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Air

NATIONAL AIR POLLUTANT EMISSION TRENDS, 1900 - 1995

National Air Pollutant Emission Trends

1900 — 1995

Disclaimer

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Foreword

This document presents the most recent estimates of national emissions of the criteria air pollutants. The emissions of each pollutant are estimated for many different source categories, which collectively account for all anthropogenic emissions. The report presents the total emissions from all 50 States. These estimates are updated annually.

This report tracks changes in national emissions since passage of the Clean Air Act Amendments of 1990 (CAAA). The emission trends are the net effect of many factors, including changes in the nation's economy and in industrial activity, technology, consumption of fuels, traffic, and other activities that cause air pollution. The trends also reflect changes in emissions as a result of air pollution regulations and emission controls. These reports will serve as a measure of our nation's progress in reducing air pollution emissions as a result of mandatory and voluntary controls and of continuous changes in national activity.

In addition to the extensive coverage of criteria air pollutant emissions from anthropogenic sources in the United States, this year's report continues to provide limited coverage of State-derived biogenic and air toxic emissions, and emissions for Canada. Preliminary estimates are presented for the years 1990 through 1995. Final estimates (including refinements to the data used to estimate emissions) will be presented in future reports.

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Acronyms and Abbreviations

ARD	Acid Rain Division
BEIS	Biogenics Emissions Inventory System
CAA	Clean Air Act
CAAA	1990 Clean Air Act Amendments
CARB	California Air Resources Board
CEM	Continuous Emission Monitoring
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
DOE	Department of Energy
EC	elemental carbon
ECOS	Environmental Council of States
EFIG	Emission Factors and Inventory Group
EIA	Energy Information Administration
EPA	United States Environmental Protection Agency
ETS	Emission Tracking System
GCVTC	Grand Canyon Visibility Transport Commission
GDP	Gross Domestic Product
gpg	grams per gallon
gpm	grams per mile
HAPs	hazardous air pollutants
HC	hydrocarbon
LADCO	Lake Michigan Air Directors Consortium
MACT	maximum achievable control technology
MMBtu	millions of British thermal units
NAAQS	National Ambient Air Quality Standards
NAPAP	National Acid Precipitation Assessment Program
NET	National Emission Trends
NH_3	ammonia
NMHC	nonmethane hydrocarbons
NO	nitric oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NSPS	New Source Performance Standards
NTI	National Toxics Inventory
O_3	ozone
OAQPS	Office of Air Quality Planning and Standards
OC	organic carbon
OMS	Office of Mobile Sources
OPPE	Office of Policy, Planning, and Evaluation
OPPIES	OPPE Particulate Programs Implementation Evaluation System
OSD	ozone season daily
OTAG	Ozone Transport and Assessment Group
Pb	lead
PM-10	particulate matter less than 10 microns in aerodynamic diameter
PM-2.5	particulate matter less than 2.5 microns in aerodynamic diameter
ppm	parts per million
RACT	Reasonably Available Control Technology
RVP	Reid vapor pressure
SIP	State implementation plan
SO_2	sulfur dioxide
TRI	Toxics Release Inventory
TSP	total suspended particulate
U.S.	United States
VMT	vehicle miles traveled
VOC	volatile organic compounds

Acknowledgment

This report was prepared with the help of many people. The EPA wishes to acknowledge the assistance of Sharon V. Nizich, David Misenheimer, Thomas McMullen, Anne Pope, and David Mobley of the Emission Factors and Inventory Group; Mark Wolcott and Lois Platte of the Office of Mobile Sources; Thomas E. Pierce of the National Exposure Research Lab; as well as Patty Carlson and Kathy Manwaring of E.H. Pechan & Associates, Inc. who assisted in preparing the emission estimates and producing this report. The agency also wishes to acknowledge the data and information that were provided by numerous people from Government agencies and private institutions and organizations, especially Libby Greenwood of Environment Canada.

Executive Summary

This report presents the United States (U.S.) Environmental Protection Agency's (EPA) latest estimates of national emissions for criteria air pollutants: carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOC), sulfur dioxide (SO_2), particulate matter less than 10 microns in aerodynamic diameter (PM-10), and lead (Pb). Estimates are presented for the years 1900 to 1995. Estimates for three criteria pollutants, NO_x, SO_2, and VOC, have been extrapolated back to 1900. Criteria pollutants are those for which ambient air standards have been set, based on established criteria for risk to human health and/or environmental degradation.

Data on emissions of hazardous air pollutants (HAPs), sometimes referred to as air toxics, and data on emissions from biogenic sources are also included in this report for the United States. Data for Canada for 1990 are presented for the criteria air pollutants.

Figures 1 and 2 present the long-term trends in the criteria air pollutant emissions from 1900 through 1995. Most of the criteria air pollutant emission levels peaked around 1970. PM-10 emissions peaked earlier (around 1950) due to smoke and particulates being the first pollutants to be regulated. Between 1970 and 1995 emissions for all criteria pollutants except NO_x declined, even though vehicle miles traveled (VMT) and gross domestic product (GDP) increased. These air pollution decreases are attributable to the Clean Air Act (CAA) regulations beginning in 1970 and continuing into the 1990s. (Intermittent economic recession and improved manufacturing practices have also played a role.)

Tables 1 and 2 present the most current emission estimates for the criteria and other air pollutants in the United States. United States criteria pollutant emissions decreased from the previous year. The decrease in NO_x and SO_2 emission estimates is a result of the implementation of Reasonably Available Control Technology (RACT) applied to major sources in nonattainment areas and Title IV applied to Phase I units at utilities as mandated by the 1990 Clean Air Act Amendments (CAAA). The reduction in CO and VOC emissions is a result of a decrease in the number of acres of land burned from wildfires. Mobile source emissions decreased from 1994 as a result of the use of new fuels (reformulated gasoline, oxygenated fuels, and lower Reid vapor pressures [RVP]). Particulate fugitive dust emissions from construction sources decreased due to the decline in construction activity.

The most recent available Canadian data for 1990 are summarized in Table 3. Table 4 presents the total ozone season daily (OSD) emission estimates for the ozone precursor pollutants (CO, NO_x, and VOC) currently contained in the National Emission Trends (NET) data base and from the Ozone Transport and Assessment Group (OTAG) study. EPA is in the process of incorporating these estimates into a single consolidated annual inventory and is also expanding the list of pollutants to include SO_2 and PM-10.

A description of the methods used for estimating CO, NO_x, VOC, SO_2, PM-10, and Pb can be found in Chapter 6 of the previous year's report [1] and in the Trends Procedures Document.[2]

Table 1. 1994 and 1995 National Annual Emission Estimates for Criteria Air Pollutants (million short tons)

Pollutant	Emissions 1994	Emissions 1995
Anthropogenic Emissions		
Carbon Monoxide	98.8	92.1
Lead (thousand short tons)	5.03	4.99
Nitrogen Oxides	23.7	21.8
Particulate Matter (PM-10)	44.6	42.6
Fugitive dust	40.9	39.4
Sulfur Dioxide	21.0	18.3
Vol. Organic Compounds	23.3	22.9
Biogenic Emissions		
Vol. Organic Compounds		32.7

Table 2. 1990 National Annual Emission Estimates for PM-2.5, Ammonia, and Hazardous Air Pollutants (million short tons)

Pollutant	Emissions 1990
Particulate Matter (PM-2.5)	10.1
Ammonia	5.2
Hazardous Air Pollutants	4.4

Table 3. 1990 Annual Criteria Air Pollutant Emission Estimates for Canada (million short tons)

Pollutant	Emissions
Carbon Monoxide	10.9
Nitrogen Oxides	2.3
Total Particulate Matter	1.4
Sulfur Dioxide	3.6
Volatile Organic Compounds	2.8

Table 4. 1990 Ozone Season Daily Emission Estimates for Ozone Precursor Pollutants (thousand short tons)

Pollutant	NET	OTAG
Carbon Monoxide	192	207
Nitrogen Oxides	53	54
Volatile Organic Compounds	58	50

Figure 1. Long-term Trend in National Emissions of SULFUR DIOXIDE, NITROGEN OXIDES, VOLATILE ORGANIC COMPOUNDS, and PARTICULATE MATTER [(PM-10), excluding fugitive dust sources]

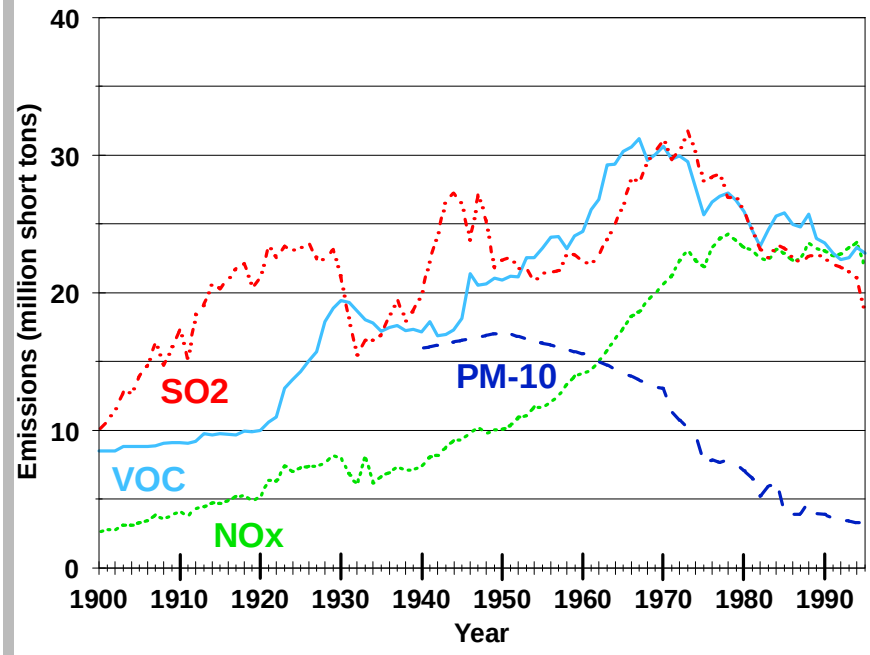
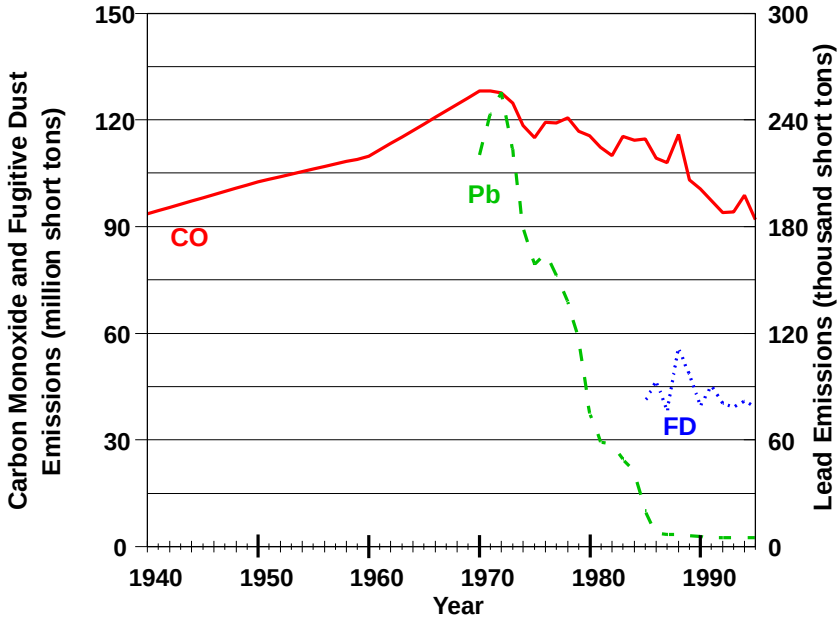


Figure 2. Long-term Trend in National Emissions of CARBON MONOXIDE, LEAD, and PARTICULATE MATTER [PM-10 (from fugitive dust sources)]



National Emission Trends

Historical trends in criteria air pollutant emissions are presented in this section for the period 1940 through 1995.[a] Because nitrogen dioxide (NO_2) is formed when NO_x emissions interact with atmospheric oxygen, and ozone (O_3) is formed when NO_x and VOC are transformed by sunlight, regulatory efforts to control NO_2 and O_3 levels focus on NO_x and VOC pollutant emissions. Because of their essential role in forming NO_2 and O_3, this report presents information on NO_x and VOC along with CO, SO_2, PM-10, and Pb.

The level and composition of economic activity in the nation, demographic influences, and the impact of regulatory efforts to control emissions affect the trends in air pollutant emissions. Significant regulatory milestones in air pollution control and the impact of these controls on emission levels are highlighted.

A basic strategy in the source emissions estimation process is to partition sources into "point" and "area" categories. A point source is a factory, power plant, or other facility with sufficiently large emissions to warrant individual cataloging; in EPA's National Emission Trends (NET) data base, the threshold generally is 100 short tons or more of a specific pollutant per year. Area sources include sources that are too small, too numerous, and too dispersed to catalog individually, but that collectively contribute significantly to the national total.

[a]The emission estimates for the years 1940, 1950, and 1960 can be found in tables and figures in Chapter 3 of the previous year's report.[1]

OVERVIEW OF AIR POLLUTION CONTROL HISTORY

The first United States (U.S.) air pollution statutes were passed by the cities of Chicago and Cincinnati in 1881 to control smoke and soot from furnaces and locomotives. County governments began to pass their own pollution control laws in the early 1900s.

In October of 1948, a pivotal air pollution episode occurred in Donora, PA. An exceptionally long weather stagnation, from a Wednesday into the following Sunday, confined emissions from heavy industries in and around this town in the Monongahela River valley. Twenty deaths, 17 on the third day alone, have been attributed to the episode; several thousand people experienced mild to severe respiratory distress. The event captured national attention and revealed a general lack of scientific knowledge about the causes and effects of air pollution.[3]

In 1952, Oregon became the first State to legislatively control air pollution. Other States followed, with air pollution statutes generally targeted toward smoke and particulate matter. As a result, PM-10 is the only pollutant with declining emissions during the 1950s and 1960s.

The Federal government's involvement in air pollution control began in 1955 with passage of the Air Pollution Control Act, which limited the extent of Federal involvement to funding assistance for the States. Congress passed several additional air pollution laws during the 1960s, including the original Clean Air Act (CAA) in 1963. All of these laws granted responsibility for setting and implementing air quality standards to the States.

With the CAA, as amended in 1970, a major change took place in air pollution policy. First, a new Federal agency, the U.S. Environmental Protection Agency (EPA), was charged with the responsibility of setting the National Ambient Air Quality Standards (NAAQS). In 1971, the EPA promulgated primary and secondary NAAQS for photochemical oxidants, CO, SO_2, total suspended particulates (TSP), and hydrocarbons (HC). Second, EPA was given authority to develop national emission standards for cars, trucks, and buses. Finally, Congress gave EPA control over emissions standards for all new sources of the common air pollutants. The major responsibility left to the States was how to control existing sources. States were charged with the task of complying by 1975 with each of the NAAQS by developing and implementing State implementation plans (SIPs) that would demonstrate how existing sources would be controlled. Modifications were again made to the CAA in 1977, with even more significant changes occurring with the 1990 CAA Amendments (CAAA).

HISTORICAL EMISSION TRENDS[b]

Emission trends are presented for the period 1970 through 1995 for CO, NO_x, VOC, SO_2, and PM-10 in Tables 5-11. Figures 3 through 9 depict emission estimates for each criteria air pollutant for 1970 to 1995. With the exception of NO_x and PM-10, all of the criteria pollutant emissions peaked in or around 1970, and there has been a general downward trend during the 1970 through 1995 time frame. For PM-10, peak emission levels occurred around 1950; PM-10 levels steadily declined until the mid-1980s and have remained relatively stable since then. NO_x emissions steadily increased up through the mid-1970s and levels have been fairly steady since their 1978 peak.

Since most air pollution is created by human activities, it is reasonable to assume that as the population grows, emissions will increase (all other factors affecting emissions remaining unchanged). For most of the air pollutants, the mid-1940s represented the highest level of per capita emissions over the study period. The only two pollutants with peak per capita emissions after this period were VOC (peak in 1967) and NO_x (peak in 1973). For Pb emissions, available only for 1970 through 1995, the peak level of per capita Pb emissions was in 1972 before unleaded gasoline was sold.

ECONOMIC EFFECTS ON EMISSIONS[c]

Changes in the general level of economic activity will also impact air pollution emissions. The size of the nation's economy is typically measured using real gross domestic product (GDP), defined as the dollar market value of all goods and services produced in the nation within a given year. If all other factors affecting emissions remain constant (e.g., production efficiency), it is reasonable to assume that as the economy grows (i.e., real GDP increases) emissions will also increase.

With the exception of Pb emissions, for which estimates are only available for 1970 through 1995, the criteria pollutants exhibit a similar pattern, which features the highest emissions per real GDP in 1940, a dramatic decline during World War II, and a subsequent increase. Since the late-1940s, emissions per real GDP have steadily declined for all criteria pollutants except NO_x. These declines can be attributed to technology changes and regulatory influences.

In addition to the general level of economic activity, the composition of economic activity (i.e., the mix of goods and services produced in the nation) may also affect emission levels. Over time, the mix of goods and services produced in

[b] Figures displaying per capita emission trends can be found in Chapter 3 of the previous year's report.[1]

[c] Figures displaying economic and regulatory influences on historic emission trends can be found in Chapter 3 of the previous year's report.[1]

the nation varies as a result of many factors, including the introduction of technological innovations and changes in consumer tastes and preferences.

Trends in emissions of each of the criteria air pollutants by principal source categories and the impact of economic, demographic, and regulatory influences on these emission trends are discussed in the following sections. Because the emissions reduction impact of the CAAA is only beginning to take effect, the discussion highlights pre-1990 regulatory activities. It is important to note that the regulatory discussion is not comprehensive. Instead, these sections emphasize regulatory efforts that have targeted the major source categories for each air pollutant.

CARBON MONOXIDE EMISSION TRENDS, 1940 THROUGH 1995

Total CO emissions (Figure 3 and Tables 5 and A-1) peaked around 1970 and have decreased thereafter. As a result of disruptions in world oil markets and a subsequent recession in the United States, CO emissions declined significantly between 1973 and 1975 (a similar decline was also exhibited in NO_x and VOC emissions during this period). On-road vehicle emissions, the major source of CO emissions, followed a similar trend — significantly increasing through 1972 (203 percent from the 1940 level) and decreasing thereafter (over 33 percent from the 1972 peak). In contrast, non-road source emissions have increased approximately 50 percent since 1970.

On-road vehicles have been the predominant source of CO emissions in the United States since World War II, comprising 69 percent of total emissions in 1970 and 64 percent in 1995. As part of the effort to reduce CO emissions, emission standards have been developed for on-road vehicles. Beginning with the 1970 model year, the EPA required that new light-duty vehicles meet CO emission standards (expressed in grams per mile [gpm]); CO standards were also applied to light-duty trucks beginning with the 1972 model year. Over the last two decades, these standards have been tightened. Separate CO standards apply to heavy-duty engines and other vehicles.

Between 1970 and 1995, fuel use increased approximately 50 percent and vehicle miles traveled (VMT) increased over 100 percent. As a result of this growth, on-road CO emissions should have increased, but due to motor vehicle emission regulations, CO emissions actually decreased 33 percent.

Non-road CO emissions represented 17 percent of the national total in 1995. In contrast to on-road CO emissions, non-road emissions increased approximately 50 percent between 1970 and 1995.

