CHAPTER 1

Executive Summary

http://www.epa.gov/oar/aqtrnd99/chapter1.pdf

Criteria pollutants are those pollutants for which the United States Environmental Protection Agency has established National Ambient Air Quality Standards (NAAQS). They include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2).

Percent Decrease in National Air Quality Concentrations

1980–1999		1990–1999
57	Carbon Monoxide	36
94	Lead	60
25	Nitrogen Dioxide	10
20	Ozone*	4
—	Particulate Matter (PM_{10})	18
50	Sulfur Dioxide	36

* based on 1-hour level.

Air quality concentrations are based on actual measurements of pollutant concentrations in the air at selected monitoring sites across the country.

Fine particulate matter, or $PM_{2.5}$, are those particles whose aerodynamic diameter is less than or equal to 2.5 micrometers.

Worth Noting:

20-YEAR TRENDS

- National levels of all the criteria pollutants are down.
- Visibility has improved in the East.

10-YEAR TRENDS

$PM_{2.5}$

- In the rural east, sulfates (which comprise approximately 50 percent of $PM_{2.5}$) are down 24 percent over the last 10 years and in 1999 have returned to 1996–1997 levels, after higher levels in 1998.
- At the Class I areas, $PM_{2.5}$ levels, on average, are also back down in 1999.

Visibility

- Overall, the eastern Class I sites do not appear to be getting any worse.
- The eastern Class I sites as an aggregate, showed a 15-percent improvement for the haziest days from 1992–1999. The light extinction due to sulfates reached its lowest level of the 1990s.

Ozone

- While national levels improved in the last 10 years, 1-hour ozone levels in selected regions increased, and 8-hour levels in rural areas increased.

Air Toxics

- Large national emission reductions have been achieved in air toxics (also known as hazardous air pollutants) between the baseline period (1990–1993) and 1996. Improvements come from "major" stationary sources and highway vehicles.

INTRODUCTION

This is the 27th annual report documenting air pollution trends in the United States.[1–25, 27] This document highlights the Environmental Protection Agency's (EPA's) most recent assessment of the nation's air quality, focusing on the 20-year period from 1980–1999. It features comprehensive information for the criteria pollutants and hazardous air pollutants, as well as relevant ambient air pollution information for visibility impairment and acid rain.

Discussions throughout this report are based on the principle that many of the programs designed to reduce ambient concentrations of the criteria pollutants also aid in reducing pollution that contributes to air toxics pollution, visibility impairment, and acid rain. Likewise, requirements under the various air

toxics, visibility, and acid rain programs can also help reduce emissions that contribute to ambient concentrations of the criteria pollutants.

CHAPTER 2

CRITERIA POLLUTANTS — NATIONAL TRENDS

EPA tracks trends associated with the criteria pollutant standards. The national and regional air quality trends, along with supporting emissions data, are presented in this chapter. National levels of all criteria pollutants are down over the last 20 years. Over the last 20 years, ozone (O_3) (1-hour and 8-hour) levels nationally have improved considerably. Some parts of the country show increases in levels over the last 10 years, due mainly to increased NO_x emissions and weather conditions favorable to O_3 formation. Rural O_3 levels appear to be increasing in the short term. However, O_3 levels in urban areas where O_3 problems have historically been the most severe have shown marked improvement in response to stringent controls. Over the last 20 years, urban NO_2 concentrations across the country have decreased. All areas of the country that once violated the NAAQS for NO_2 now meet this standard. Since 1988 represents the first complete year of PM_{10} data for most monitors, a 20-year trend is not available. However, the most recent 10-year period (1990–1999) shows that the national average of annual mean PM_{10} concentrations decreased 18 percent. The national composite average of SO_2 annual mean concentrations decreased 36 percent between 1990–1999 with the largest single-year reduction occurring between 1994 and 1995. Nationally carbon monoxide (CO) levels for 1999 are the lowest recorded in the last 20 years and this air quality improvement is consistent across all regions of the country. Presently only six areas of the country have CO levels violating the NAAQS. From 1980–1999, there has been a 94-percent decrease in lead (Pb) emissions with a corresponding 94-percent decrease in maximum quarterly average Pb concentrations at population oriented monitors. There are only six areas in the country in nonattainment for Pb and these are associated with specific point sources.

