ozone standard (assessed over a 3-year period) or has contributed to violations of this standard. The designations take effect on June 15, 2004. They are a crucial first step in state, tribal, and local governments' efforts to reduce ground-level ozone.

The map below shows the 8-hour ozone nonattainment areas. These 126 areas include 474 counties and are home to 159 million people. These 474 counties are comprised of those with monitors violating the standard between 2000 and 2003 and others that contribute to the areas' ozone problems. In addition to metropolitan areas, some of our national parks, including Great Smoky Mountains in Tennessee and North Carolina, Shenandoah in Virginia, and Point Reyes National Seashore in California, are not meeting the 8-hour ozone standards. Nonattainment areas must take actions to improve their ozone air quality on a certain timeline. For more details on 8-hour ozone designations, visit www.epa.gov/ozonedesignations.

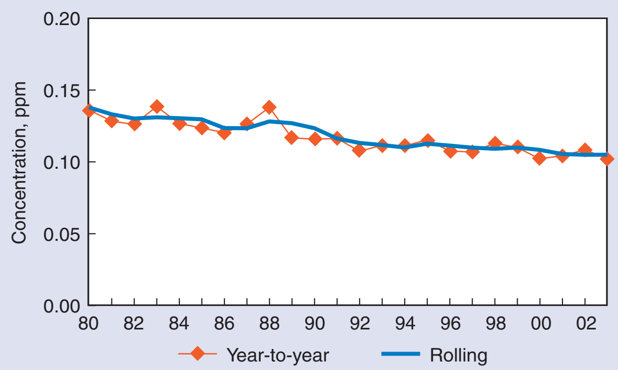



## Smoothing Out the Trends

Trends in ozone concentrations can be difficult to discern because of the year-to-year variability of the data. By using a rolling 3-year time period, we can smooth out the "peaks" and "valleys" in the trend, making it easier to read without changing the overall trend statistic. Three years is consistent with the 3-year period used to assess compliance with the ozone standards. For the 1-hour trends in this report, we use the fourth highest daily maximum over a 3-year period to be consistent with the 1-hour ozone standard. For the 8-hour trends in this report, we use a 3-year average of the fourth highest daily maximum in each year to be consistent with the 8-hour ozone standard.

The 3-year statistic is assigned to the last year in each 3-year period. For example, 1990 is based on 1988–1990, and 2003 is based on 2001–2003. Thus, when endpoint comparisons are used in this report to describe long-term changes (1980–2003 or 1990–2003), they are based on the first 3-year period and the last 3-year period.

**Year-to-Year Versus Rolling Average National 8-Hour Ozone Trends, 1980–2003**



## Measuring Progress

In addition to comparing 2003 ozone levels with levels for recent years, EPA has been evaluating longer-term trends in ozone using data collected from a nationwide network of monitoring sites. From these data, EPA has developed 1-hour and 8-hour ozone trends for the periods 1980-2003 and 1990-2003. Nationally, 2003 levels were 29% lower than 1980 levels and 16% lower than 1990 levels for the 1-hour ozone standard. For the 8-hour standard, 2003 ozone levels were 21% lower than 1980 levels and 9% lower than 1990 levels (Figures 6-9). Ozone levels are still decreasing nationwide, but the rate of decrease for 8-hour levels has slowed since 1990.

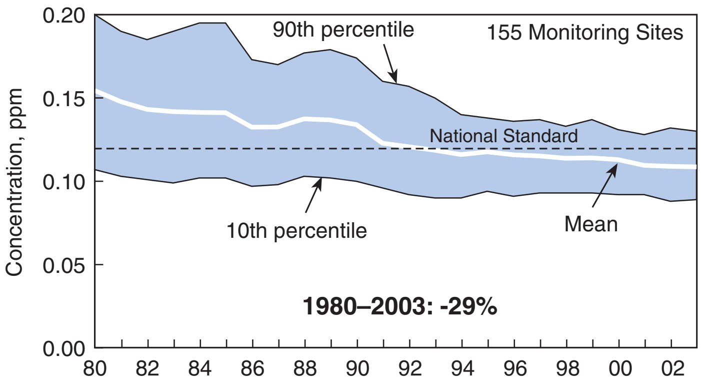



**Figure 6.** One-Hour Ozone Air Quality Trend, 1980–2003, Based on Running Fourth Highest Daily Maximum 1-Hour Ozone Value over 3 Years.