NITROGEN OXIDE AND VOLATILE ORGANIC COMPOUND EMISSIONS TRENDS, 1940 THROUGH 1995

Nitrogen oxides (Figure 4 and Tables 6 and A-2) and VOCs (Figure 5 and Tables 7 and A-3) are grouped together here because they comprise the primary O_3 precursors that are transformed by sunlight to produce the secondary pollutant, tropospheric O_3. While there is currently no NAAQS for VOC, from the standpoint of modeling O_3 formation the category of VOC emissions is as important as the officially designated criteria pollutants for which there are NAAQS. Nitrogen oxide emissions increased steeply between 1940 and 1970. Since 1970, NO_x emissions have remained relatively stable. VOC emissions increased fairly steadily until the late 1960s. Since then, VOC emissions have fluctuated, but have declined overall. On-road vehicles have been major contributors to each of these pollutants (e.g., in 1970, on-road vehicles accounted for 42 percent of total VOC and 36 percent of total NO_x emissions).

In 1971, photochemical oxidants NAAQS and HC NAAQS were first promulgated. In 1979, the photochemical oxidants standard was restated as O_3 and revised to a daily maximum hourly average of 0.12 parts per million (ppm) not to be exceeded on the average of more than once per year. It replaced an hourly oxidant standard of 0.08 ppm

not to be exceeded more than once per year. Ozone is formed through a photochemical process in the presence of and NO_x and VOCs. As with CO, NO_x and VOC exhaust emission limits for on-road vehicles have been established over the last two decades.

Nitrogen Oxide Emission Trends

NO_x emissions increased over 220 percent between 1940 and 1995, including a 14 percent increase over the 1970 through 1995 period. Emissions from on-road vehicles accounted for 18 percent of total NO_x emissions in 1940. Emissions from on-road vehicles have declined since their peak in 1978. Currently, on-road vehicle emissions constitute approximately 33 percent of total NO_x emissions.

One would anticipate that NO_x emissions from on-road vehicles will increase as VMT and fuel use increase and gas prices decline (all other factors remaining unchanged). This pattern does exist for the period 1940 through 1978; however, NO_x emissions begin to decline after 1978 while VMT and fuel use continue rising and gasoline prices decline in real terms.

The effects of previously noted regulations account for the declines in NO_x emissions occurring after 1978. Although VMT has more than doubled since 1970, NO_x emissions from on-road vehicles are nearly equal to their 1970 levels.

In contrast to the on-road vehicle trends, NO_x emissions from non-road sources increased over the entire 1940-1995 period. Emission standards for selected non-road engine categories are scheduled to begin in 1996; significant emission reductions are not expected until after the year 2000.

The current reductions in emissions are a result of the installation (at utilities and industries) of low NO_x burners in response to the Reasonably Available Control Technology (RACT) requirements of the CAAA (see SO_2 emissions section for further details).

Volatile Organic Compound Emission Trends

Volatile organic compounds are a principal component in the chemical and physical atmospheric reactions that form O_3 and other photochemical oxidants. The emissions of VOC species that primarily contribute to the formation of O_3 are included in total VOC emissions, while emissions of methane (CH_4), a nonreactive compound, are not included. No adjustments are made to include chlorofluorocarbons or to exclude ethane and other VOCs with negligible photochemical reactivity. On-road vehicle emissions are estimated as nonmethane hydrocarbons (NMHCs).

Total national VOC emissions are presented in Figure 5 and Tables 7 and A-3. During the 1940 through 1970 period, VOC emissions increased nearly 80 percent, reaching a peak in 1970. Since 1970, VOC emissions have declined approximately 24 percent. Total VOC emissions from the transportation sector increased 160 percent between 1940 and 1970. Volatile organic compound emissions from on-road vehicles peaked in 1970 at 13 million short tons, or 42 percent of the national VOC emission total. It is reasonable to assume that, absent regulation, VOC emissions will increase as VMT and fuel use increase and as gasoline prices decrease. This trend was present for the period prior to 1970. Since 1970, however, VOC emissions from on-road vehicles have declined 51 percent while VMT and fuel use increased. Gasoline prices decreased in real terms after 1980. These trends indicate the influence of regulation in reducing VOC emissions from on-road vehicles.

In contrast, non-road source emissions increased throughout the study period. Since 1970, for example, non-road VOC emissions have increased over 46 percent.

SULFUR DIOXIDE EMISSION TRENDS, 1940 THROUGH 1995

Figure 6 and Tables 8 and A-4 depict SO_2 emissions. Total SO_2 emissions increased by more than 55 percent during the period 1940-1973, but

decreased approximately 33 percent since 1973. From 1940 to 1970, SO_2 emissions from electric utilities doubled every decade as a result of increased coal consumption. From 1970 to 1995, SO_2 emissions from electric utilities decreased about 31 percent. Sulfur dioxide emissions from electric utilities accounted for 66 percent of the total national SO_2 emissions in 1995.

The SO_2 NAAQS was promulgated in 1971. Also in that year, the EPA developed a New Source Performance Standard (NSPS) requiring that all new coal-fired power plants emit no more than 1.2 pounds of SO_2 per million British thermal units (MMBtu) of electricity produced. Most new plants met this NSPS by burning lower-sulfur coals. An amendment to the CAA in 1977 effectively required any new coal-fired power plant to not only meet the original NSPS, but to also use some form of scrubbing equipment, even when using low-sulfur coal.

Between 1970 and 1993, SO_2 emissions from coal-fired electric power facilities declined 8 percent; at the same time that there was a 150 percent increase in coal consumed to produce electricity.

Title IV (Acid Deposition Control) of the CAAA specifies that SO_2 emissions will be reduced by 10 million tons and NO_x emissions by 2 million tons from 1980 emissions levels. For electric utility units, the SO_2 reductions were to occur in two stages: Phase I, which affects 263 mostly coal-fired units and begins in 1995; and Phase II, which affects the rest of the affected units and begins in the year 2000. Utilities were able to choose from among a variety of possibilities to achieve SO_2 emissions reductions in a cost effective manner, including participating in a market-based allowance trading system.[4]

Many utilities decided to switch to lower sulfur coal and some decided to install scrubbers, achieving greater SO_2 reductions than EPA had anticipated. This is reflected by the large SO_2 emissions decline in 1995.

Although a court settlement delayed Phase I NO_x reductions under Title IV until 1996, RACT conditions needed to be met in 1995. Thus, low NO_x burners were often installed in 1995 leading to the NO_x emissions decline in 1995. Because actual, rather than estimated data have become available, recent Trends utility data were acquired differently. For 1994 and 1995, the NO_x, SO_2, and heat input utility data for 1994 and 1995 were obtained from two sources: if actual data existed from EPA's Acid Rain Division's (ARD) Emission Tracking System's (ETS) Continuous Emission Monitoring (CEM) data,[5] they were used; if not, the data estimated from the Department of Energy (DOE)/Energy Information Administration's (EIA) Form EIA-767 data were used (as has been done in previous years for the *Trends* reports). For 1994, the only available ETS/CEM data were for the 263 SO_2 Phase I designated units; for 1995, in accordance with the CAA, almost all of the utility units (all operating affected units) reported CEM data. The annual ETS/CEM data were provided by ARD and were disaggregated to the boiler-SCC level by the Emission Factors and Inventory Group (EFIG).

PARTICULATE MATTER (PM-10) EMISSION TRENDS, 1940 THROUGH 1995

Figure 7 depicts total national PM-10 emissions excluding fugitive dust sources. These estimates have declined significantly since 1950. In 1940, emissions from fuel combustion represented 25 percent of PM-10 emissions excluding fugitive dust sources. Electric utility PM-10 emissions result primarily from the combustion of coal. Between 1940 and 1970, PM-10 emissions from this source increased by approximately 85 percent. A NAAQS for TSP was first promulgated in 1971. In 1987, the TSP standard was reviewed and revised to include only the PM-10 fraction. Beginning in December 1976, a NSPS for new, modified, or reconstructed fossil-fuel-fired steam generators became effective. Between 1970 and 1993, PM-10 emissions declined 85 percent from coal-fired electric power facilities while coal consumption to produce electricity increased approximately 150 percent.

Tables 9 and A-5 present PM-10 emissions for all source categories including fugitive dust emissions for the years 1985 through 1995.

The PM-10 emissions from fugitive dust sources are presented for the years 1985-1995 in Figure 8. Fugitive dust sources are very sensitive to meteorological conditions and can fluctuate from year-to-year. Emissions from wind erosion are very sensitive to regional soil conditions and changes in total precipitation and wind speeds. For example, the total national emissions from wind erosion in 1993 are 2 million short tons, compared to 18 million short tons in 1988. The lack of precipitation in 1988 prior to spring crop planting, especially in the central and western United States, contributed to greater wind erosions for that year. In 1993, unusually heavy spring rains in Kansas and Oklahoma, where wind erosion is normally very significant, resulted in a 57 percent decrease in wind erosion emissions from the previous year.

PARTICULATE MATTER (PM-2.5) AND AMMONIA EMISSION ESTIMATES, 1990

EPA is considering revisions to the existing particulate matter (PM) NAAQS. A national PM emission inventory is needed by EPA to assess the possible impacts of revisions to the NAAQS. EPA's Office of Policy, Planning, and Evaluation (OPPE) developed a national inventory under the OPPE Particulate Programs Implementation Evaluation System (OPPIES). The inventory developed under this program included emission estimates for PM-10, particulate matter less than 2.5 microns in aerodynamic diameter (PM-2.5), and ammonia (NH_3).[6] This inventory has since been revised by EPA's Office of Air Quality Planning and Standards (OAQPS) and the results for PM-2.5 and NH_3 are presented in Table 10. Tables A-7 and A-8 of Appendix A present the PM-2.5 and NH_3 emissions for 1990 by source category and by EPA region. Fugitive dust sources are the largest contributors to PM-2.5 emissions. Animal husbandry sources are the largest contributors to NH_3 emissions.

LEAD EMISSION TRENDS, 1970 THROUGH 1995

The trend in Pb emissions is presented in Figure 9 and Tables 11 and A-6 for the period 1970 through 1995. Total Pb emissions decreased 98 percent over the 1970 to 1995 period.

On-road vehicles have historically been the major source of air-borne Pb. In 1970, for example, Pb emissions from on-road vehicles accounted for 78 percent of total emissions. Total Pb emissions decreased sharply from 1970 to 1995 as the result of regulatory actions. The Pb phase-down program has required the gradual reduction of the Pb content of all gasoline over a period of many years. The Pb content of leaded gasoline was reduced dramatically from an average of 1.0 grams per gallon (gpg) to 0.5 gpg on July 1, 1985, and still further to 0.1 gpg on January 1, 1986. In addition, as part of EPA's overall automotive emission control program, unleaded gasoline was introduced in 1975 for use in automobiles equipped with catalytic control devices. These devices reduce CO, NO_x, and VOC emissions. In 1975, unleaded gasoline's share of the total gasoline market was 13 percent. In 1982, the unleaded share of the total gasoline market was approximately 50 percent. By 1995, unleaded gasoline sales accounted for 99 percent of the gasoline market. In 1995, on-road vehicles contributed 28 percent of annual Pb emissions, down substantially from 87 percent in 1983. The 1990 CAAA prohibit the use of leaded gasoline in highway vehicles after December 31, 1995.

Absent regulation, one would predict that Pb emissions from vehicles would increase as VMT and fuel use increase and as gasoline prices decline. Between 1970 and 1993, fuel consumption and VMT increased approximately 50 percent and 100 percent, respectively, while on-road Pb emissions declined by 99 percent. This downward trend in Pb emissions is a direct result of the regulatory actions reducing the Pb content of gasoline.

Figure 3. Trend in CARBON MONOXIDE Emissions by 7 Principal Sources Categories, 1970 to 1995

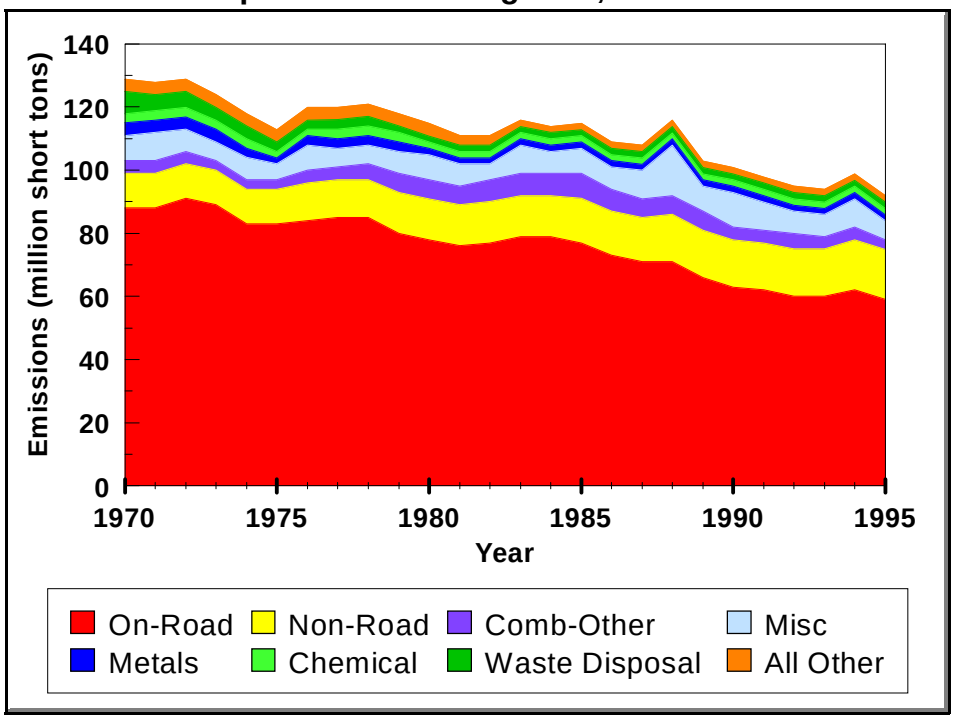


Figure 4. Trend in NITROGEN OXIDE Emissions by 7 Principal Source Categories, 1970 to 1995

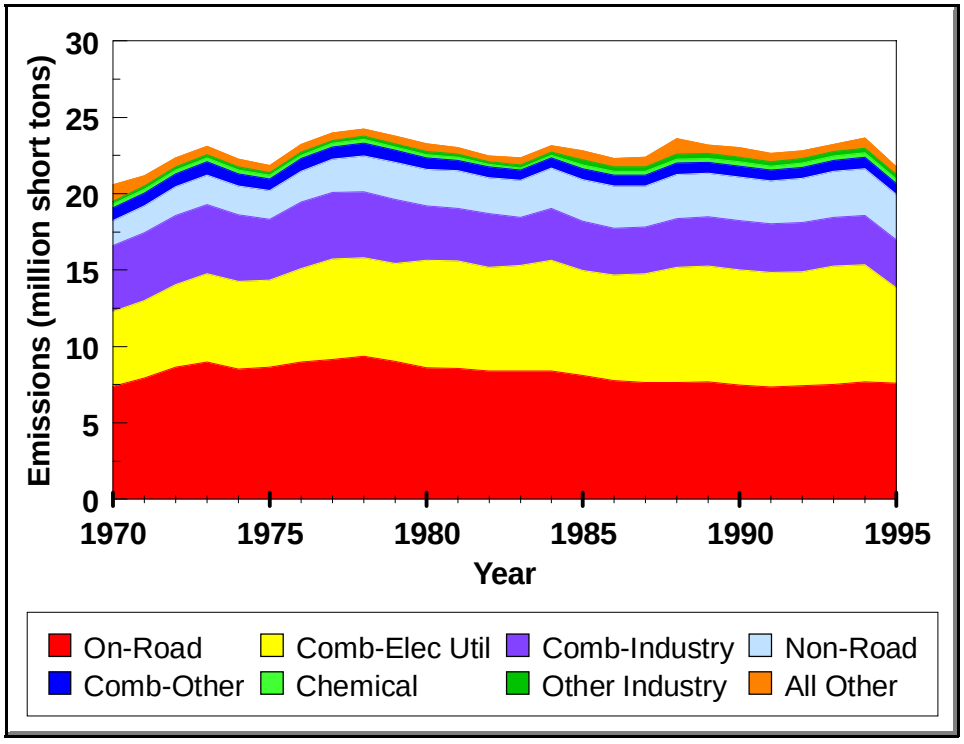


Figure 5. Trend in VOLATILE ORGANIC COMPOUND Emissions by 7 Principal Source Categories, 1970 to 1995

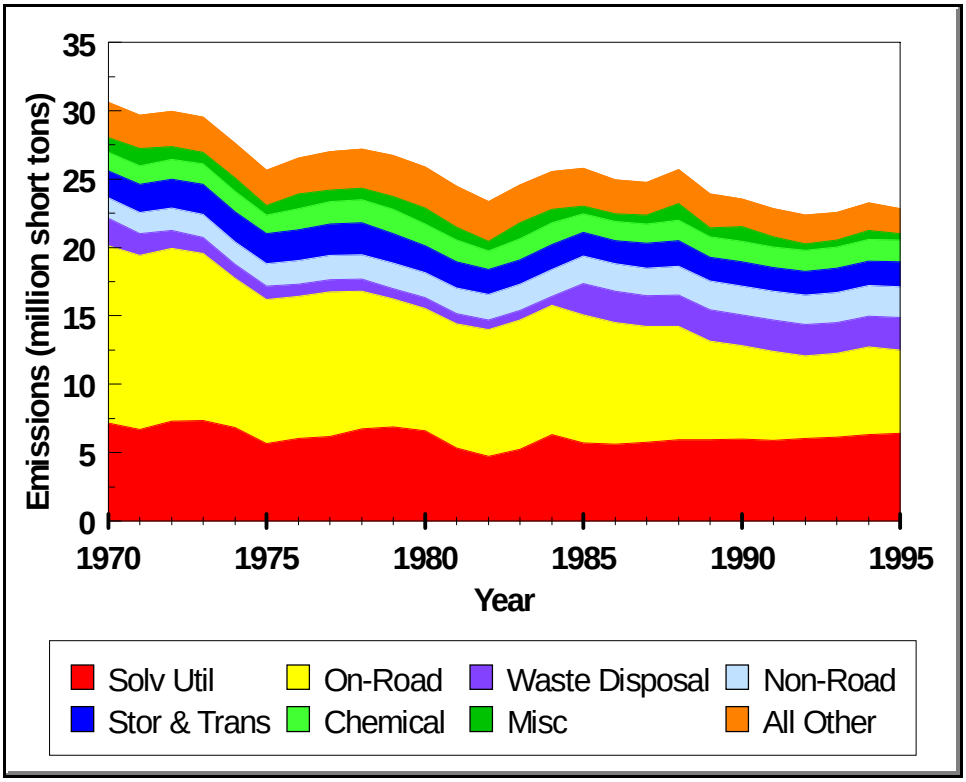


Figure 6. Trend in SULFUR DIOXIDE Emissions by 6 Principal Source Categories, 1970 to 1995