Summary of MSA Trend Analyses by Pollutant, 1990–1999

Trend Statistic		Total # MSAs	# MSAs Up	# MSAs Down	# MSAs with No Significant Change
CO	second max 8-hour	138	0	107	31
Lead	max quarterly mean	69	1	44	24
NO_2	arithmetic mean	99	3	41	55
Ozone	fourth max 8-hour	207	25	10	172
Ozone	second daily max 1-hour	207	17	14	176
PM_{10}	90th percentile	216	1	113	102
PM_{10}	weighted annual mean	216	2	126	88
SO_2	arithmetic mean	148	1	86	61
SO_2	second max 24-hour	149	1	82	66

CHAPTER 3

CRITERIA POLLUTANTS — METROPOLITAN AREA TRENDS

Chapter 3 characterizes air quality on a more local level, using three different indicators. First, this chapter lists the 1999 peak air quality concentrations for metropolitan statistical areas (MSAs) . Second, 10-year trends are assessed for each area using a statistical method to measure whether the trend is up or down. The results show that of the 263 areas examined: 1) 214 had downward trends in at least one of the criteria pollutants; 2) 34 had upward trends; 3) 41 areas had no significant trends. A closer look at the

34 areas with upward trends reveals that most were exceeding the level of the 8-hour ozone standard.

The third way in which local air quality is evaluated is by looking at the Air Quality Index (AQI) in the nation's 94 largest metropolitan areas. Ozone accounts for majority of the days with AQI values over 100. Between 1990 and 1999, the total number of days with AQI values greater than 100 decreased 62 percent in southern California but actually rose 25 percent in the remaining major cities across the United States.

CHAPTER 4

CRITERIA POLLUTANTS — OFFICIAL NONATTAINMENT AREAS

Chapter 4 summarizes the current status of nonattainment areas, which are those officially designated areas not meeting the NAAQS for at least one of the six criteria pollutants. As of September 2000, 114 areas are designated nonattainment. These areas are displayed on a map in this chapter. A second map depicts the current ozone nonattainment areas, color-coded to indicate the severity of the ozone problem in each area. The condensed list of nonattainment areas as of September 2000 is presented in Table A-19.

CHAPTER 5

AIR TOXICS

Chapter 5 presents information on Hazardous Air Pollutants (HAPs), commonly called air toxics. These are pollutants known to cause or suspected of causing cancer or other serious human health effects or ecosystem damage. As of the date of this publication, the 1996 National Toxics Inventory (NTI) contains the most complete, up-to-date air toxics emission estimates available for 188 HAPs. For purposes of this report, the information in the NTI has been divided into four overarching source types: 1) large industrial or "major" sources; 2) "area and other sources," which include smaller industrial sources, such as small drycleaners and gasoline stations, as well as natural sources, such as wildfires; 3) "onroad" mobile, including highway vehicles; and 4) "nonroad" mobile sources, like aircraft, locomotives, and lawn mowers. Summaries of the 1996 emissions provide detail that includes contributions of source types to the 188 HAPs, the subset of 33 urban HAPs as well as the recently designated 21 mobile source air toxics.

A comparison of the 1996 NTI to the baseline period (1990–1993) shows that large national emission reductions have been achieved. For 188 HAPs, there is a 23-percent reduction between the baseline and 1996. For the 33 urban HAPs, there is a 30-percent reduction between the baseline and 1996. Improvements come from "major" stationary sources and highway vehicles. Further reductions are expected from both existing programs and planned future efforts.

Although there is currently no national air toxics monitoring network, there are approximately 300 monitoring sites currently producing ambient data on some of the HAPs. Although the sites are not necessarily at locations which represent the highest area-wide concentrations, they can still be used to provide useful information on trends in ambient air toxics. Ambient monitoring results generally reveal downward trends for most pollutants. The most consistent improvements are apparent for benzene and for total suspended lead. From 1994–1999, annual average concentrations for these two HAPs declined 40 and 47 percent respectively. EPA is working together with state and local air monitoring agencies to build upon the existing monitoring sites to develop a national monitoring network.

CHAPTER 6

VISIBILITY TRENDS

The Clean Air Act (CAA) authorizes EPA to protect visibility, or visual air quality, through a number of programs. These programs include the National Visibility Program under sections 169a and 169b of the Act, the Prevention of Significant Deterioration Program for the review of potential impacts from new and modified sources, the secondary National Ambient Air Quality Standards (NAAQS) for PM_{10} and $PM_{2.5}$, and the Acid Rain Program under section 401. The National Visibility Program, established in 1980, requires the protection of visibility in 156 mandatory federal Class I areas across the country (primarily national parks and wilderness areas). The CAA established as a national visibility goal "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory federal Class I areas in which impairment results from man-made air pollution." The Act also calls for state programs to make "reasonable progress" toward the national goal.