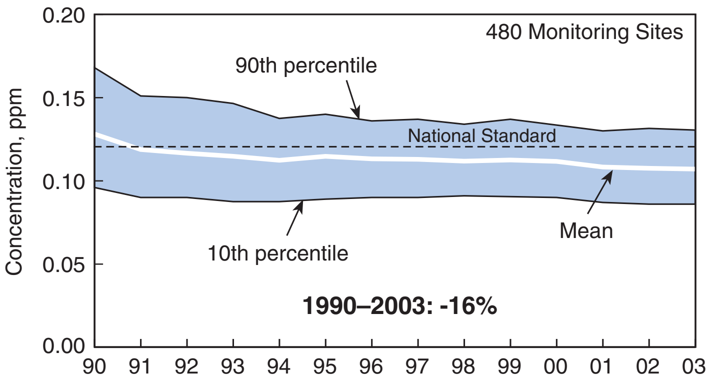



**Figure 7.** One-Hour Ozone Air Quality Trend, 1990–2003, Based on Running Fourth Highest Daily Maximum 1-Hour Ozone Value over 3 Years.

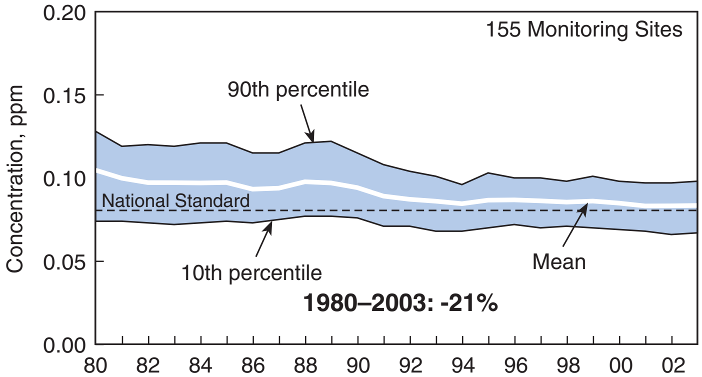



**Figure 8.** 8-Hour Ozone Air Quality Trend, 1980–2003, Based on 3-Year Rolling Averages of Annual Fourth Highest Daily Maximum 8-hour Ozone Concentrations.

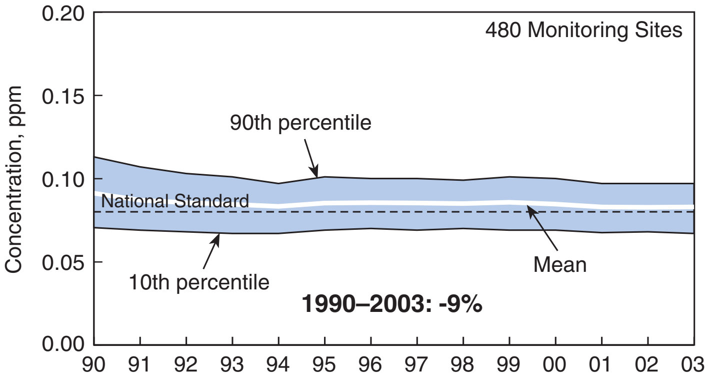



**Figure 9.** 8-Hour Ozone Air Quality Trend, 1990–2003, Based on 3-Year Rolling Averages of Annual Fourth Highest Daily Maximum Ozone Concentrations.

***Note:*** *There are 480 monitoring sites with sufficient data for measuring trends from 1990 to 2003. There are fewer sites with sufficient data for longer trend periods because some began monitoring in the mid-1980s, some had gaps in middle years, and some discontinued monitoring at some point. There are 155 monitoring sites with sufficient data for trends from 1980 to 2003.*