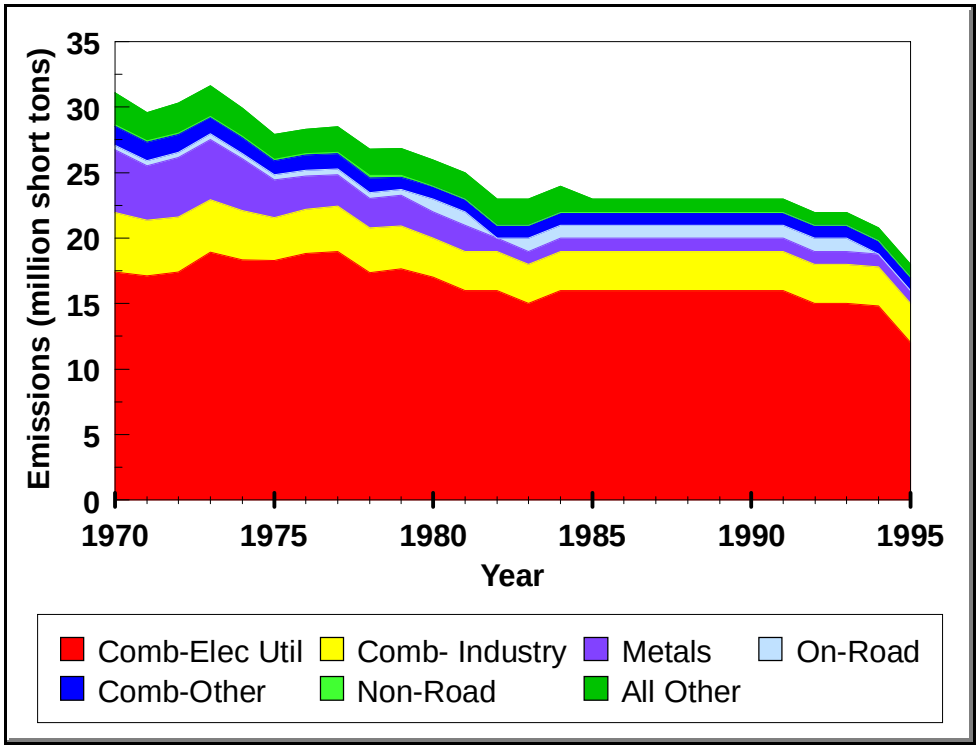


Figure 7. Trend in PARTICULATE MATTER (PM-10) Emissions by 7 Principal Source Categories Excluding Fugitive Dust Sources, 1970 to 1995

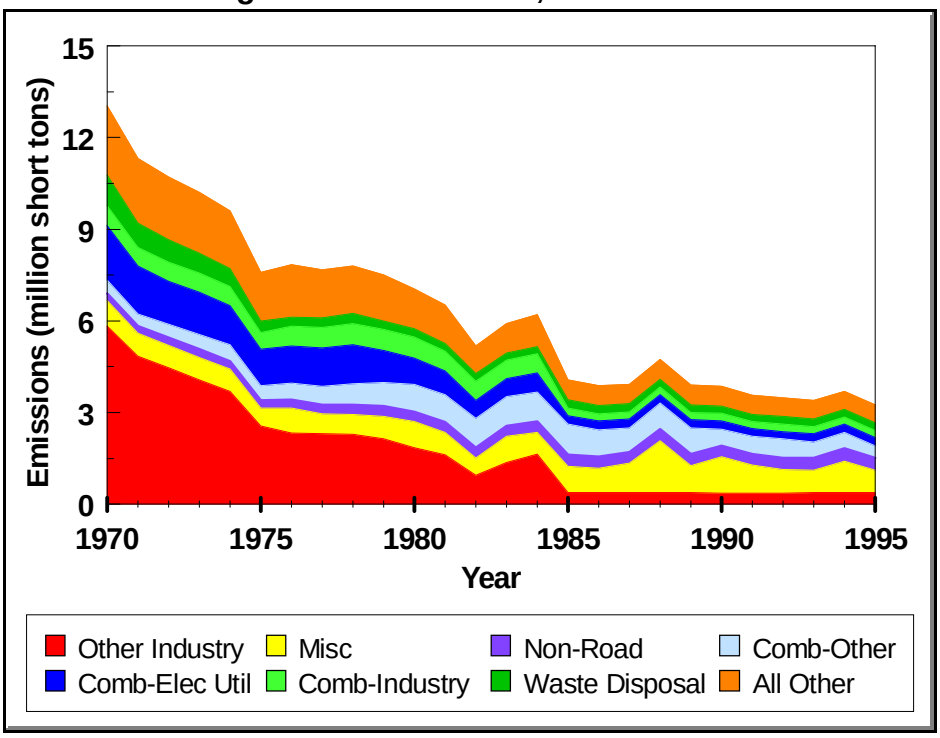


Figure 8. Trend in PARTICULATE MATTER (PM-10) Emissions by 4 Principal Fugitive Dust Sources, 1985 to 1995

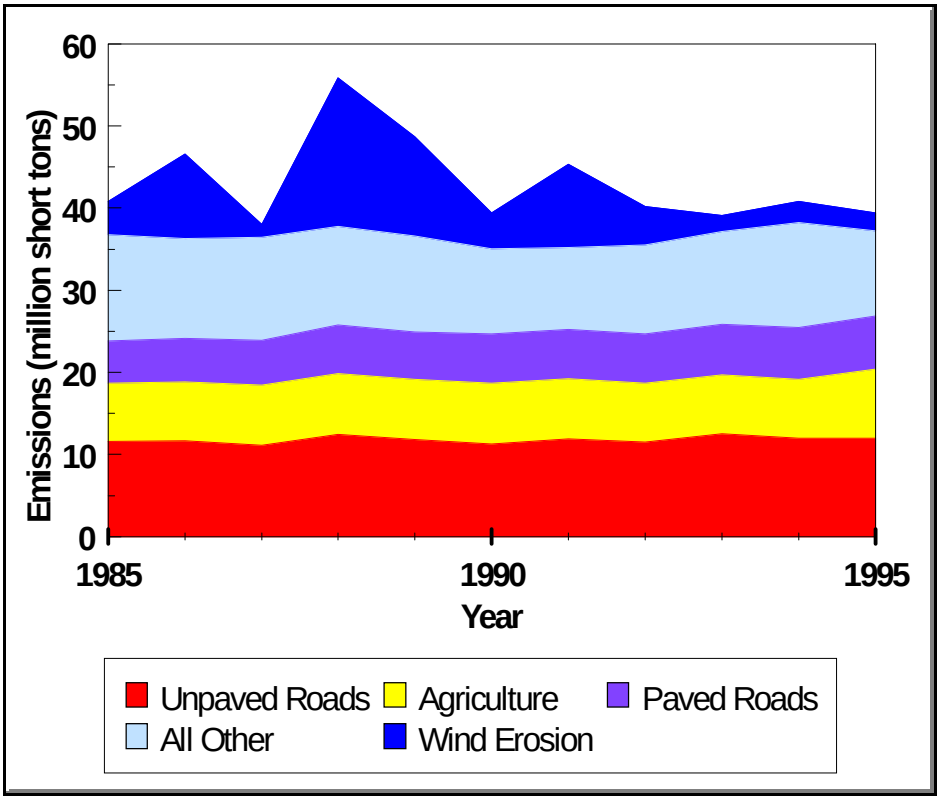


Figure 9. Trend in LEAD Emissions by 5 Principal Source Categories, 1970 to 1995

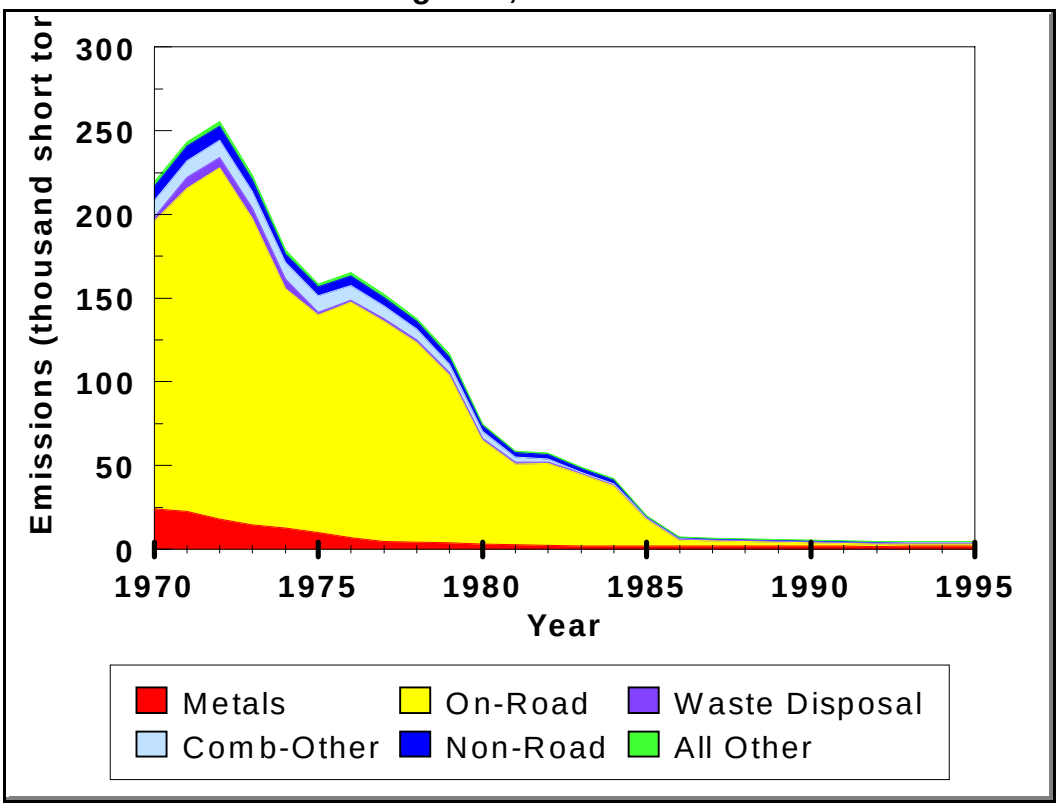


Table 5. Carbon Monoxide Emissions, 1970 through 1995 (thousand short tons)

Source Category	1970	1980	1990	1995
Fuel Comb. Elec. Util.	237	322	314	324
Fuel Comb. Industrial	770	750	677	672
Fuel Comb. Other	3,625	6,230	4,072	2,964
Chemical & Allied Prod.	3,397	2,151	1,940	2,237
Metals Processing	3,644	2,246	2,080	2,223
Petroleum & Related Inc.	2,179	1,723	435	379
Other Industrial Proc.	620	830	717	767
Solvent Utilization	NA	NA	2	2
Storage & Transport	NA	NA	55	65
Waste Dispos & Recycl.	7,059	2,300	1,686	1,766
On-road Vehicles	88,034	78,049	62,858	58,624
Non-road Sources	10,605	12,681	14,642	15,622
Miscellaneous	7,909	8,344	11,173	6,454
Total	**128,079**	**115625**	**100,650**	**92,099**

Note: The sums of subcategories may not equal total due to rounding.

Table 6. Nitrogen Oxide Emissions, 1970 through 1995 (thousand short tons)

Source Category	1970	1980	1990	1995
Fuel Comb. Elec. Util.	4,900	7,024	7,516	6,233
Fuel Comb. Industrial	4,325	3,555	3,256	3,137
Fuel Comb. Other	836	741	712	707
Chemical & Allied Prod.	271	216	276	283
Metals Processing	77	65	81	84
Other Industrial Proc.	187	205	306	323
Solvent Utilization	NA	NA	2	3
Storage & Transport	NA	NA	2	3
Waste Disposal & Recycl.	440	111	82	85
On-road Vehicles	7,390	8,621	7,488	7,605
Non-road Sources	1,628	2,423	2,843	2,996
Miscellaneous	330	248	373	228
Total	**20,625**	**23,281**	**23,038**	**21,779**

Note: The sums of subcategories may not equal total due to rounding.

Table 7. Volatile Organic Compound Emissions, 1970 through 1995 (thousand short tons)

Source Category	1970	1980	1990	1995
Fuel Comb. Elec. Util.	30	45	36	35
Fuel Comb. Industrial	150	157	135	135
Fuel Comb. Other	541	848	749	539
Chem. & Allied Prod. Mfg	1,341	1,595	1,526	1,617
Metals Processing	394	273	72	77
Petroleum & Related Industries	1,194	1,440	643	628
Other Industrial Processes	270	237	401	422
Solvent Utilization	7,174	6,584	5,975	6,394
Storage & Transport	1,954	1,975	1,759	1,803
Waste Disposal & Recycling	1,984	758	2,262	2,411
On-road Vehicles	12,972	8,979	6,854	6,104
Non-road Sources	1,542	1,869	2,120	2,252
Miscellaneous	1,101	1,134	1,069	446
Total	**30,646**	**25,893**	**23,599**	**22,865**

Note: The sums of subcategories may not equal total due to rounding.

Table 8. Sulfur Dioxide Emissions, 1970 through 1995 (thousand short tons)

Source Category	1970	1980	1990	1995
Fuel Comb. Elec. Util.	17,398	17,469	15,898	12,013
Fuel Comb. Industrial	4,568	2,951	3,106	3,046
Fuel Comb. Other	1,490	971	595	599
Chem. & Allied Prod. Mfg	591	280	440	471
Metals Processing	4,775	1,842	663	720
Petroleum & Related Industries	881	734	440	385
Other Industrial Processes	846	918	401	438
Solvent Utilization	NA	NA	1	1
Storage & Transport	NA	NA	5	5
Waste Disposal & Recycling	8	33	36	37
On-road Vehicles	411	521	571	304
Non-road Sources	83	175	265	292
Miscellaneous	110	11	14	8
Total	**31,161**	**25,905**	**22,433**	**18,319**

Note: The sums of subcategories may not equal total due to rounding.

Table 9. Particulate Matter (PM-10) Emissions, 1970 through 1995
(thousand short tons)

Source Category	1970	1980	1990	1995
Fuel Comb. Elec. Util.	1,775	879	282	258
Fuel Comb. Industrial	641	679	241	239
Fuel Comb. Other	455	887	553	408
Chemical & Allied Prod	235	148	63	66
Metals Processing	1,316	622	136	145
Petroleum Ind	286	138	29	26
Other Industrial Proc	5,832	1,846	374	393
Solvent Utilization	NA	NA	2	2
Storage & Transport	NA	NA	57	60
Waste Disposal	999	273	242	253
On-road Vehicles	443	397	357	304
Non-road Sources	223	329	372	393
Natural Sources*	NA	NA	4,362	2,163
Miscellaneous*	839	852	36,267	37,925
TOTAL	**13,044**	**7,050**	**43,337**	**42,636**

* Fugitive dust emissions were not estimated prior to 1985. In 1995 they represent 92% of the total emissions.
Note: The sums of subcategories may not equal total due to rounding.

Table 10. Ammonia and Particulate Matter (PM-2.5) 1990 Emissions
(thousand short tons)

	1990	
Source Category	Ammonia	PM-2.5
Fuel Comb. Elec. Util.	5	110
Fuel Comb. Industrial	17	177
Fuel Comb. Other	8	506
Chemical & Allied Prod	183	43
Metals Processing	6	96
Petroleum Ind	43	21
Other Industrial Proc	38	251
Solvent Utilization		2
Storage & Transport		27
Waste Disposal	82	197
On-road Vehicles	198	293
Non-road Sources	3	293
Natural Sources		778
Miscellaneous	4,638	7,332
TOTAL	**5,215**	**10,125**

Note: The sums of subcategories may not equal total due to rounding.

Table 11. Lead Emissions, 1970 through 1995
(short tons)

Source Category	1970	1980	1990	1995
Fuel Comb. Elec. Util.	327	129	64	63
Fuel Comb. Industrial	237	60	18	17
Fuel Comb. Other	10,052	4,111	418	413
Chemical & Allied Prod.	103	104	136	80
Metals Processing	24,224	3,026	2,169	1,937
Other Industrial Proc.	2,028	808	169	55
Waste Disp. & Recycl.	2,200	1,210	804	842
On-road Vehicles	171961	62,189	1,690	1,387
Non-road Sources	8,340	3,320	197	191
Totals	**219,471**	**74,956**	**5,666**	**4,986**

Note: The sums of subcategories may not equal total due to rounding.

1995 Emissions

Between 1994 and 1995 emissions decreased for all criteria air pollutants. Reductions in NO_x emissions from point sources resulted from the implementation of RACT. Utilities consumed more coal and gas but decreased consumption of oil in 1995. Reduction in Phase I unit utility SO_2 emissions resulted from requirements in Title IV of the CAAA. Residential consumption of wood also decreased in 1995.

The decrease in CO, NO_x, VOC, and PM-10 on-road emissions is a result of reductions from fleet turnover (Tier I standards being phased in), required reformulated gasoline, oxygenated fuels, and lower RVPs overcoming the higher VMT. The increase in SO_2 on-road emissions from 1994 resulted from increased VMT. The 1995 emissions from non-road sources decreased as a result of decreased use of non-road engines (gasoline and diesel), outweighing the increase in non-road vehicle (plane, train, marine vessel) estimates.

The miscellaneous emissions decreased significantly from the 1994 emissions. This is due to the decreased number of acres of land burned in the United States by wildfires. Wildfire severity (i.e., how many and how intense) is due in part to meteorological conditions such as: temperatures, humidity, thunderstorms, and relative amount of rain.

Table 12 presents the state-level emissions and ranking for the pollutants CO, NO_x, VOC, SO_2, and PM-10.

CARBON MONOXIDE EMISSIONS

Figure 10 presents a pie chart of the 1995 CO emissions by source category, three of which (solvent utilization, storage and transport, and electric utility fuel combustion) constitute less than 0.5 percent of the total and are combined with petroleum and related industries, industrial fuel combustion, other industrial processes, waste disposal and recycling, and chemical and allied chemical manufacturing in the "remaining categories" grouping. As the figure shows, on-road vehicles are the major contributors to CO emissions. In 1995, they represented 64 percent of the total CO emissions. Of the total on-road vehicle emissions, 64 percent is from cars (light-duty gasoline vehicles, motorcycles, and light-duty diesel vehicles). The second major contributor to CO emissions is non-road engines and vehicles, which constitute approximately 17 percent of total CO emissions. These emissions result primarily from the gasoline consumption by construction, industrial and farm equipment, and recreational marine vessels.

A map presenting the county-level emission densities is shown in Figure 11. The majority of CO emissions are emitted in the eastern third and west coast of the United States near the major population centers.

NITROGEN OXIDE EMISSIONS

Figure 12 presents a pie chart of the 1995 NO_x emissions by source category, four of which (solvent utilization, storage and transport, waste disposal and recycling, and metals processing) constitute less than 1 percent of the total and are combined with chemical and allied product manufacturing, other industrial processes, miscellaneous, and petroleum and related industries in the "remaining categories" grouping. As shown, on-road vehicles represent 35 percent of the total 1995 NO_x emissions. Emissions from electric utilities represent 29 percent of the total emissions. Eighty-nine percent of the emissions

estimated for electric utilities are attributed to coal combustion, of which 72 percent are emissions from bituminous coal combustion. As with CO emissions, light-duty gasoline vehicles are a major contributor (47 percent) to 1995 on-road vehicle NO_x emissions.

A map presenting the county-level emission densities is shown in Figure 13. The majority of NO_x emissions are emitted in the eastern third and west coast of the United States.

VOLATILE ORGANIC COMPOUND EMISSIONS

Figure 14 presents a pie chart of the 1995 VOC emissions by source category. Two of the source categories (electric utility fuel combustion and metals processing) constituted less than 0.5 percent of the total emissions and are combined with chemical and allied products, petroleum and related industries, miscellaneous, other industrial processes, and fuel combustion (industrial, other) in the "remaining categories" grouping. The "remaining categories" grouping contributed 17 percent to the total VOC estimate in 1995. As shown, solvent utilization and on-road vehicles each contributed 27 percent to the total 1995 VOC emissions. Light-duty gasoline vehicles produced 60 percent of the on-road vehicle 1995 VOC emissions. Surface coating represents 43 percent of the solvent utilization emissions. There are 26 subcategories of surface coating as presented in Table A-3.

A map presenting the county-level emission densities is shown in Figure 15. The majority of VOC emissions are emitted in the eastern third and west coast of the United States.