The trends analyses presented in this chapter are based on data from the IMPROVE network. There were 34 sites having data adequate for assessing trends between 1990 and 1999. The network recently has been expanded to provide complete coverage of all mandatory federal Class I areas.

Because of the significant regional variations in visibility conditions, the trends are grouped into eastern and western regions, rather than a national aggregate. The trends are presented in terms of the annual average values for the "clearest," "typical," and "haziest" days monitored each year.

The results show that, in general, visibility is worse in the East than in the West. In fact, visibility impairment for the worst days in the West is close to the level of impairment for the best day in the East.

This year's analyses show that the 10 eastern U.S. Class I sites as an aggregate show improvement for the haziest days over the 1992–1999 timeframe primarily due to reduced levels of sulfate. The 26 western U.S. Class I sites as an aggregate show improvement for the clearest 20 percent and middle 20 percent of days over 1990–1999 timeframe.

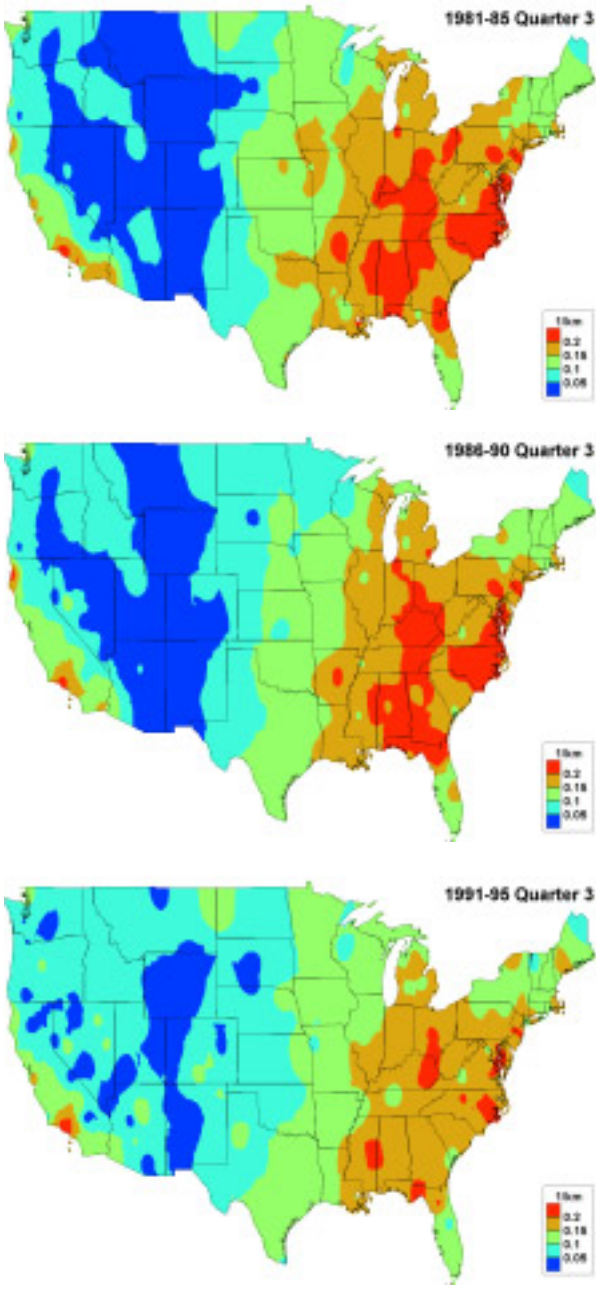
Long-term visibility trends (1990–1999) illustrated in the figures show that summer visibility in the eastern United States improved between 1991–1995. This trend follows overall trends in sulfur dioxides emissions discussed in Chapter 2.

CHAPTER 7

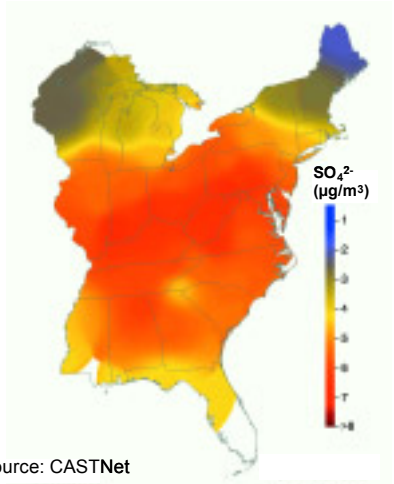
ATMOSPHERIC DEPOSITION OF SULFUR AND NITROGEN COMPOUNDS

Sulfur and nitrogen oxides are emitted into the atmosphere primarily from the burning of fossil fuels. These emissions react in the atmosphere to form compounds that are transported long distances and are subsequently deposited in the form of pollutants such as particulate matter (sulfates, nitrates) and related