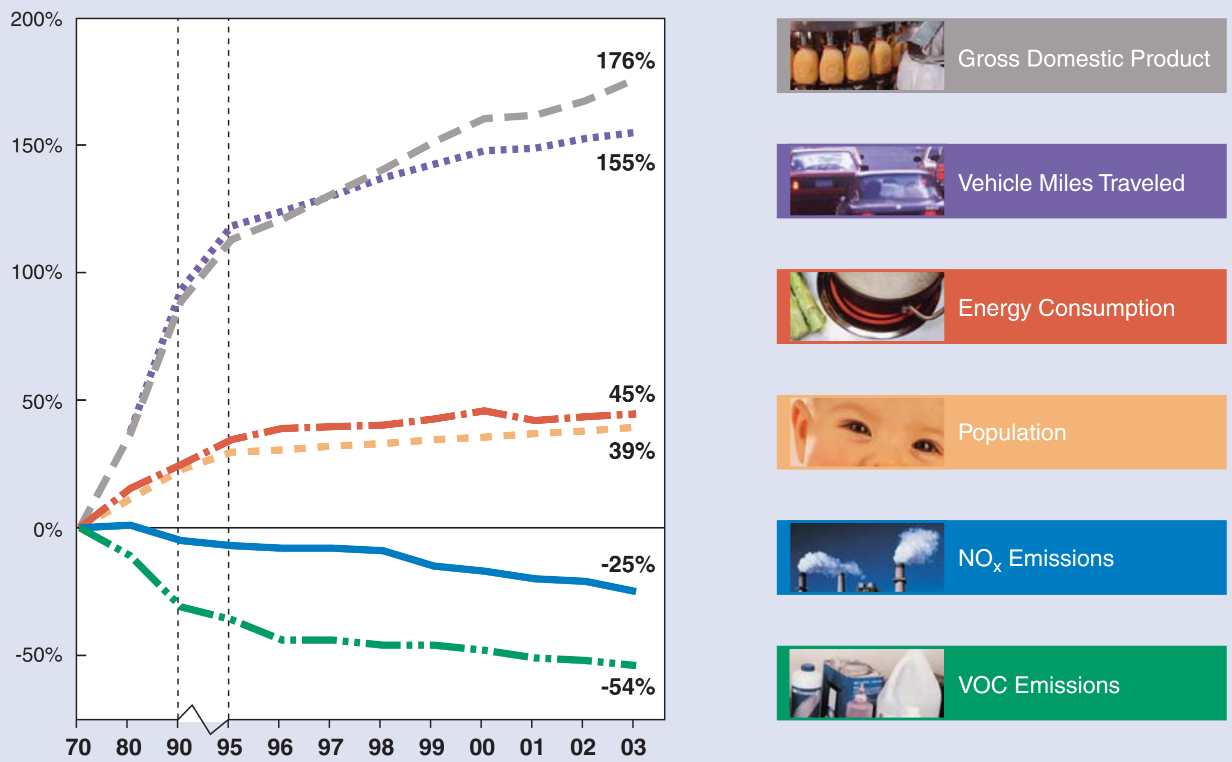



**Figure 10.** Comparison of Growth Areas and Emissions. Between 1970 and 2003, gross domestic product increased 176% VMT increased 155%, energy consumption increased 45%, and population increased 39%. At the same time, emissions of $NO_x$ decreased 25% and VOC decreased 54%.

Over the past 30 years, EPA, in conjunction with state and local agencies, has instituted various programs to reduce $NO_x$ and VOC emissions that contribute to ozone formation. These emission reductions occurred at the same time the nation's economy, energy consumption, and population were growing. For example, between 1970 and 2003, gross domestic product increased approximately 176%; VMT, 155%; energy consumption, 45%; and population, 39%, whereas emissions of $NO_x$ and VOCs decreased approximately 25% and 54%, respectively (Figure 10). The ratio of $NO_x$ and VOC emissions to population has also dropped since 1970 (Figure 11).