SULFUR DIOXIDE EMISSIONS

Figure 16 presents a pie chart of the 1995 SO_2 emissions by source category, five of which (solvent utilization, storage and transport, waste disposal and recycling, non-road sources, and miscellaneous) constitute less than 2 percent of the total and are combined with non-road sources, petroleum and related industries, and other industrial processes in the "remaining categories" grouping. As shown, electric utilities are the major contributor to SO_2 emissions. In 1995 they represented 66 percent of the total SO_2 emissions. The second largest contributor is industrial fuel combustion, which produced 17 percent of the 1995 SO_2 emissions. Coal combustion produces 96 percent of the electric utility emissions. Bituminous coal combustion accounts for 78 percent of the electric utility coal combustion emissions.

A map presenting the county-level emission densities is shown in Figure 17. The majority of SO_2 emissions are emitted from large point sources throughout the United States.

PARTICULATE MATTER (PM-10) EMISSIONS

Figure 18 presents a pie chart in which all categories, with the exclusion of fugitive dust sources, have been combined into the category "non-fugitive dust." Fugitive dust sources constitute 92 percent of the 1995 total PM-10 emissions. Unpaved roads (28 percent of total PM-10 emissions) are the greatest contributor to 1995 PM-10 fugitive dust emissions. The remaining five top categories are construction (23 percent), agricultural crops (19 percent), paved roads (15 percent), wind erosion (5 percent), and mining and quarrying (1 percent).

A map presenting the county-level emission densities is shown in Figure 19. The majority of PM-10 emissions are emitted in high per capita and agricultural rural areas of the United States. The high county-level emission densities estimated for Mississippi and Oklahoma in 1995 were replaced with 1990 and 1987 estimates, respectively. The algorithm used to allocate fugitive dust emissions to the county level resulted in unrealistic values for counties in Mississippi and Oklahoma. EPA plans to investigate the cause and make revisions in future reports.

LEAD EMISSIONS

Of the 14 Tier 1 source categories, the following five are not estimated for Pb, since they

are thought to be negligible: solvent utilization, storage and transport, petroleum and related industries, natural sources, and miscellaneous. The remaining nine categories are presented in a pie chart in Figure 20. The "remaining categories" grouping includes chemical and allied product manufacturing, other industrial processes, and fuel combustion (electric utility and industrial). Metal processing, the major contributor of Pb emissions in 1995, represents 39 percent of the total emissions. Nonferrous metal processing represents 64 percent of the 1995 metals processing Pb emissions. Primary and secondary Pb products are responsible for 53 and 27 percent, respectively, of the nonferrous metals processing Pb emissions in 1995. Based on the emissions reported in the Locating and Estimating Lead document,[7] the on-road vehicle emissions are over estimated. EPA plans to investigate the inconsistency and make revisions in future reports.

Table 12. 1995 State-level Emissions and Rank for Carbon Monoxide, Nitrogen Oxides, Volatile Organic Compounds, Sulfur Dioxide, and Particulate Matter (PM-10) (thousand short tons)

	Carbon Monoxide		Nitrogen Oxides		Volatile Organic Compounds		Sulfur Dioxide		Particulate Matter (PM-10)	
State	**Rank**	**Emissions**	**Rank**	**Emissions**	**Rank**	**Emissions**	**Rank**	**Emissions**	**Rank**	**Emissions**
Alabama	14	2,395	15	547	18	505	7	740	21	795
Alaska	41	514	49	29	47	65	51	2	41	224
Arizona	22	1,575	27	310	29	261	19	329	37	457
Arkansas	30	1,114	34	226	28	261	34	126	30	649
California	1	8,047	2	1,389	2	1,834	26	204	3	2,442
Colorado	28	1,304	29	302	33	237	35	113	22	786
Connecticut	37	725	39	134	34	183	43	55	43	203
Delaware	48	232	46	56	38	114	37	93	49	62
District of Columbia	51	102	51	18	51	24	48	6	51	24
Florida	3	4,728	5	875	7	864	9	716	5	1,674
Georgia	5	3,802	14	631	11	674	11	587	13	1,116
Hawaii	49	227	50	33	50	28	50	20	47	101
Idaho	36	802	42	89	39	106	46	37	25	757
Illinois	9	3,104	4	880	4	912	5	968	6	1,640
Indiana	11	2,862	6	853	13	629	2	1,429	20	805
Iowa	32	988	32	251	32	240	24	257	14	1,032
Kansas	31	1,079	21	387	31	254	31	149	11	1,233
Kentucky	26	1,432	11	682	24	362	6	783	33	548
Louisiana	12	2,686	8	744	12	673	16	426	28	690
Maine	42	432	44	71	41	92	39	79	45	120
Maryland	29	1,261	24	321	27	273	20	322	38	406
Massachusetts	25	1,467	30	270	23	382	27	195	39	398
Michigan	8	3,266	9	737	9	756	14	505	19	824
Minnesota	21	1,641	23	339	21	410	33	141	10	1,247
Mississippi	24	1,494	28	307	25	344	25	227	9	1,256
Missouri	15	2,296	16	512	19	493	12	545	4	1,677
Montana	39	590	40	125	42	87	36	94	7	1,429
Nebraska	38	622	38	165	35	143	38	81	18	880
Nevada	40	537	41	116	40	94	42	59	44	187
New Hampshire	44	340	43	74	45	76	41	65	48	85
New Jersey	20	1,713	22	362	17	566	32	145	36	474
New Mexico	35	813	31	256	37	139	22	271	8	1,320
New York	6	3,628	12	662	3	967	15	493	12	1,176
North Carolina	10	2,871	13	643	8	818	13	522	26	743
North Dakota	46	280	37	182	43	82	21	279	24	759
Ohio	4	3,921	3	1,114	6	875	1	1,567	15	970
Oklahoma	27	1,335	19	417	26	299	28	159	2	2,641
Oregon	19	1,729	35	211	30	257	44	45	29	681
Pennsylvania	7	3,585	7	815	5	899	4	1,272	16	967
Rhode Island	50	222	47	32	46	66	47	6	50	43
South Carolina	23	1,568	25	317	10	723	23	270	35	492
South Dakota	45	338	45	59	44	78	45	40	34	539
Tennessee	16	2,196	10	688	14	606	10	671	32	620
Texas	2	7,365	1	2,412	1	2,842	3	1,389	1	3,752
Utah	34	821	36	208	36	140	40	77	40	365
Vermont	47	240	48	28	49	47	49	5	46	102
Virginia	17	2,153	17	505	16	578	17	395	31	624
Washington	13	2,397	26	316	22	404	30	152	17	934
West Virginia	33	972	18	439	15	594	8	722	42	209
Wisconsin	18	1,858	20	396	20	447	18	333	23	761
Wyoming	43	429	33	246	48	63	29	154	27	721
National		**92,099**		**21,779**		**22,865**		**18,319**		**42,636**

NOTE: The sums of States may not equal National due to rounding.

Figure 10. 1995 National CARBON MONOXIDE Emissions by Principal Source Category

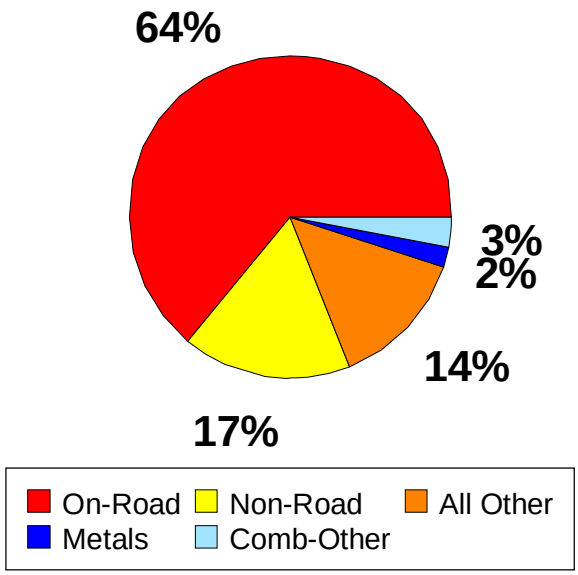


Figure 11. Density Map of 1995 CARBON MONOXIDE Emissions by County

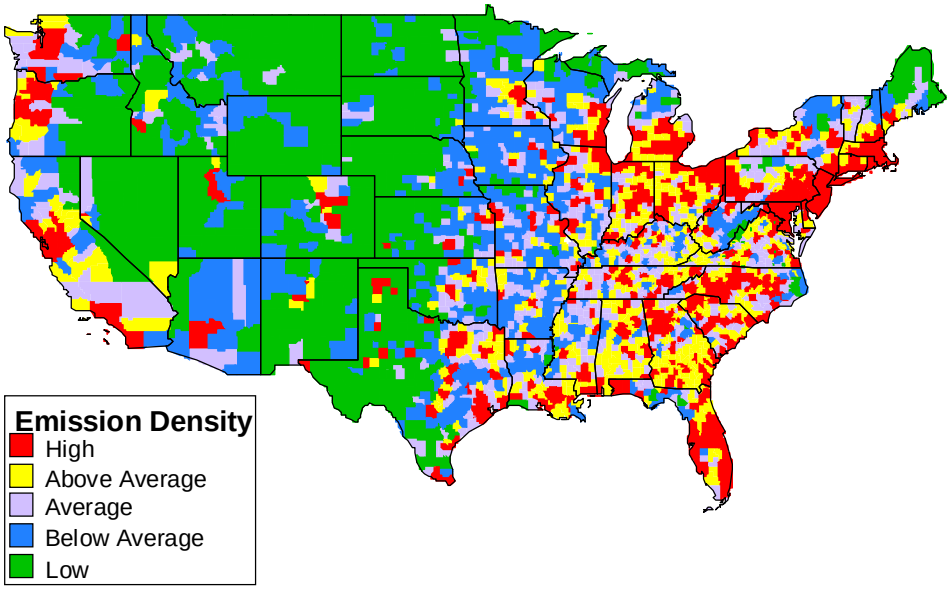


Figure 12. 1995 National NITROGEN OXIDE Emissions by Principal Source Category

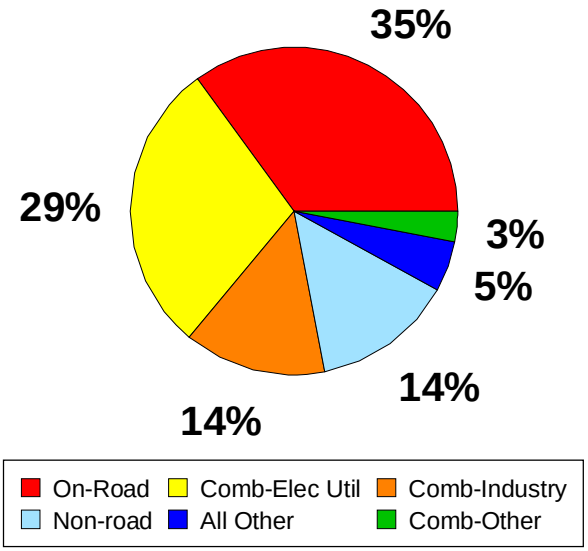


Figure 13. Density Map of 1995 NITROGEN OXIDE Emissions by County

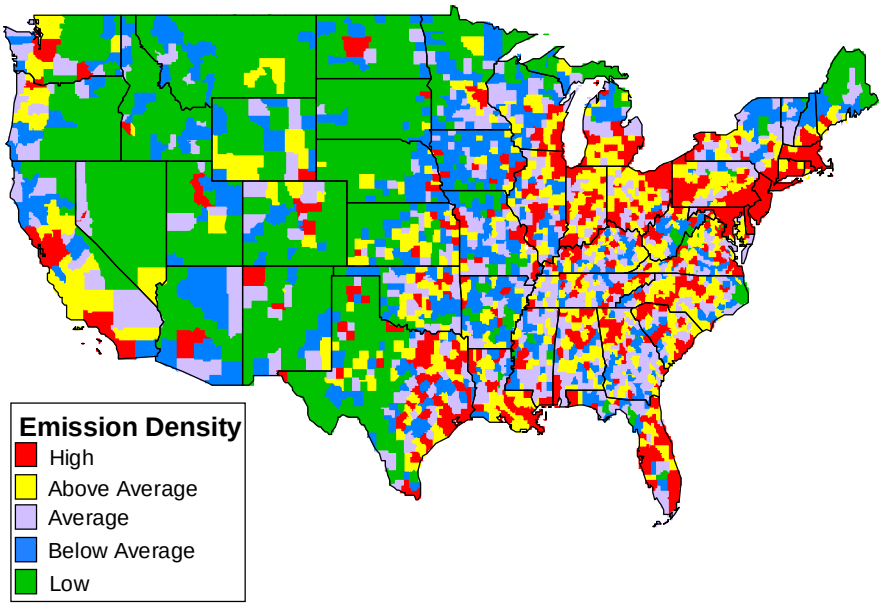


Figure 14. 1995 National VOLATILE ORGANIC COMPOUND Emissions by Principal Source Category

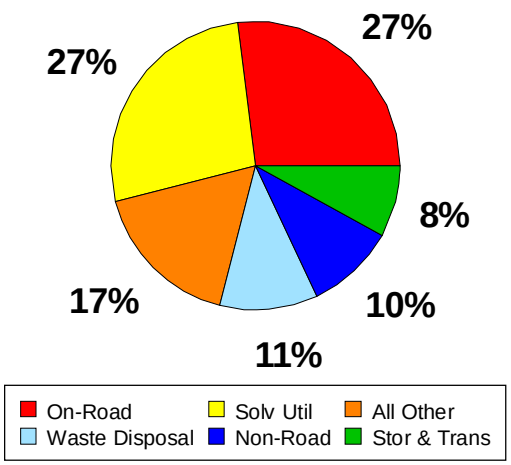


Figure 15. Density Map of 1995 VOLATILE ORGANIC COMPOUND Emissions by County

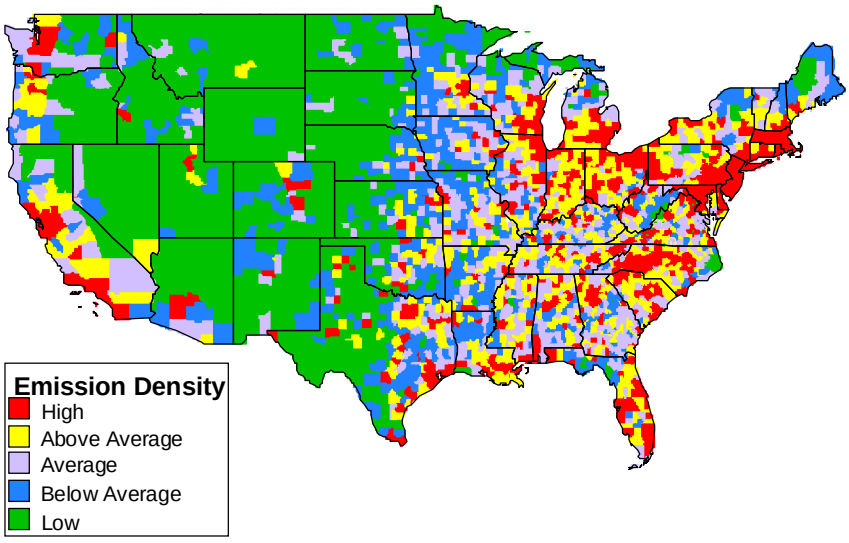


Figure 16. 1995 National SULFUR DIOXIDE Emissions by Principal Source Category

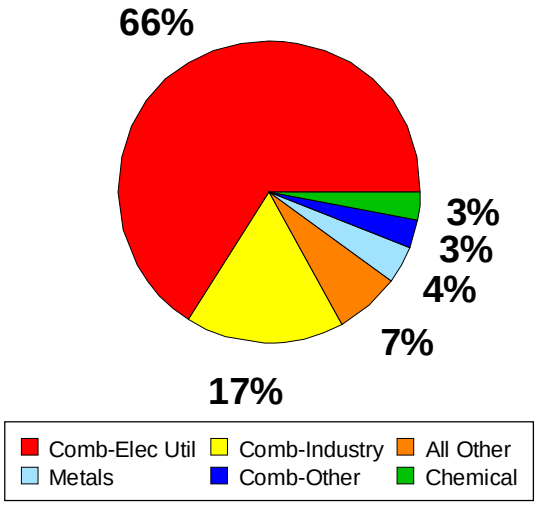


Figure 17. Density Map of 1995 SULFUR DIOXIDE Emissions by County

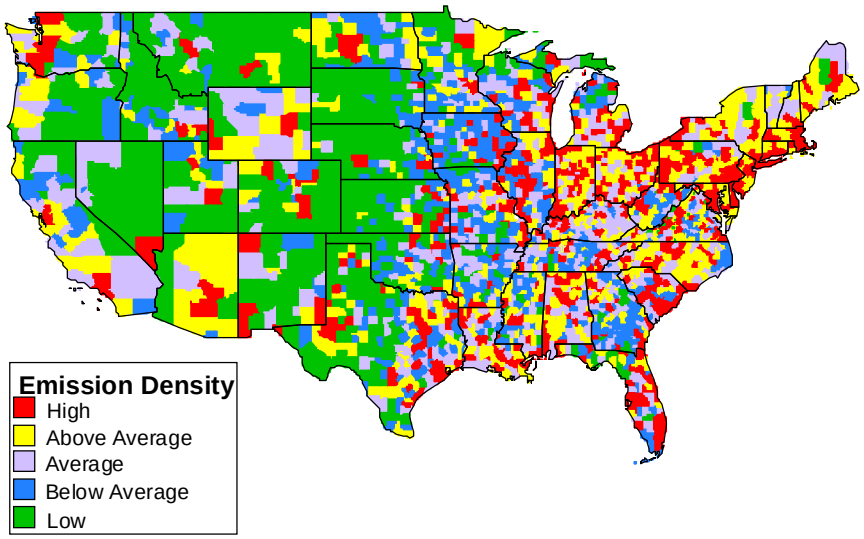


Figure 18. 1995 National PARTICULATE MATTER (PM-10) Emissions by Principal Source Category