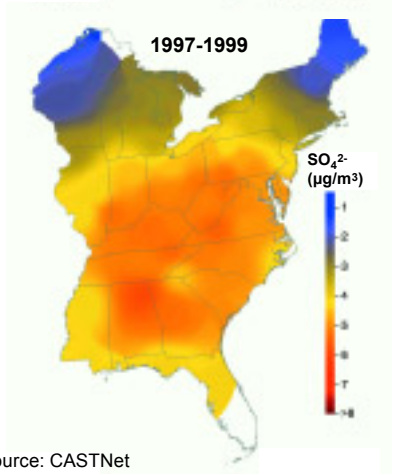
Long-term Trends for 75th Percentile Light Extinction Coefficient from Airport Visual Data (July–September)



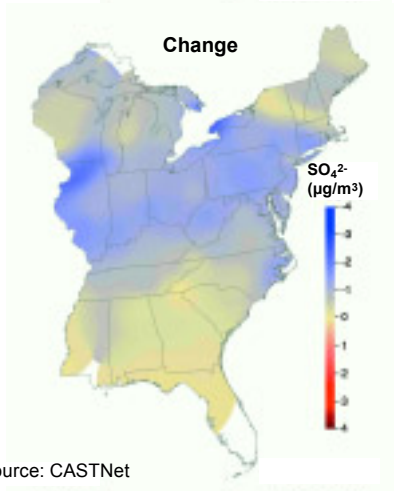
Rural Annual Average Sulfate Concentrations From CASTNet, 1990–1992 vs. 1997–1999



Source: CASTNet



Source: CASTNet



Source: CASTNet

gases (nitrogen dioxide, sulfur dioxide and nitric acid). Nitrogen oxides will also interact with volatile organic compounds to form ozone. The effects of atmospheric deposition include acidification of lakes and streams, nutrient enrichment of coastal waters and large river basins, soil nutrient depletion and decline of sensitive forests, agricultural crop damage, and impacts on ecosystem biodiversity. Toxic pollutants and metals can also be transported and deposited through atmospheric processes.

Both local and long-range emission sources contribute to atmospheric deposition. Total atmospheric deposition is determined using both wet and dry deposition measurements. Wet deposition is the portion dissolved in cloud droplets and is deposited during rain or other forms of precipitation. Dry deposition includes both gas and particle transfer to surfaces during periods of no precipitation. Although the term "acid rain" is widely recognized, the dry deposition portion can range from 20–60 percent of total deposition.

EPA is required by several Congressional and other mandates to assess the effectiveness of air pollution control efforts. These mandates include Title IX of the 1990 Clean Air Act Amendments (the National Acid Precipitation Assessment Program), the Government Performance and Results Act, and the U.S./Canada Air Quality Agreement. One measure of effectiveness of these efforts is whether sustained reductions in the amount of atmospheric deposition over broad geographic regions are occurring. However, permanent changes in SO_2 emissions happen very slowly and atmospheric trends are often obscured by the wide variability of measurements and climate. Numerous years of continuous and consistent data are required to overcome this variability, making long-term monitoring networks especially critical for characterizing deposition levels and identifying relationships among emissions, atmospheric loadings and effects on human health and the environment.

Sulfate concentrations in precipitation have decreased over the past two decades. The reductions were relatively large in the early 1980s followed by more moderate declines until 1995. These reductions in wet sulfates are similar to changes in SO_2 emissions. In 1995 and 1996, however, concentrations of sulfates in precipitation over a large area of the eastern United States exhibited a dramatic and unprecedented reduction. Sulfates in rain have been estimated to be 10–25 percent lower than levels expected with a continuation of 1983–1994 trends. The wet sulfate deposition levels in the 1990–1992 and 1997–1999 time periods, together with the absolute change, are illustrated in the figure. This important reduction in acid precipitation is directly related to the large regional decreases in SO_2 emissions resulting from phase I of the Acid Rain Program (See "Trends in SO_2" in Chapter 2 of this report). The largest reductions in sulfate deposition occurred along the Ohio River Valley and in states to the north and immediately downwind of this region. Nitrogen trends paint a different picture. Nitrate and ammonium deposition derived from National Atmospheric Deposition Program measurement sites reveal 10-year improvement in some areas, including eastern TX, MI, PA and NY. Increased deposition is estimated for the Plains states; and the Western Ohio River and Central Mississippi River Valleys. From ammonium in rain, increases are also noted for eastern NC. However, nitrogen levels for most areas of the county in 1997–1999 were not appreciably different from historical levels.

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