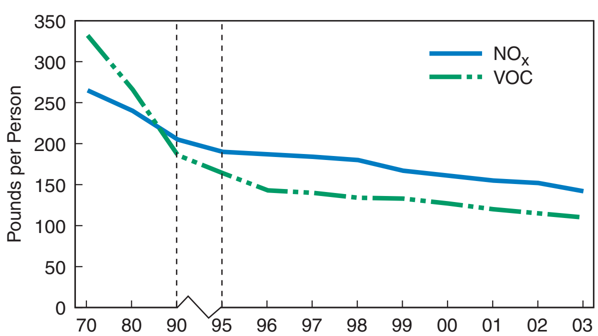



**Figure 11.** $NO_x$ and VOC Emissions Per Capita, 1970–2003.

Figure 12 shows the trends in $NO_x$ emissions for the period 1970-2003. After 1980, $NO_x$ emissions decreased approximately 27%, and, after 1990, $NO_x$ emissions decreased approximately 22%. Most of the $NO_x$ emission reductions since the Clean Air Act was enacted in 1970 have occurred since 1990, during which time $NO_x$ emissions have decreased by 5.5 million tons. Most of this decrease (89% of all $NO_x$ reductions) has come from two sectors: on-road motor vehicles, which have reduced emissions by 2.5 million tons (a 26% reduction since 1990), and electric utilities, which have reduced emissions by 2.4 million tons (a 36% reduction since 1990).

Figure 13 shows the trends in VOC emissions for the period 1970-2003. VOC emissions have declined steadily, dropping approximately 48% since 1980 and 32% since 1990. Since 1990, most of this decrease (92% of all VOC reductions) has come from two sectors: on-road motor vehicles, which reduced emissions by over 5 million tons (a 55% reduction since 1990), and solvent utilization, which reduced emissions by more than 1 million tons (a 20% reduction since 1990). Table 1 lists the major emission control programs that have contributed to $NO_x$ and VOC reductions since 1990.

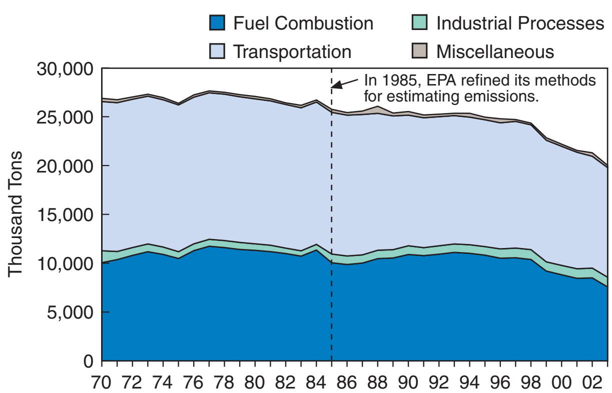



**Figure 12.** National Trends in $NO_x$ Emissions, 1970–2003.

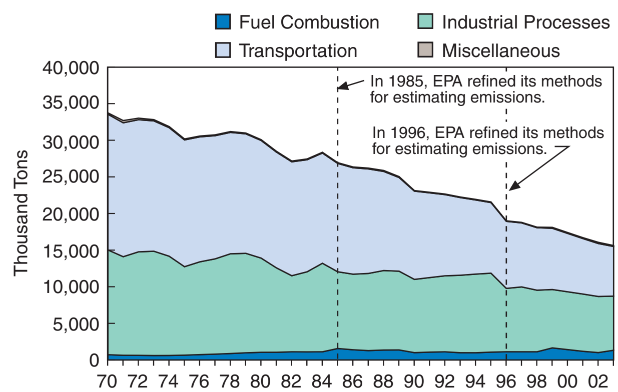



**Figure 13.** National Trends in VOC Emissions, 1970–2003.

**Table 1. Emission Control Programs Contributing to $NO_x$ and VOC Emission Reductions Since 1990**

| Sector | Program | $NO_x$ Reductions | VOC Reductions |
|---|---|---|---|
| Electric Utilities | Acid Rain Program | X | |
| Electric Utilities | Ozone Transport Commission $NO_x$ Program | X | |
| Electric Utilities | $NO_x$ State Implementation Plan Call | X | |
| Chemical Manufacturing | Synthetic Organic Chemical Manufacturing Maximum Achievable Control Technology | | X |
| Other Stationary Source | Clean Air Act Solvent and Coating Controls | | X |
| Mobile Sources | Tier I Emission Standards | X | X |
| Mobile Sources | Reformulated Gasoline | X | X |
| Mobile Sources | National Low Emission Vehicle Program | X | X |
| Mobile Sources | Inspection/Maintenance Programs | X | X |
| Mobile Sources | Reid Vapor Pressure Controls | | X |
| Mobile Sources | Evaporative Controls | | X |