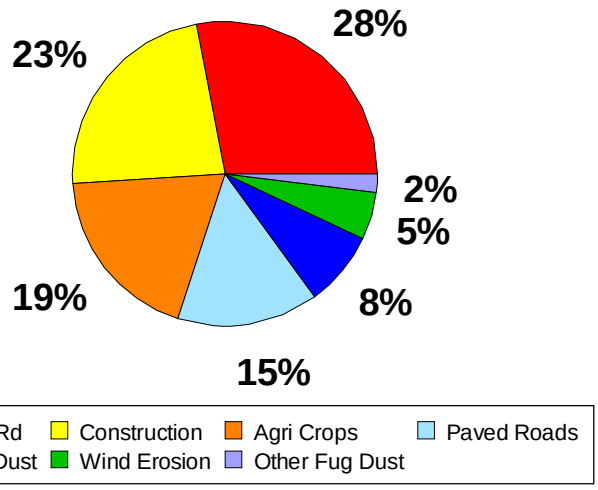


Figure 19. Density Map of 1995 PARTICULATE MATTER (PM-10) Emissions by County

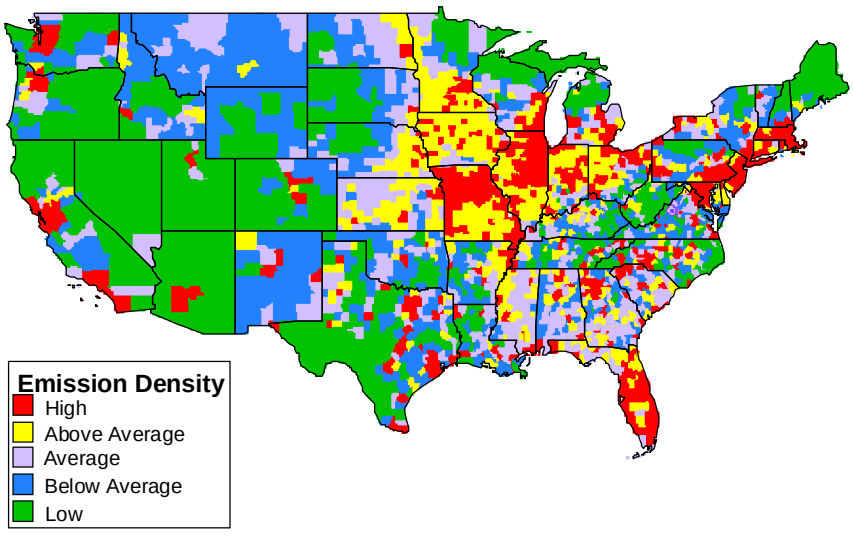
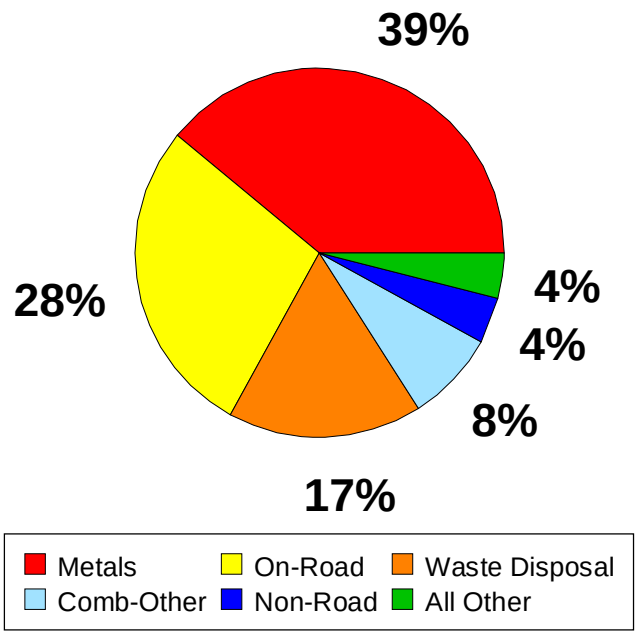


Figure 20. 1995 LEAD Emissions by Principal Source Category



State Emissions

In 1994, an emission inventory[8] was developed for the Grand Canyon Visibility Transport Commission (GCVTC) to support visibility modeling and emission management evaluation activities required under the 1990 CAAA. The inventory was developed for the 11 western States (listed in Table 13). The base year for the inventory is 1990. The inventory includes county-level annual emission estimates of SO_2, NO_x, VOC, NH_3, PM-2.5, TSP, and elemental and organic carbon particulate (EC/OC) for stationary (point and area), mobile (on-road and non-road), and biogenic sources. Development of the inventory required merging several data sets. The following data sets were used in descending order of priority: State-derived data directly available from each State; 1990 NET inventory to fill geographical data gaps in inventories provided by the States; and the 1985 National Acid Precipitation Assessment Program (NAPAP) inventory to fill pollutant gaps (i.e., TSP and NH_3). Table 13 presents a comparison between the Grand Canyon and NET inventory from nonutility point sources. EPA is in the process of incorporating these estimates into the NET inventory.

Table 13. Comparison Between the Grand Canyon Visibility Transport Commission (GCVTC) and National Emission Trends (NET) Emissions by State from Nonutility Point Sources, 1990 (thousand short tons)

	Carbon Monoxide		Nitrogen Oxides		Volatile Organic Compounds		Sulfur Dioxide		Part. Matter (PM-10)	
State	**GC**	**NET**	**GC**	**NET**	**GC**	**NET**	**GC**	**NET**	**GC**	**NET**
Arizona	11	5	40	3	12	2	60	183	10	2
California	150	94	192	169	218	99	54	71	49	28
Colorado	22	4	42	18	24	5	14	9	36	1
Idaho	5	5	8	8	1	1	25	25	17	5
Montana	44	35	16	11	9	6	48	54	23	6
Nevada	11	60	5	2	4	0	2	2	11	3
New Mexico	20	18	70	61	11	8	101	181	9	7
Oregon	106	24	27	8	19	16	21	10	29	7
Utah	44	43	17	29	6	9	52	26	8	4
Washington	236	438	33	62	24	47	47	73	13	25
Wyoming	15	52	40	31	20	16	40	39	4	2
GCVTC Region	**664**	**777**	**489**	**402**	**348**	**208**	**465**	**672**	**210**	**90**

NOTE: The sums of States may not equal GCVTC Region due to rounding.

The Ozone Transport Assessment Group (OTAG) is a national workgroup formed by the EPA and the Environmental Council of States (ECOS) to assess and resolve issues relevant to ozone transport. To successfully perform photochemical modeling required the development of high quality base and future year emissions inputs.[9] The base year emission inventory data

included a 1990 average summer day emission inventory of CO, NO_x, and VOC covering all stationary point and area sources throughout the entire OTAG modeling domain. Mobile emission estimates were also developed for the entire domain, based upon inputs collected from the States, EPA, and the Lake Michigan Air Directors Consortium (LADCO). This inventory represented the integration of all emissions data supplied by the States with EPA's NET inventory. Table 14 presents the OTAG 1990 emissions by State and major source category. The ozone season for this report is defined June, July, and August. The OTAG area has an eastern boundary of the Atlantic Ocean and a western border running from north to south through North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. In total, the OTAG inventory completely covers 37 States and the District of Columbia. Estimates for Mississippi and Iowa are the same as those in the NET inventory because these states did not submit data to OTAG. EPA is in the process of incorporating these estimates into the NET inventory.

Table 14. Ozone Transport and Assessment Group State-level Ozone Season Daily Emissions (short tons)

	Point Emissions (short tons per day)			Area Emissions (short tons per day)			On-road Emissions (short tons per day)			Total Emissions (short tons per day)		
State	**CO**	**NOx**	**VOC**	**CO**	**NOx**	**VOC**	**CO**	**NOx**	**VOC**	**CO**	**NOx**	**VOC**
Alabama	529	901	191	1263	313	616	4070	396	513	5862	1609	1321
Arkansas	252	178	44	716	209	424	1828	210	241	2796	597	709
Connecticut	35	115	42	835	128	372	1956	218	279	2827	462	693
Delaware	43	148	36	185	42	89	548	67	74	777	257	199
District of Columbia	1	8	1	148	18	31	239	24	31	388	51	63
Florida	188	1,438	97	3,475	415	1,455	9888	904	1255	13,551	2,758	2,807
Georgia	466	904	142	1,994	307	780	6778	659	876	9,238	1,870	1,798
Illinois	1457	1806	700	2914	553	1392	6322	733	919	10693	3092	3011
Indiana	1066	1752	347	1148	388	872	4262	449	575	6476	2588	1794
Iowa	34	423	39	745	169	493	2136	238	281	2914	830	813
Kansas	195	530	138	2038	400	648	1996	225	252	4228	1,155	1038
Kentucky	282	1105	342	856	403	536	2909	338	387	4047	1846	1,265
Louisiana	1593	1,132	317	1727	722	689	3284	285	406	6605	2,140	1411
Maine	88	102	57	187	34	148	1029	130	128	1304	266	332
Maryland	428	569	66	1238	202	446	2709	305	332	4374	1076	843
Massachusetts	59	369	82	1462	233	614	2702	326	352	4223	928	1048
Michigan	439	1459	426	1972	393	960	6493	648	895	8905	2500	2281
Minnesota	221	400	168	1892	202	806	3686	378	487	5800	980	1461
Mississippi	254	347	169	1292	315	571	2109	260	277	3654	922	1018
Missouri	283	722	179	2162	232	773	3188	423	457	5633	1377	1410
Nebraska	19	278	39	1024	170	366	1248	142	160	2291	591	564
New Hampshire	64	115	28	154	27	92	838	99	106	1056	241	226
New Jersey	132	834	342	1434	264	611	3373	424	500	4939	1521	1454
New York	140	794	481	2813	454	1240	8037	865	1031	10990	2113	2752
North Carolina	236	847	352	2552	234	865	3797	443	493	6585	1524	1710
North Dakota	29	357	14	394	98	208	513	68	67	936	523	289
Ohio	2074	2352	470	2,009	476	1085	8277	737	1093	12,360	3,565	2648
Oklahoma	100	310	66	826	410	527	2937	319	361	3863	1039	954
Pennsylvania	3,015	2,097	426	1745	402	855	6475	591	869	11,234	3,090	2,151
Rhode Island	6	12	23	208	28	95	621	61	83	836	101	200
South Carolina	136	433	159	982	160	598	3218	331	404	4337	923	1162
South Dakota	0	55	2	462	38	176	605	78	79	1067	171	257
Tennessee	298	1200	411	2,323	465	976	4296	444	553	6,916	2,109	1,940
Texas	1128	2,810	811	7278	836	2239	12400	1359	1495	20806	5,004	4545
Vermont	1	1	4	79	12	45	501	65	62	581	78	110
Virginia	114	328	300	1587	387	770	5266	551	655	6968	1266	1724
West Virginia	827	1620	236	486	128	262	1395	159	178	2708	1907	676
Wisconsin	281	536	138	1,262	216	622	2925	351	402	4,468	1,104	1,162
OTAG Region	**16,511**	**29,387**	**7,885**	**55,867**	**10,483**	**24,346**	**134857**	**14304**	**17608**	**207,236**	**54,174**	**49,840**

NOTE: OTAG Emissions Data Base Version 3. The sums of States may not equal OTAG Region due to rounding.

Biogenic Emissions

This report presents a preliminary estimate of biogenic VOC and nitric oxide (NO) emissions for 1988, 1990, 1991, and 1995. The methodology for computing these estimates is based on the Biogenic Emissions Inventory System — Version 2 (BEIS2).[10,11] Because of a better understanding of environmental influences and the availability of more recent field measurements, this newer version of BEIS tends to produce higher annual fluxes of isoprene and NO than the earlier version of BEIS.[12,13] The emission estimates are presented in Table 15 for VOC and Table 16 for NO. Except for 1990, differences in annual emission estimates are due to year-to-year variations in air temperature and cloudiness. The 1990 estimate was taken from the 1994 trends report and was based on a slightly different version of BEIS2.

Biogenic emission estimates are strongly affected by differences in climatology and land use. Tables 17 and 18 show that highest emissions occur in the summer, when temperatures are highest. Variations in biogenic emissions are influenced by fluctuations in temperature. For example an increase of 10°C can result in over a two-fold increase in both VOC and NO. As shown here, annual emission estimates correlate very strongly with changes in annual temperature patterns.

Figures 21 and 22 show the spatial variation in biogenic emission densities estimated for counties across the United States. While some of this variability is attributable to differences in temperature and solar radiation, much of the spatial difference can be attributed to variations in land use. Higher VOC densities in the southern United States and in Missouri are strongly linked to the large areas of high-emitting oak trees. The relatively high densities of NO in the Midwestern United States are associated with areas of fertilized crop land.

Research in the area of biogenic emissions continues to be quite active, and changes in emission estimates are to be expected in the next few years. Meanwhile, these emissions should be viewed with an uncertainty of at least a factor of two.

Table 15. Biogenic Volatile Organic Compound Emissions by State
(thousand short tons)

STATE	1988	1990	1991	1995
Alabama	1,826	2,114	1,852	1,937
Arizona	535	542	517	548
Arkansas	1,837	1,852	1,476	1,741
California	1,815	1,778	1,711	1,794
Colorado	889	748	817	826
Connecticut	81	68	74	81
Delaware	25	19	24	26
District of Columbia	1	1	1	1
Florida	1,352	1,513	1,246	1,436
Georgia	1,666	1,958	1,609	1,721
Idaho	854	810	764	706
Illinois	283	227	257	244
Indiana	237	185	227	218
Iowa	141	95	103	112
Kansas	154	140	133	118
Kentucky	677	575	648	636
Louisiana	1,291	1,403	1,043	1,367
Maine	599	567	621	622
Maryland	164	132	155	169
Massachusetts	140	107	129	140
Michigan	581	422	548	533
Minnesota	729	519	612	636
Mississippi	1,662	1,801	1,450	1,642
Missouri	1,472	1,222	1,298	1,267
Montana	912	729	781	666
Nebraska	95	79	81	78
Nevada	152	140	142	135
New Hampshire	168	147	163	171
New Jersey	130	115	124	132
New Mexico	505	533	499	531
New York	350	303	328	361
North Carolina	1,072	1,194	1,002	1,110
North Dakota	69	49	51	48
Ohio	270	211	243	259
Oklahoma	1,013	1,016	864	887
Oregon	1,066	1,118	1,002	1,114
Pennsylvania	594	510	560	642
Rhode Island	24	18	21	24
South Carolina	738	886	652	755
South Dakota	142	103	113	104
Tennessee	1,063	1,022	1,010	997
Texas	2,711	2,864	2,244	2,649
Utah	407	374	353	345
Vermont	102	91	100	106
Virginia	911	886	850	917
Washington	685	780	650	801
West Virginia	510	420	473	492
Wisconsin	648	450	516	541
Wyoming	505	387	397	358
National	**33,852**	**33,224**	**30,536**	**32,742**

NOTE: The sums of States may not equal National total due to rounding.

Table 16. Biogenic Nitric Oxide Emissions by State
(thousand short tons)

STATE	1988	1990	1991	1995
Alabama	14	19	14	14
Arizona	55	51	53	55
Arkansas	19	21	19	19
California	42	40	42	42
Colorado	39	35	38	38
Connecticut	1	1	1	1
Delaware	2	2	2	2
District of Columbia	0	0	0	0
Florida	22	29	22	22
Georgia	19	29	20	20
Idaho	25	23	24	24
Illinois	90	84	90	86
Indiana	49	48	51	49
Iowa	93	82	90	87
Kansas	91	87	91	85
Kentucky	19	20	20	19
Louisiana	19	20	19	19
Maine	3	3	3	3
Maryland	6	6	6	6
Massachusetts	1	1	1	1
Michigan	25	25	26	25
Minnesota	58	52	56	54
Mississippi	19	22	19	19
Missouri	44	42	44	42
Montana	60	49	57	53
Nebraska	91	83	90	86
Nevada	46	38	44	44
New Hampshire	1	1	1	1
New Jersey	2	2	2	2
New Mexico	62	59	61	64
New York	17	19	18	18
North Carolina	21	26	22	21
North Dakota	51	42	48	44
Ohio	36	36	37	35
Oklahoma	35	37	35	34
Oregon	24	22	23	23
Pennsylvania	19	21	20	20
Rhode Island	0	0	0	0
South Carolina	10	16	11	11
South Dakota	62	53	60	56
Tennessee	17	18	18	17
Texas	199	203	199	202
Utah	28	25	27	28
Vermont	2	2	2	2
Virginia	10	12	10	10
Washington	15	15	14	15
West Virginia	4	4	4	4
Wisconsin	36	34	35	35
Wyoming	39	40	36	35
National	**1,638**	**1,596**	**1,628**	**1,591**

NOTE: The sums of States may not equal National total due to rounding.

Table 17. Biogenic Volatile Organic Compound Seasonal Allocation, 1988 to 1995
(percentages)

Year	Winter	Spring	Summer	Autumn
1988	3	18	61	18
1990	4	17	57	22
1991	3	21	62	14
1995	3	18	59	19

Table 18. Biogenic Nitric Oxide Seasonal Allocation, 1988 to 1995
(percentages)

Year	Winter	Spring	Summer	Autumn
1988	11	23	42	24
1990	15	21	39	25
1991	12	24	40	23
1995	12	22	41	24

Figure 21. Density Map of VOLATILE ORGANIC COMPOUND 1995 Biogenic Emissions by County

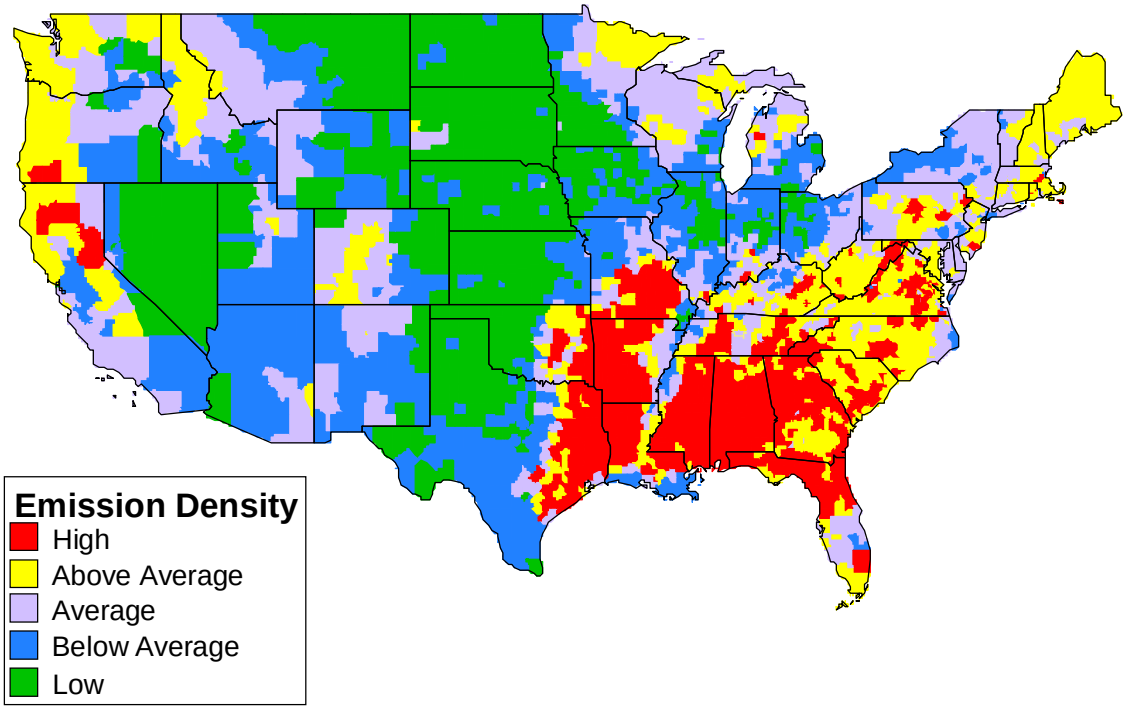
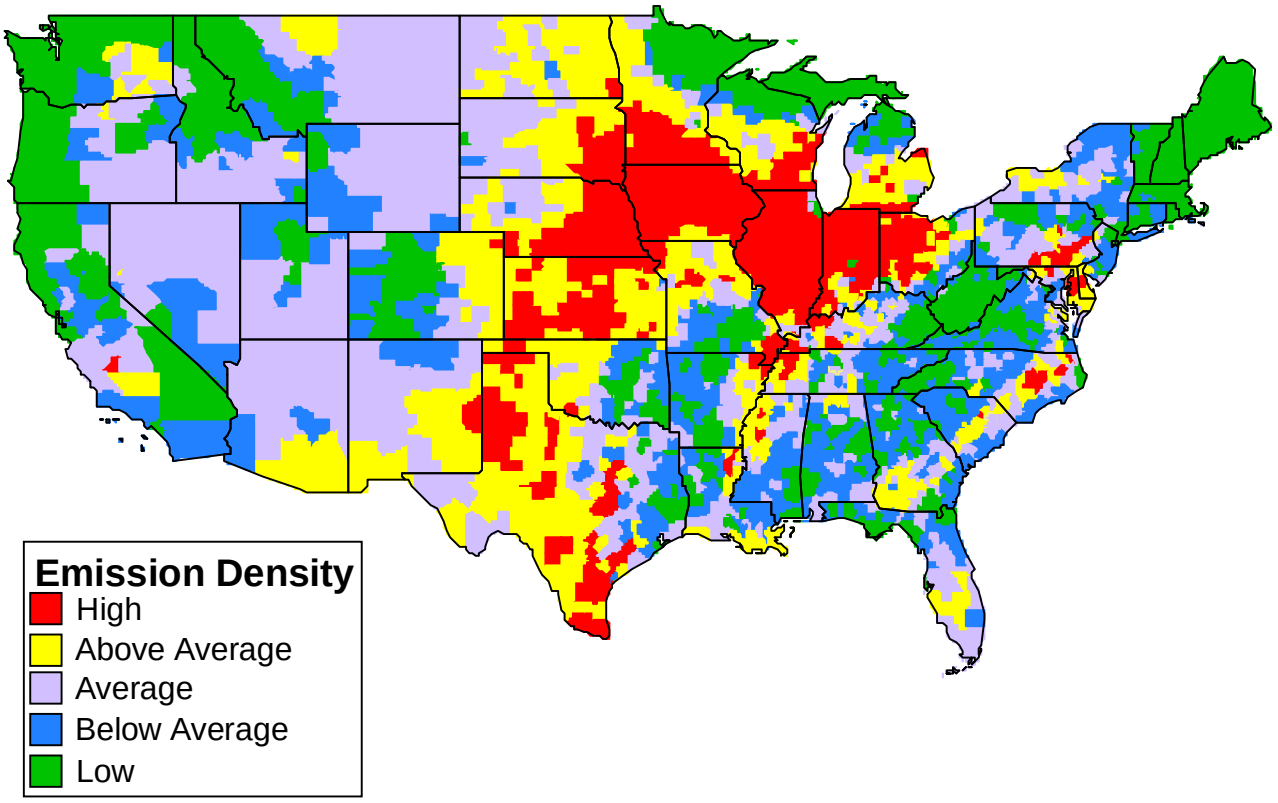


Figure 22. Density Map of NITRIC OXIDE 1995 Biogenic Emissions by County



Air Toxic Emissions

There are approximately 4.4 million tons of pollutants released in to the air each year for which there is an association with, or potential for, severe public health (e.g., cancer or other serious, irreversible health effects such as reproductive and development effects and neurological effects). The problems posed when these pollutants cause or contribute significantly to exposures leading to such severe effects are generally referred to as "air toxics" problems. The term "air toxics" also refers to pollutant-specific damage to wildlife, aquatic life, or other natural resources, or significant degradation of environmental quality over broad areas.

There is considerable uncertainty in evaluating the air toxics problem, and often toxic problems are described in qualitative, rather than quantitative terms. For this reason, the OAQPS is currently developing a National Toxics Inventory (NTI)[14] which at this time includes 347 pollutants from 796 point, area, and mobile source categories. Data from the Toxic Release Inventory (TRI) were used as the foundation of this inventory. Because TRI data do not include mobile and area sources, other references needed to be considered. Data from OAQPS studies such as the sections 112 k, 112(c)(6), the Draft Mercury Report,[15] and studies used to develop Maximum Achievable Control Technology (MACT) standards, supplement the TRI data in NTI. State and local data such as the California Air Resources Board's (CARB) Hot Spots Report replace all other data in NTI. The use of this non-TRI data has been particularly important, for it provided estimates that indicate that area sources account for approximately 31 percent of toxic emissions and mobile sources account for 39 percent of toxic emissions (relative to the 189 Hazardous Air Pollutants [HAPs] as delineated in Title III of the CAAA).

It should be noted that this is a work in progress and additional MACT studies still need to be added, along with various State and local toxic inventory data and results from Title V Operating Permit surveys. For this report, data for 37 toxic pollutants are summarized.

Table 19 lists the 20 top emitting source categories including point, area and mobile sources. These 20 source categories account for 79 percent of toxic annual emissions (the 189 HAPs priority pollutants). As mentioned earlier, area and mobile sources collectively account for 70 percent of toxic emissions; in fact, the first two source categories, on-road motor vehicles and residential wood combustion, account for approximately 47 percent of the 189 HAP pollutants emitted annually.

Table 20 provides information on the type of effect associated with the pollutant and the current NTI annual emission estimate. It should be noted that these 37 pollutants account for approximately 86 percent of the 189 HAPs emitted annually.

Figure 23 shows the geographic distribution of total toxic pollutants by State for high, medium, and low emission ranges.

Table 19. Top 20 Sources of Toxic Emissions (short tons)

Rank	Source Category	Emission
1	On-road motor vehicles	1.52E+06
2	Residential wood combustion	5.25E+05
3	Glycol dehydrators	2.45E+05
4	Consumer and commercial product solvent use	2.22E+05
5	Non-road mobile vehicles	2.09E+05
6	Forest fires	1.91E+05
7	Prescribed burning	1.31E+05
8	Industrial wood waste combustion	9.93E+04
9	Dry cleaning	8.98E+04
10	Halogenated solvent cleaning	5.77E+04
11	Utility coal combustion	3.96E+04
12	Gasoline distribution; stage II	2.27E+04
13	Primary aluminum production	1.80E+04
14	Industrial coal combustion	1.69E+04
15	Manufacture of motor vehicles and car bodies	1.51E+04
16	Gasoline distribution, stage 1	1.37E+04
17	Plastics foam products	1.36E+04
18	Commercial printing, gravure	1.27E+04
19	Pulp mills	1.21E+04
20	Structure fires	1.18E+04

Figure 23. The National Toxic Inventory's 189 Hazardous Air Pollutant (HAP) Emissions by State

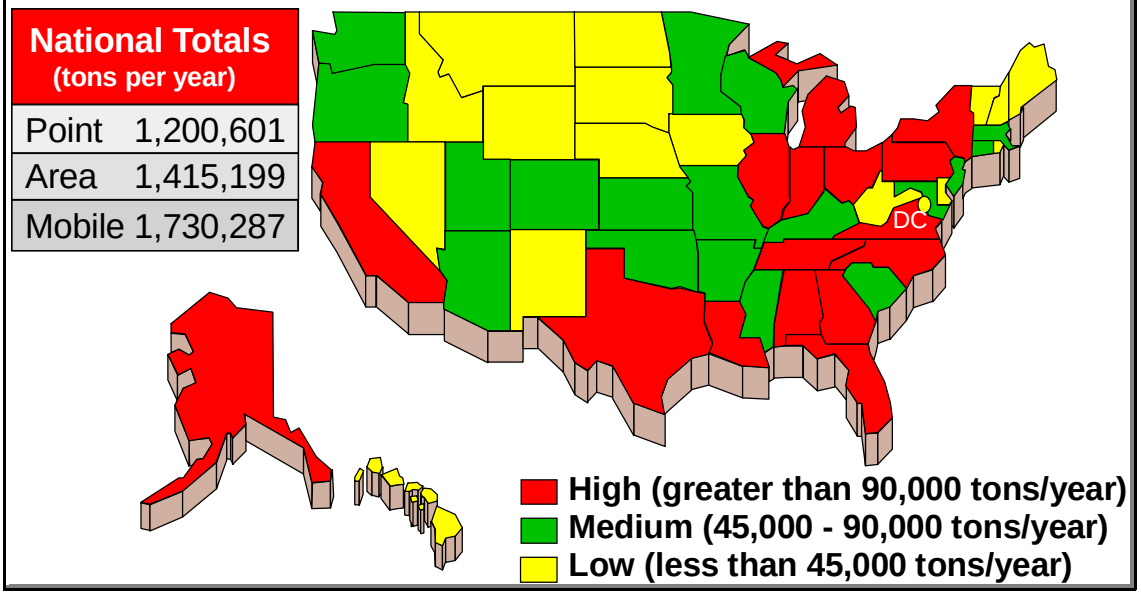


Table 20. 37 Toxic Pollutants Ranked by Annual Emission Totals (short tons)

Pollutant	HTP[a]	Ep[b]	EFAE[c]	Op[d]	PM[e]	Emissions
Toluene				x	x	1.22E+06
POM (PAHs)	x	x		x	x	7.53E+05
Benzene	x					5.72E+05
Formaldehyde			x	x		2.81E+05
Xylenes				x	x	1.87E+05
1,3-Butadiene	x			x		1.23E+05
Tetrachloroethylene			x			1.09E+05
Acetaldehyde				x		9.53E+04
Trichloroethylene				x		5.33E+04
Acrolein	x		x	x		4.93E+04
Methylene chloride		x				4.34E+04
Hydrazine	x			x		3.94E+04
Glycol ethers				x		2.30E+04
Styrene				x		1.67E+04
Arsenic compounds	x	x			x	1.36E+04
Chloroform		x		x		6.93E+03
Nickel compounds	x	x			x	5.36E+03
Lead compounds	x	x			x	3.76E+03
Manganese	x	x			x	1.70E+03
Ethylene dichloride	x			x		1.27E+03
Bis(2-chloroethyl) ether	x					7.90E+02
Cadmium compounds	x	x			x	7.90E+02
Acrylonitrile	x			x		6.98E+02
Ethylene oxide	x	x	x	x		6.52E+02
Vinyl chloride	x			x		5.17E+02
Chromium compounds	x	x			x	2.94E+02
MDI	x			x		2.73E+02
Mercury compounds	x	x			x	2.46E+02
2,4-Toluene	x		x	x		4.50E+01
Antimony compounds	x	x				2.18E+01
Ethylene dibromide	x					1.68E+01
Acrylamide	x			x		1.44E+01
Beryllium compounds	x	x				9.29E+00
Phosgene	x	x	x	x		2.85E+00
2,3,7,8-TCDF	x			x	x	1.44E-02
2,3,7,8-TCDD	x			x	x	1.56E-03
Coke oven emissions	x				x	f

[a] Highly Toxic Pollutant (HTP) are those HAP with a reference concentration of less than $5.0E\text{-}03^{3}$ mg/m^{3} (noncancer effects); a weight of evidence classification of A (known human carcinogen) of B1 (probable human carcinogen); or, a verified unit risk estimate of greater than $2.0\ E\text{-}05^{-5}$ $(\mu g/m^{3})^{-1}$ and a weight of evidence classification of A or B.

[b] Environmentally Persistent (EP) HAP for which there is potential for persistence in the environment of greater than 14 days.

[c] Effects from Acute Exposure (EFAE)

[d] Ozone Precursors (OP)

[e] PM or PM precursors

[f] Coke oven gas emissions not included in Version 2 of the National Toxic Inventory.

Canada

The 1990 criteria air pollutant annual emissions data for Canada were provided by Environment Canada[16] for the year 1990. Table 21 displays the emission estimates for Canada by major source category. Table 22 displays the emissions for Canada by Province.

Table 21. 1990 Emissions for Canada by Major Source Category
(thousand short tons)

Source Category	Carbon Monoxide	Nitrogen Oxides	Volatile Organic Compounds	Sulfur Dioxide	Total Particulate Matter
Industrial Sources	1,308	533	929	2,667	893
Nonindustrial Fuel Combustion	804	349	283	816	301
Transportation	8,114	1,381	886	147	147
Incineration	700	8	61	3	38
Miscellaneous	10	1	684	0	34

Table 22. 1990 Emissions for Canada by Province
(thousand short tons)

Province	Carbon Monoxide	Nitrogen Oxides	Volatile Organic Compounds	Sulfur Dioxide	Total Particulate Matter
Alberta	1,440	537	703	624	214
British Columbia	1,390	227	228	111	168
Manitoba	426	81	84	561	66
New Brunswick	275	75	43	203	36
New Foundland	184	47	54	73	104
Northwest Territories	21	10	10	17	7
Nova Scotia	356	81	77	198	53
Ontario	3,727	723	951	1,305	358
Prince Edward Island	75	8	21	5	6
Quebec	2,298	331	441	435	263
Saskatchewan	729	146	228	99	131

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Appendix A National Emissions (1970 to 1995) by Subcategory

Table A-1. Carbon Monoxide Emissions

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. ELEC. UTIL.	***237***	***276***	***322***	***292***	***291***	***300***	***313***	***319***	***314***	***315***	***313***	***322***	***325***	***324***
Coal	106	134	188	208	208	217	229	231	233	233	235	245	246	248
Oil	41	69	48	18	24	20	25	26	20	19	15	16	15	10
Gas	90	73	85	56	48	53	48	51	51	51	51	49	53	55
Internal Combustion	NA	NA	NA	10	11	10	11	11	11	12	11	12	12	11
FUEL COMB. INDUSTRIAL	***770***	***763***	***750***	***670***	***650***	***649***	***669***	***672***	***677***	***667***	***672***	***670***	***671***	***672***
Coal	100	67	58	86	87	85	87	87	86	72	80	77	80	81
Oil	44	49	35	47	46	46	46	46	46	52	47	47	50	49
Gas	462	463	418	257	242	252	265	271	276	274	276	276	273	273
Other	164	184	239	167	172	171	173	173	171	170	170	170	170	170
Internal Combustion	NA	NA	NA	113	103	96	98	96	98	99	99	99	98	98
FUEL COMB. OTHER	***3,625***	***3,441***	***6,230***	***7,525***	***6,607***	***6,011***	***6,390***	***6,450***	***4,072***	***4,373***	***4,616***	***3,961***	***3,888***	***2,964***
Commercial/Institutional Coal	12	17	13	14	14	14	15	15	15	15	15	15	15	14
Commercial/Institutional Oil	27	23	21	18	18	19	18	17	16	16	17	17	17	17
Commercial/Institutional Gas	24	25	26	42	42	43	47	49	50	50	50	51	51	51
Misc. Fuel Comb. (Except Residential)	NA	NA	NA	57	60	59	55	55	52	52	52	52	52	52
Residential Wood	2,932	3,114	5,992	7,232	6,316	5,719	6,086	6,161	3,781	4,090	4,332	3,679	3,607	2,683
fireplaces	*686*	*729*	*1,402*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
woodstoves	*2,246*	*2,385*	*4,590*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Residential Other	630	262	178	162	157	157	168	153	158	151	150	149	147	146
CHEMICAL & ALLIED PRODUCT MFG	***3,397***	***2,204***	***2,151***	***1,845***	***1,853***	***1,798***	***1,917***	***1,925***	***1,940***	***1,944***	***1,964***	***1,998***	***2,048***	***2,237***
Organic Chemical Mfg	340	483	543	251	261	260	278	285	286	284	288	289	293	302
ethylene dichloride	*11*	*12*	*17*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
maleic anhydride	*73*	*147*	*103*	*16*	*16*	*15*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*
cyclohexanol	*36*	*39*	*37*	*5*	*5*	*5*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
other	*220*	*286*	*386*	*230*	*240*	*240*	*256*	*264*	*264*	*262*	*266*	*268*	*271*	*280*
Inorganic Chemical Mfg	190	153	191	89	94	89	95	95	95	95	96	96	98	100
pigments; TiO2 chloride process: reactor	*18*	*22*	*34*	*77*	*82*	*77*	*83*	*84*	*83*	*83*	*84*	*84*	*85*	*88*
other	*172*	*131*	*157*	*12*	*12*	*11*	*12*	*12*	*12*	*12*	*12*	*12*	*13*	*12*
Polymer & Resin Mfg	NA	NA	NA	19	19	18	18	18	19	19	19	19	20	21
Agricultural Chemical Mfg	NA	NA	NA	16	16	16	17	17	17	18	18	18	19	17
Pharmaceutical Mfg	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other Chemical Mfg	2,866	1,567	1,417	1,471	1,463	1,415	1,509	1,510	1,522	1,529	1,542	1,574	1,619	1,796
carbon black mfg	*2,866*	*1,567*	*1,417*	*1,078*	*1,068*	*1,034*	*1,098*	*1,112*	*1,126*	*1,131*	*1,142*	*1,170*	*1,207*	*1,362*
carbon black furnace: fugitives	*NA*	*NA*	*NA*	*155*	*165*	*161*	*185*	*180*	*179*	*184*	*185*	*190*	*196*	*216*
other	*NA*	*NA*	*NA*	*238*	*231*	*219*	*226*	*219*	*218*	*214*	*215*	*214*	*216*	*218*

Table A-1. Carbon Monoxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
METALS PROCESSING	***3,644***	***2,496***	***2,246***	***2,223***	***2,079***	***1,984***	***2,101***	***2,132***	***2,080***	***1,992***	***2,044***	***2,091***	***2,166***	***2,223***
Nonferrous Metals Processing	652	636	842	694	650	614	656	677	681	653	665	676	695	735
aluminum anode baking	*326*	*318*	*421*	*41*	*40*	*38*	*40*	*41*	*41*	*40*	*41*	*42*	*43*	*46*
prebake aluminum cell	*326*	*318*	*421*	*257*	*243*	*232*	*248*	*254*	*255*	*245*	*251*	*256*	*264*	*281*
other	*NA*	*NA*	*NA*	*396*	*367*	*344*	*368*	*382*	*384*	*368*	*373*	*378*	*389*	*409*
Ferrous Metals Processing	2,991	1,859	1,404	1,523	1,423	1,365	1,439	1,449	1,394	1,333	1,373	1,410	1,465	1,483
basic oxygen furnace	*440*	*125*	*80*	*694*	*640*	*617*	*650*	*662*	*642*	*615*	*634*	*651*	*677*	*686*
carbon steel electric arc furnace	*181*	*204*	*280*	*19*	*17*	*17*	*18*	*18*	*17*	*16*	*17*	*17*	*18*	*18*
coke oven charging	*62*	*53*	*43*	*9*	*9*	*8*	*9*	*9*	*8*	*8*	*8*	*8*	*9*	*9*
gray iron cupola	*1,203*	*649*	*340*	*302*	*294*	*281*	*288*	*280*	*262*	*249*	*254*	*261*	*271*	*271*
iron ore sinter plant windbox	*1,025*	*759*	*600*	*304*	*280*	*266*	*287*	*293*	*283*	*271*	*280*	*287*	*298*	*302*
other	*81*	*70*	*61*	*194*	*184*	*176*	*188*	*187*	*181*	*174*	*180*	*185*	*192*	*196*
Metals Processing NEC	NA	NA	NA	6	6	6	6	6	6	5	6	6	6	6
PETROLEUM & RELATED INDUSTRIES	***2,179***	***2,211***	***1,723***	***462***	***451***	***455***	***441***	***436***	***435***	***412***	***410***	***398***	***390***	***379***
Oil & Gas Production	NA	NA	NA	11	9	8	8	8	8	8	8	8	8	8
Petroleum Refineries & Related Industries	2,168	2,211	1,723	449	440	445	431	427	425	403	400	388	380	369
fcc units	*1,820*	*2,032*	*1,680*	*403*	*398*	*408*	*393*	*390*	*389*	*367*	*364*	*352*	*344*	*334*
other	*348*	*179*	*44*	*46*	*41*	*37*	*38*	*37*	*36*	*36*	*36*	*36*	*36*	*35*
Asphalt Manufacturing	11	0	0	2	2	2	2	2	2	2	2	2	2	2
OTHER INDUSTRIAL PROCESSES	***620***	***630***	***830***	***694***	***715***	***713***	***711***	***716***	***717***	***710***	***719***	***732***	***751***	***767***
Agriculture, Food, & Kindred Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Textiles, Leather, & Apparel Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Wood, Pulp & Paper, & Publishing Products	610	602	798	627	647	646	649	655	657	652	661	672	689	704
sulfate pulping: rec. furnace/evaporator	*NA*	*NA*	*NA*	*475*	*491*	*489*	*491*	*497*	*498*	*495*	*502*	*510*	*523*	*534*
sulfate (kraft) pulping: lime kiln	*610*	*602*	*798*	*140*	*145*	*144*	*145*	*146*	*146*	*145*	*146*	*149*	*152*	*156*
other	*NA*	*NA*	*NA*	*12*	*12*	*13*	*13*	*13*	*13*	*13*	*13*	*13*	*13*	*14*
Rubber & Miscellaneous Plastic Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Mineral Products	10	27	32	43	44	44	44	43	43	41	42	44	46	47
Machinery Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Electronic Equipment	NA	NA	NA	18	18	18	13	12	12	11	11	11	11	11
Transportation Equipment	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous Industrial Processes	NA	NA	NA	6	5	5	5	5	5	5	5	5	5	5
SOLVENT UTILIZATION	***NA***	***NA***	***NA***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***
Degreasing	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Graphic Arts	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Surface Coating	NA	NA	NA	0	0	0	1	1	1	1	1	1	1	1
Other Industrial	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0

Table A-1. Carbon Monoxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
STORAGE & TRANSPORT	***NA***	***NA***	***NA***	***49***	***51***	***50***	***56***	***55***	***55***	***54***	***55***	***56***	***58***	***65***
Bulk Terminals & Plants	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Petroleum & Petroleum Product Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Petroleum & Petroleum Product Transport	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Organic Chemical Storage	NA	NA	NA	42	45	44	51	49	49	48	49	50	52	58
Inorganic Chemical Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Bulk Materials Storage	NA	NA	NA	6	5	5	5	5	5	5	5	5	5	6
WASTE DISPOSAL & RECYCLING	***7,059***	***3,230***	***2,300***	***1,941***	***1,916***	***1,850***	***1,806***	***1,747***	***1,686***	***1,701***	***1,717***	***1,732***	***1,746***	***1,766***
Incineration	2,979	1,764	1,246	958	949	920	903	876	849	857	864	872	879	890
conical wood burner	*1,431*	*579*	*228*	*17*	*18*	*18*	*19*	*19*	*18*	*18*	*18*	*18*	*18*	*18*
municipal incinerator	*333*	*23*	*13*	*34*	*35*	*34*	*35*	*35*	*35*	*35*	*35*	*35*	*35*	*35*
industrial	*NA*	*NA*	*NA*	*9*	*9*	*9*	*10*	*9*	*9*	*9*	*9*	*9*	*10*	*10*
commmercial/institutional	*108*	*68*	*60*	*32*	*33*	*35*	*38*	*39*	*40*	*40*	*40*	*41*	*42*	*42*
residential	*1,107*	*1,094*	*945*	*865*	*852*	*822*	*800*	*773*	*745*	*753*	*759*	*766*	*772*	*783*
other	*NA*	*NA*	*NA*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Open Burning	4,080	1,466	1,054	982	966	930	903	870	836	844	852	859	867	876
industrial	*1,932*	*1,254*	*1,007*	*20*	*21*	*21*	*21*	*21*	*21*	*20*	*21*	*22*	*23*	*22*
commmercial/institutional	*2,148*	*212*	*47*	*4*	*4*	*4*	*4*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
residential	*NA*	*NA*	*NA*	*958*	*941*	*905*	*877*	*845*	*811*	*819*	*826*	*833*	*839*	*849*
Landfills	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
ON-ROAD VEHICLES	***88,034***	***83,134***	***78,049***	***77,387***	***73,347***	***71,250***	***71,081***	***66,050***	***62,858***	***62,074***	***59,859***	***60,202***	***61,833***	***58,624***
Light-Duty Gas Vehicles & Motorcycles	64,031	59,281	53,561	49,451	46,698	45,340	45,553	42,234	40,502	40,267	39,370	39,163	37,507	35,981
light-duty gas vehicles	*63,846*	*59,061*	*53,342*	*49,273*	*46,522*	*45,161*	*45,367*	*42,047*	*40,316*	*40,089*	*39,190*	*38,973*	*37,312*	*35,786*
motorcycles	*185*	*220*	*219*	*178*	*175*	*179*	*186*	*187*	*187*	*177*	*180*	*190*	*195*	*195*
Light-Duty Gas Trucks	16,570	15,767	16,137	18,960	17,789	17,274	17,133	15,940	15,084	15,014	14,567	15,196	17,350	16,292
light-duty gas trucks 1	*10,102*	*9,611*	*10,395*	*11,834*	*10,795*	*10,187*	*9,890*	*9,034*	*8,511*	*8,450*	*8,161*	*8,430*	*9,534*	*8,980*
light-duty gas trucks 2	*6,468*	*6,156*	*5,742*	*7,126*	*6,995*	*7,087*	*7,244*	*6,906*	*6,573*	*6,565*	*6,407*	*6,766*	*7,815*	*7,312*
Heavy-Duty Gas Vehicles	6,712	7,140	7,189	7,716	7,601	7,347	7,072	6,506	5,930	5,459	4,569	4,476	5,525	4,883
Diesels	721	945	1,161	1,261	1,259	1,289	1,322	1,369	1,342	1,334	1,352	1,367	1,451	1,468
heavy-duty diesel vehicles	*721*	*915*	*1,139*	*1,235*	*1,232*	*1,260*	*1,290*	*1,336*	*1,307*	*1,298*	*1,315*	*1,328*	*1,411*	*1,427*
light-duty diesel trucks	*NA*	*0*	*4*	*4*	*4*	*5*	*5*	*6*	*6*	*6*	*6*	*7*	*8*	*8*
light-duty diesel vehicles	*NA*	*30*	*19*	*22*	*23*	*24*	*26*	*28*	*29*	*30*	*31*	*33*	*32*	*33*
NON-ROAD SOURCES	***10,605***	***11,462***	***12,681***	***13,706***	***13,984***	***14,131***	***14,500***	***14,518***	***14,642***	***14,601***	***14,900***	***15,269***	***15,657***	***15,622***
Non-Road Gasoline	9,478	10,145	11,004	11,815	12,057	12,286	12,465	12,538	12,655	12,641	12,883	13,162	13,452	13,506
recreational	*268*	*283*	*299*	*312*	*314*	*316*	*318*	*321*	*324*	*327*	*330*	*333*	*336*	*341*
construction	*250*	*274*	*368*	*421*	*416*	*402*	*401*	*398*	*395*	*376*	*395*	*423*	*453*	*406*
industrial	*732*	*803*	*970*	*1,104*	*1,137*	*1,164*	*1,207*	*1,227*	*1,228*	*1,197*	*1,234*	*1,285*	*1,340*	*1,309*
lawn & garden	*4,679*	*5,017*	*5,366*	*5,685*	*5,749*	*5,808*	*5,866*	*5,929*	*6,001*	*6,075*	*6,143*	*6,212*	*6,276*	*6,384*

Table A-1. Carbon Monoxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
NON-ROAD SOURCES (continued)														
Non-Road Gasoline (continued)														
farm	*46*	*60*	*77*	*84*	*85*	*47*	*92*	*63*	*63*	*66*	*68*	*70*	*73*	*66*
light commercial	*2,437*	*2,554*	*2,680*	*2,894*	*3,028*	*3,203*	*3,219*	*3,223*	*3,254*	*3,198*	*3,295*	*3,402*	*3,519*	*3,526*
logging	*9*	*21*	*25*	*28*	*27*	*33*	*31*	*33*	*33*	*32*	*33*	*34*	*35*	*36*
airport service	*80*	*94*	*116*	*129*	*133*	*137*	*144*	*147*	*149*	*148*	*151*	*157*	*163*	*161*
recreational marine vessels	*976*	*1,037*	*1,102*	*1,157*	*1,167*	*1,175*	*1,185*	*1,195*	*1,207*	*1,221*	*1,233*	*1,245*	*1,256*	*1,276*
other	*1*	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Non-Road Diesel	543	623	801	910	912	797	930	845	841	818	853	903	954	869
recreational	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
construction	*336*	*362*	*479*	*553*	*552*	*538*	*538*	*535*	*528*	*501*	*526*	*564*	*603*	*539*
industrial	*33*	*35*	*43*	*49*	*50*	*51*	*53*	*54*	*54*	*53*	*54*	*56*	*59*	*58*
lawn & garden	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*4*	*4*	*4*	*4*
farm	*127*	*170*	*214*	*237*	*237*	*131*	*259*	*175*	*176*	*183*	*189*	*196*	*203*	*183*
light commercial	*10*	*11*	*11*	*12*	*13*	*14*	*14*	*14*	*14*	*14*	*14*	*15*	*15*	*15*
logging	*1*	*2*	*2*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
airport service	*33*	*39*	*48*	*54*	*55*	*57*	*60*	*61*	*62*	*62*	*63*	*65*	*68*	*67*
Aircraft	506	600	743	831	858	887	931	955	966	962	980	1,019	1,063	1,051
Marine Vessels	14	17	37	44	47	50	56	59	58	58	60	62	63	65
coal	*2*	*2*	*4*	*5*	*5*	*6*	*6*	*7*	*6*	*6*	*7*	*7*	*7*	*7*
diesel	*12*	*14*	*32*	*39*	*41*	*44*	*48*	*52*	*51*	*51*	*53*	*54*	*55*	*57*
residual oil	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Railroads	65	77	96	106	109	112	118	121	122	122	124	124	124	130
MISCELLANEOUS	***7,909***	***5,263***	***8,344***	***7,895***	***7,254***	***8,820***	***15,863***	***8,121***	***11,173***	***8,530***	***6,774***	***6,700***	***9,245***	***6,454***
Other Combustion	7,909	5,263	8,344	7,895	7,254	8,820	15,863	8,121	11,173	8,530	6,774	6,700	9,245	6,454
structural fires	*101*	*258*	*217*	*242*	*242*	*242*	*242*	*242*	*242*	*242*	*242*	*242*	*242*	*242*
agricultural fires	*873*	*539*	*501*	*396*	*441*	*483*	*612*	*571*	*552*	*549*	*559*	*573*	*589*	*612*
slash/prescribed burning	*1,146*	*2,268*	*2,226*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*
forest wildfires	*5,620*	*2,165*	*5,396*	*2,957*	*2,271*	*3,795*	*10,709*	*3,009*	*6,079*	*3,439*	*1,674*	*1,586*	*4,115*	*1,301*
other	*169*	*34*	*4*											
TOTAL ALL SOURCES	**128,079**	**115,110**	**115,625**	**114,690**	**109,199**	**108,012**	**115,849**	**103,144**	**100,650**	**97,376**	**94,043**	**94,133**	**98,779**	**92,099**

Note(s): NA = not available. For several source categories, emissions either prior to or beginning with 1985 are not available at the more detailed level but are contained in the more aggregate estimate.

"Other" categories may contain emissions that could not be accurately allocated to specific source categories.

Zero values represent less than 500 short tons/year.

In order to convert emissions to gigagrams (thousand metric tons), multiply the above values by 0.9072.

No data was available after 1984 to split the emissions from residential wood burning devices between fireplaces and woodstoves.

Table A-2. Nitrogen Oxide Emissions

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. ELEC. UTIL.	***4,900***	***5,694***	***7,024***	***6,916***	***6,909***	***7,128***	***7,530***	***7,607***	***7,516***	***7,488***	***7,475***	***7,773***	***7,698***	***6,233***
Coal	3,888	4,828	6,123	6,051	6,061	6,278	6,668	6,708	6,698	6,662	6,694	7,008	6,915	5,556
bituminous	*2,112*	*2,590*	*3,439*	*4,438*	*4,427*	*4,529*	*4,623*	*4,665*	*4,600*	*4,522*	*4,564*	*4,535*	*4,411*	*4,000*
subbituminous	*1,041*	*1,276*	*1,694*	*1,340*	*1,290*	*1,411*	*1,659*	*1,650*	*1,692*	*1,732*	*1,707*	*2,054*	*2,109*	*1,286*
anthracite & lignite	*344*	*414*	*542*	*272*	*344*	*337*	*387*	*392*	*406*	*408*	*423*	*418*	*394*	*270*
other	*391*	*548*	*447*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Oil	1,012	866	901	177	246	204	260	272	210	201	160	169	153	87
residual	*40*	*101*	*39*	*174*	*242*	*200*	*257*	*269*	*207*	*198*	*158*	*166*	*149*	*84*
distillate	*972*	*765*	*862*	*4*	*4*	*4*	*4*	*4*	*3*	*3*	*3*	*3*	*4*	*3*
Gas	NA	NA	NA	640	552	599	551	578	558	569	568	543	576	549
natural	*NA*	*NA*	*NA*	*640*	*552*	*599*	*551*	*578*	*558*	*569*	*568*	*543*	*576*	*549*
Internal Combustion	NA	NA	NA	48	50	48	50	49	50	56	52	53	55	42
FUEL COMB. INDUSTRIAL	***4,325***	***4,007***	***3,555***	***3,209***	***3,065***	***3,063***	***3,187***	***3,209***	***3,256***	***3,175***	***3,216***	***3,197***	***3,206***	***3,137***
Coal	771	520	444	608	613	596	617	615	613	512	571	550	568	562
bituminous	*532*	*359*	*306*	*430*	*439*	*435*	*447*	*446*	*445*	*371*	*414*	*399*	*412*	*404*
subbituminous	*164*	*111*	*94*	*14*	*14*	*14*	*15*	*14*	*14*	*12*	*13*	*13*	*13*	*14*
anthracite & lignite	*75*	*51*	*44*	*33*	*31*	*27*	*29*	*30*	*30*	*25*	*28*	*27*	*28*	*28*
other	*NA*	*NA*	*NA*	*131*	*129*	*119*	*126*	*124*	*124*	*103*	*115*	*111*	*115*	*117*
Oil	332	354	286	309	300	292	296	294	297	338	305	306	318	302
residual	*228*	*186*	*179*	*191*	*181*	*172*	*175*	*176*	*177*	*205*	*184*	*185*	*194*	*180*
distillate	*104*	*112*	*63*	*89*	*89*	*89*	*91*	*88*	*90*	*104*	*93*	*94*	*99*	*97*
other	*NA*	*56*	*44*	*29*	*30*	*31*	*31*	*29*	*30*	*28*	*28*	*27*	*26*	*25*
Gas	3,060	2,983	2,619	1,520	1,433	1,505	1,584	1,625	1,656	1,641	1,651	1,650	1,634	1,610
natural	*3,053*	*2,837*	*2,469*	*1,282*	*1,206*	*1,285*	*1,360*	*1,405*	*1,436*	*1,425*	*1,437*	*1,440*	*1,427*	*1,414*
process	*8*	*5*	*5*	*227*	*216*	*210*	*214*	*209*	*211*	*206*	*205*	*202*	*199*	*188*
other	*NA*	*140*	*145*	*11*	*10*	*10*	*10*	*10*	*10*	*9*	*9*	*9*	*9*	*9*
Other	162	149	205	118	120	119	121	120	119	117	118	118	118	116
wood/bark waste	*102*	*108*	*138*	*89*	*92*	*92*	*93*	*92*	*91*	*91*	*91*	*91*	*91*	*89*
liquid waste	*NA*	*NA*	*NA*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*
other	*60*	*41*	*67*	*17*	*16*	*15*	*16*	*16*	*16*	*15*	*15*	*15*	*15*	*14*
Internal Combustion	NA	NA	NA	655	599	552	569	556	570	567	571	572	567	547
FUEL COMB. OTHER	***836***	***785***	***741***	***712***	***694***	***706***	***740***	***736***	***712***	***719***	***730***	***726***	***727***	***707***
Commercial/Institutional Coal	23	33	25	37	36	37	39	38	39	39	38	38	38	36
Commercial/Institutional Oil	210	176	155	106	110	121	117	106	99	98	101	102	102	98

Table A-2. Nitrogen Oxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. OTHER (continued)														
Commercial/Institutional Gas	120	125	131	145	139	144	157	159	164	164	166	167	168	166
Misc. Fuel Comb. (Except Residential)	NA	NA	NA	11	12	11	11	11	11	11	11	11	11	10
Residential Wood	44	39	74	88	77	69	74	75	46	50	53	45	44	33
Residential Other	439	412	356	326	320	323	343	347	352	358	361	363	364	364
distillate oil	*118*	*113*	*85*	*75*	*76*	*79*	*80*	*78*	*81*	*83*	*85*	*86*	*86*	*85*
natural gas	*242*	*246*	*238*	*248*	*241*	*241*	*259*	*267*	*269*	*272*	*274*	*275*	*276*	*277*
other	*79*	*54*	*33*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*2*	*2*	*2*	*2*
CHEMICAL & ALLIED PRODUCT MFG	***271***	***238***	***216***	***262***	***264***	***255***	***274***	***273***	***276***	***278***	***284***	***286***	***291***	***283***
Organic Chemical Mfg	70	53	54	37	38	38	42	42	42	42	43	43	44	45
Inorganic Chemical Mfg	201	168	159	22	19	17	18	18	19	19	19	19	19	20
Polymer & Resin Mfg	NA	NA	NA	22	22	22	23	23	23	23	24	24	25	26
Agricultural Chemical Mfg	NA	NA	NA	143	145	141	151	152	154	156	161	162	164	154
Paint, Varnish, Lacquer, Enamel Mfg	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Pharmaceutical Mfg	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other Chemical Mfg	NA	NA	NA	38	38	37	40	39	38	38	38	39	39	39
METALS PROCESSING	***77***	***73***	***65***	***87***	***80***	***75***	***82***	***83***	***81***	***78***	***80***	***81***	***84***	***84***
Nonferrous Metals Processing	NA	NA	NA	16	15	14	15	15	15	14	15	15	15	16
Ferrous Metals Processing	77	73	65	58	53	48	53	54	53	51	53	54	56	55
Metals Processing NEC	NA	NA	NA	13	13	13	13	14	13	12	12	13	13	13
PETROLEUM & RELATED INDUSTRIES	***240***	***63***	***72***	***124***	***109***	***101***	***100***	***97***	***100***	***97***	***96***	***95***	***95***	***91***
Oil & Gas Production	NA	NA	NA	69	55	48	48	47	50	49	48	48	49	48
Petroleum Refineries & Related Industries	240	63	72	55	53	52	51	49	50	47	47	46	45	43
Asphalt Manufacturing	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
OTHER INDUSTRIAL PROCESSES	**187**	**182**	**205**	**327**	**328**	**320**	**315**	**311**	**306**	**297**	**305**	**315**	**328**	**323**
Agriculture, Food, & Kindred Products	NA	NA	NA	5	5	5	5	5	5	5	5	5	5	5
Textiles, Leather, & Apparel Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Wood, Pulp & Paper, & Publishing Products	18	18	24	73	76	76	76	77	77	76	78	79	81	83
Rubber & Miscellaneous Plastic Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Mineral Products	169	164	181	239	238	230	225	220	216	208	214	222	234	226
cement mfg	*97*	*89*	*98*	*137*	*136*	*130*	*126*	*124*	*121*	*116*	*119*	*124*	*131*	*128*
glass mfg	*48*	*53*	*60*	*48*	*48*	*47*	*46*	*45*	*44*	*42*	*44*	*46*	*48*	*44*
other	*24*	*23*	*23*	*54*	*54*	*53*	*53*	*51*	*51*	*49*	*50*	*52*	*55*	*54*

Table A-2. Nitrogen Oxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
OTHER INDUSTRIAL PROCESSES (continued)														
Machinery Products	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2
Transportation Equipment	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous Industrial Processes	NA	NA	NA	8	8	7	7	7	7	7	7	7	7	7
SOLVENT UTILIZATION	***NA***	***NA***	***NA***	***2***	***3***	***3***	***3***	***3***	***2***	***2***	***3***	***3***	***3***	***3***
Degreasing	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Graphic Arts	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Surface Coating	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2
Other Industrial	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
STORAGE & TRANSPORT	***NA***	***NA***	***NA***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***3***	***3***	***3***	***3***
Petroleum & Petroleum Product Storage	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Petroleum & Petroleum Product Transport	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Organic Chemical Storage	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Inorganic Chemical Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Bulk Materials Storage	NA	NA	NA	0	0	0	1	1	1	1	1	1	1	1
WASTE DISPOSAL & RECYCLING	***440***	***159***	***111***	***87***	***87***	***85***	***85***	***84***	***82***	***83***	***83***	***84***	***85***	***85***
Incineration	110	56	37	27	29	29	31	31	32	32	32	32	32	32
Open Burning	330	103	74	59	58	56	54	52	50	51	51	52	52	53
Landfills	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
ON-ROAD VEHICLES	***7,390***	***8,645***	***8,621***	***8,089***	***7,773***	***7,651***	***7,661***	***7,682***	***7,488***	***7,373***	***7,440***	***7,510***	***7,672***	***7,605***
Light-Duty Gas Vehicles & Motorcycles	4,158	4,725	4,421	3,806	3,602	3,492	3,500	3,494	3,437	3,464	3,614	3,680	3,573	3,611
light-duty gas vehicles	*4,156*	*4,722*	*4,416*	*3,797*	*3,592*	*3,482*	*3,489*	*3,483*	*3,425*	*3,453*	*3,602*	*3,668*	*3,560*	*3,598*
motorcycles	*2*	*3*	*5*	*9*	*10*	*10*	*11*	*11*	*12*	*11*	*12*	*12*	*13*	*13*
Light-Duty Gas Trucks	1,278	1,461	1,408	1,530	1,457	1,436	1,419	1,386	1,341	1,339	1,356	1,420	1,657	1,624
light-duty gas trucks 1	*725*	*819*	*864*	*926*	*867*	*842*	*824*	*803*	*780*	*782*	*792*	*828*	*960*	*946*
light-duty gas trucks 2	*553*	*642*	*544*	*603*	*590*	*594*	*595*	*584*	*561*	*557*	*564*	*592*	*697*	*678*
Heavy-Duty Gas Vehicles	278	319	300	330	332	332	336	343	335	326	308	315	351	347
Diesels	1,676	2,141	2,493	2,423	2,383	2,390	2,406	2,458	2,375	2,244	2,163	2,094	2,091	2,022
heavy-duty diesel vehicles	*1,676*	*2,118*	*2,463*	*2,389*	*2,347*	*2,352*	*2,366*	*2,416*	*2,332*	*2,199*	*2,116*	*2,047*	*2,043*	*1,974*
light-duty diesel trucks	*NA*	*0*	*5*	*6*	*6*	*6*	*7*	*7*	*7*	*8*	*8*	*8*	*10*	*10*
light-duty diesel vehicles	*NA*	*23*	*25*	*28*	*29*	*31*	*33*	*35*	*36*	*37*	*39*	*39*	*38*	*39*

Table A-2. Nitrogen Oxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
NON-ROAD SOURCES	***1,628***	***1,879***	***2,423***	***2,734***	***2,777***	***2,664***	***2,914***	***2,844***	***2,843***	***2,796***	***2,885***	***2,985***	***3,095***	***2,996***
Non-Road Gasoline	81	88	102	113	116	118	122	123	124	122	125	129	133	132
recreational	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
construction	*2*	*2*	*3*	*4*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*4*	*4*	*3*
industrial	*46*	*51*	*61*	*70*	*72*	*74*	*76*	*78*	*78*	*76*	*78*	*81*	*85*	*83*
lawn & garden	*5*	*6*	*6*	*6*	*6*	*6*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
farm	*0*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
light commercial	*3*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*5*	*5*	*5*	*5*
logging	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
airport service	*2*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
recreational marine vessels	*16*	*17*	*18*	*19*	*19*	*19*	*19*	*19*	*20*	*20*	*20*	*20*	*20*	*21*
other	*6*	*6*	*6*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
Non-Road Diesel	941	1,068	1,374	1,562	1,569	1,416	1,597	1,485	1,478	1,433	1,494	1,582	1,673	1,530
recreational	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
construction	*599*	*647*	*854*	*986*	*984*	*959*	*961*	*955*	*944*	*894*	*939*	*1,007*	*1,076*	*964*
industrial	*75*	*82*	*99*	*112*	*116*	*119*	*123*	*125*	*125*	*122*	*126*	*131*	*136*	*133*
lawn & garden	*4*	*4*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*6*	*6*	*6*	*6*	*6*
farm	*166*	*220*	*280*	*309*	*309*	*172*	*340*	*228*	*230*	*239*	*248*	*256*	*265*	*239*
light commercial	*17*	*18*	*18*	*20*	*21*	*22*	*22*	*22*	*22*	*22*	*23*	*23*	*24*	*24*
logging	*2*	*4*	*5*	*5*	*5*	*6*	*6*	*7*	*7*	*6*	*7*	*7*	*7*	*7*
airport service	*78*	*92*	*113*	*125*	*129*	*133*	*140*	*143*	*144*	*144*	*146*	*152*	*159*	*157*
Aircraft	72	85	106	119	123	128	134	138	139	139	141	147	153	152
Marine Vessels	40	48	110	131	140	149	165	175	173	174	179	183	188	193
coal	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
diesel	*34*	*41*	*93*	*110*	*118*	*125*	*138*	*147*	*145*	*146*	*151*	*154*	*158*	*162*
residual oil	*6*	*7*	*17*	*20*	*22*	*24*	*26*	*28*	*27*	*27*	*28*	*29*	*30*	*30*
Railroads	495	589	731	808	829	854	897	923	929	929	946	945	947	990
MISCELLANEOUS	***330***	***165***	***248***	***309***	***257***	***351***	***726***	***292***	***373***	***283***	***249***	***219***	***374***	***228***
Other Combustion	330	165	248	309	257	351	726	292	373	283	249	219	374	228
TOTAL ALL SOURCES	**20,625**	**21,889**	**23,281**	**22,860**	**22,348**	**22,403**	**23,618**	**23,222**	**23,038**	**22,672**	**22,847**	**23,276**	**23,661**	**21,779**

Note(s): NA = not available. For several source categories, emissions either prior to or beginning with 1985 are not available at the more detailed level but are contained in the more aggregate estimate.

"Other" categories may contain emissions that could not be accurately allocated to specific source categories.

Zero values represent less than 500 short tons/year.

In order to convert emissions to gigagrams (thousand metric tons), multiply the above values by 0.9072.

Table A-3. Volatile Organic Compound Emissions

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. ELEC. UTIL.	***30***	***40***	***45***	***32***	***34***	***34***	***37***	***37***	***36***	***36***	***35***	***36***	***36***	***35***
Coal	18	22	31	24	24	25	27	27	27	27	27	29	29	29
Oil	7	14	9	5	7	6	7	7	6	5	4	5	4	3
Gas	5	4	5	2	2	2	2	2	2	2	2	2	2	2
Internal Combustion	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
FUEL COMB. INDUSTRIAL	***150***	***150***	***157***	***134***	***133***	***131***	***136***	***134***	***135***	***135***	***135***	***134***	***135***	***135***
Coal	4	3	3	7	7	7	7	7	7	6	7	7	7	7
Oil	4	5	3	17	16	16	16	16	16	18	16	16	17	16
Gas	77	71	62	57	57	57	61	61	61	61	61	61	61	61
Other	65	71	89	35	36	36	36	36	35	36	35	35	36	36
Internal Combustion	NA	NA	NA	18	16	15	15	15	15	15	15	15	15	15
FUEL COMB. OTHER	***541***	***470***	***848***	***1,403***	***1,230***	***1,117***	***1,188***	***1,200***	***749***	***807***	***853***	***729***	***715***	***539***
Commercial/Institutional Coal	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Commercial/Institutional Oil	4	3	3	4	4	4	4	4	4	4	4	4	4	4
Commercial/Institutional Gas	6	7	7	6	6	6	6	7	7	7	7	7	7	7
Misc. Fuel Comb. (Except Residential)	NA	NA	NA	4	4	4	4	4	4	4	4	4	4	4
Residential Wood	460	420	809	1,372	1,199	1,085	1,155	1,169	718	776	822	698	684	509
fireplaces	*107*	*98*	*189*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
woodstoves	*353*	*322*	*620*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Residential Other	70	38	28	16	16	16	17	15	15	15	15	14	14	14
CHEMICAL & ALLIED PRODUCT MFG	***1,341***	***1,351***	***1,595***	***1,358***	***1,412***	***1,410***	***1,513***	***1,506***	***1,526***	***1,533***	***1,546***	***1,557***	***1,577***	***1,617***
Organic Chemical Mfg	629	751	884	492	512	505	552	551	554	557	561	562	567	581
ethylene oxide mfg	*8*	*9*	*10*	*2*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
phenol mfg	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
terephthalic acid mfg	*29*	*46*	*60*	*51*	*54*	*53*	*57*	*57*	*58*	*58*	*58*	*58*	*59*	*61*
ethylene mfg	*70*	*79*	*111*	*41*	*43*	*42*	*48*	*47*	*47*	*48*	*49*	*49*	*50*	*52*
charcoal mfg	*48*	*29*	*40*	*39*	*41*	*42*	*45*	*46*	*46*	*46*	*46*	*47*	*47*	*50*
socmi reactor	*81*	*96*	*118*	*100*	*106*	*104*	*116*	*115*	*117*	*116*	*118*	*118*	*120*	*123*
socmi distillation	*NA*	*NA*	*NA*	*10*	*11*	*10*	*11*	*11*	*12*	*11*	*12*	*12*	*12*	*12*
socmi air oxidation processes	*NA*	*NA*	*NA*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
socmi fugitives	*194*	*235*	*254*	*203*	*208*	*205*	*221*	*220*	*222*	*223*	*223*	*224*	*224*	*225*
other	*199*	*257*	*291*	*43*	*45*	*44*	*49*	*48*	*48*	*49*	*50*	*50*	*51*	*52*
Inorganic Chemical Mfg	65	78	93	34	36	35	39	38	38	40	40	40	41	42
Polymer & Resin Mfg	271	299	384	415	436	449	473	469	477	482	486	492	500	513
polypropylene mfg	*0*	*0*	*1*	*13*	*14*	*13*	*15*	*15*	*15*	*15*	*15*	*16*	*16*	*17*
polyethylene mfg	*17*	*18*	*22*	*80*	*83*	*81*	*90*	*88*	*89*	*91*	*93*	*95*	*98*	*101*
polystyrene resins	*10*	*11*	*15*	*7*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*9*	*9*

Table A-3. Volatile Organic Compound Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
CHEMICAL & ALLIED PRODUCT MFG (continued)														
Polymer & Resin Mfg (continued)														
synthetic fiber	*112*	*149*	*199*	*217*	*231*	*248*	*250*	*250*	*257*	*257*	*257*	*258*	*259*	*261*
styrene/butadiene rubber	*77*	*68*	*70*	*59*	*61*	*60*	*66*	*65*	*65*	*66*	*67*	*69*	*71*	*75*
other	*55*	*54*	*77*	*38*	*40*	*39*	*44*	*43*	*43*	*45*	*45*	*46*	*48*	*49*
Agricultural Chemical Mfg	NA	NA	NA	22	23	23	25	25	25	26	27	27	28	26
Paint, Varnish, Lacquer, Enamel Mfg	61	66	65	10	10	10	11	11	11	11	11	11	11	12
paint & varnish mfg	*61*	*66*	*65*	*10*	*10*	*10*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*12*
other	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Pharmaceutical Mfg	40	55	77	55	57	58	61	61	62	62	62	63	64	62
Other Chemical Mfg	275	102	92	330	339	331	352	352	357	356	359	361	366	383
carbon black mfg	*275*	*102*	*92*	*26*	*25*	*24*	*26*	*26*	*27*	*27*	*27*	*28*	*29*	*33*
printing ink mfg	*NA*	*NA*	*NA*	*13*	*13*	*13*	*13*	*13*	*13*	*13*	*14*	*14*	*14*	*16*
fugitives unclassified	*NA*	*NA*	*NA*	*16*	*17*	*16*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*19*
carbon black furnace: fugitives	*NA*	*NA*	*NA*	*4*	*4*	*4*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*6*
other	*NA*	*NA*	*NA*	*271*	*279*	*273*	*290*	*290*	*295*	*293*	*295*	*296*	*300*	*309*
METALS PROCESSING	***394***	***336***	***273***	***76***	***73***	***70***	***74***	***74***	***72***	***69***	***72***	***74***	***77***	***77***
Nonferrous Metals Processing	NA	NA	NA	18	18	18	19	19	19	19	19	20	21	21
Ferrous Metals Processing	394	336	273	57	54	51	54	54	52	50	51	53	55	55
coke oven door & topside leaks	*216*	*187*	*152*	*12*	*12*	*11*	*12*	*12*	*11*	*10*	*11*	*11*	*11*	*12*
coke oven by-product plants	*NA*	*NA*	*NA*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
other	*177*	*149*	*121*	*41*	*39*	*37*	*39*	*39*	*38*	*37*	*38*	*39*	*40*	*41*
Metals Processing NEC	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
PETROLEUM & RELATED INDUSTRIES	***1,194***	***1,342***	***1,440***	***703***	***666***	***655***	***645***	***639***	***643***	***634***	***638***	***631***	***630***	***628***
Oil & Gas Production	411	378	379	107	79	70	71	68	72	69	68	69	70	66
Petroleum Refineries & Related Industries	773	951	1,045	592	584	582	571	568	568	562	566	560	557	559
vaccuum distillation	*24*	*31*	*32*	*15*	*14*	*14*	*13*	*13*	*13*	*12*	*12*	*11*	*11*	*11*
cracking units	*27*	*27*	*21*	*34*	*33*	*33*	*32*	*31*	*31*	*30*	*29*	*28*	*28*	*27*
process unit turnarounds	*NA*	*NA*	*NA*	*15*	*14*	*14*	*13*	*13*	*14*	*13*	*13*	*12*	*12*	*12*
petroleum refinery fugitives	*NA*	*NA*	*NA*	*76*	*71*	*69*	*66*	*65*	*66*	*66*	*66*	*65*	*64*	*64*
other	*721*	*893*	*992*	*454*	*452*	*452*	*447*	*446*	*444*	*442*	*447*	*443*	*442*	*446*
Asphalt Manufacturing	11	13	16	3	3	3	3	3	3	3	3	3	3	3

Table A-3. Volatile Organic Compound Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
OTHER INDUSTRIAL PROCESSES	***270***	***235***	***237***	***390***	***395***	***394***	***408***	***403***	***401***	***398***	***403***	***406***	***411***	***422***
Agriculture, Food, & Kindred Products	208	182	191	169	171	175	177	175	177	176	179	180	183	192
vegetable oil mfg	*59*	*61*	*81*	*46*	*47*	*49*	*50*	*49*	*50*	*50*	*52*	*52*	*53*	*58*
whiskey fermentation: aging	*105*	*77*	*64*	*24*	*24*	*24*	*24*	*23*	*23*	*23*	*24*	*24*	*24*	*25*
bakeries	*45*	*44*	*46*	*51*	*52*	*51*	*52*	*51*	*51*	*50*	*50*	*51*	*51*	*52*
other	*NA*	*NA*	*NA*	*49*	*50*	*51*	*52*	*52*	*52*	*52*	*53*	*54*	*55*	*58*
Textiles, Leather, & Apparel Products	NA	NA	NA	10	10	10	10	10	10	10	10	10	10	10
Wood, Pulp & Paper, & Publishing Products	NA	NA	NA	42	44	44	44	44	44	44	44	45	46	48
Rubber & Miscellaneous Plastic Products	60	51	44	41	43	43	46	46	46	45	45	46	46	46
rubber tire mfg	*60*	*51*	*44*	*10*	*10*	*10*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
green tire spray	*NA*	*NA*	*NA*	*5*	*5*	*5*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
other	*NA*	*NA*	*NA*	*26*	*28*	*28*	*29*	*29*	*29*	*29*	*29*	*29*	*30*	*30*
Mineral Products	2	2	2	15	15	15	14	14	14	14	14	14	15	15
Machinery Products	NA	NA	NA	4	4	4	4	4	3	3	3	3	4	4
Electronic Equipment	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Transportation Equipment	NA	NA	NA	1	1	1	0	0	0	0	0	0	0	0
Miscellaneous Industrial Processes	NA	NA	NA	108	108	103	112	109	106	106	106	106	106	106
SOLVENT UTILIZATION	***7,174***	***5,651***	***6,584***	***5,699***	***5,626***	***5,743***	***5,945***	***5,964***	***5,975***	***5,918***	***6,031***	***6,156***	***6,313***	***6,394***
Degreasing	707	448	513	756	634	681	754	757	757	728	745	762	785	803
open top	*NA*	*NA*	*NA*	*28*	*28*	*28*	*29*	*29*	*28*	*28*	*28*	*28*	*29*	*30*
conveyorized	*NA*	*NA*	*NA*	*5*	*5*	*5*	*5*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
cold cleaning	*NA*	*NA*	*NA*	*31*	*33*	*31*	*34*	*35*	*34*	*34*	*34*	*34*	*35*	*35*
other	*707*	*448*	*513*	*691*	*568*	*618*	*687*	*689*	*690*	*662*	*678*	*695*	*717*	*734*
Graphic Arts	319	254	373	317	325	340	362	363	363	362	368	381	396	411
letterpress	*NA*	*NA*	*NA*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
flexographic	*NA*	*NA*	*NA*	*18*	*19*	*19*	*20*	*20*	*20*	*20*	*21*	*21*	*22*	*23*
lithographic	*NA*	*NA*	*NA*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*5*	*5*	*5*
gravure	*NA*	*NA*	*NA*	*131*	*138*	*140*	*148*	*150*	*151*	*149*	*151*	*156*	*163*	*166*
other	*319*	*254*	*373*	*162*	*163*	*174*	*188*	*187*	*186*	*187*	*191*	*198*	*205*	*216*
Dry Cleaning	263	229	320	169	217	216	216	212	209	211	216	218	221	223
perchloroethylene	*NA*	*NA*	*NA*	*85*	*111*	*110*	*109*	*107*	*105*	*106*	*109*	*110*	*111*	*112*
petroleum solvent	*NA*	*NA*	*NA*	*84*	*106*	*106*	*106*	*105*	*104*	*105*	*107*	*108*	*109*	*110*
other	*263*	*229*	*320*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

Table A-3. Volatile Organic Compound Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
SOLVENT UTILIZATION (continued)														
Surface Coating	3,570	2,977	3,685	2,549	2,602	2,606	2,646	2,635	2,619	2,568	2,623	2,687	2,773	2,779
industrial adhesives	*52*	*41*	*55*	*381*	*353*	*353*	*366*	*375*	*383*	*366*	*378*	*392*	*412*	*407*
fabrics	*161*	*177*	*186*	*34*	*34*	*35*	*35*	*35*	*35*	*34*	*35*	*36*	*36*	*36*
paper	*652*	*548*	*626*	*106*	*109*	*110*	*114*	*114*	*114*	*112*	*114*	*117*	*121*	*121*
large appliances	*49*	*43*	*36*	*22*	*19*	*19*	*19*	*18*	*18*	*17*	*18*	*18*	*19*	*18*
magnet wire	*7*	*6*	*5*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
autos & light trucks	*165*	*204*	*165*	*85*	*86*	*88*	*87*	*87*	*86*	*79*	*80*	*80*	*81*	*82*
metal cans	*49*	*57*	*73*	*97*	*96*	*95*	*96*	*95*	*95*	*91*	*93*	*94*	*97*	*102*
metal coil	*18*	*19*	*21*	*50*	*50*	*49*	*50*	*50*	*49*	*47*	*48*	*50*	*52*	*53*
wood furniture	*211*	*231*	*231*	*132*	*140*	*142*	*143*	*140*	*138*	*133*	*138*	*148*	*159*	*155*
metal furniture	*35*	*42*	*52*	*41*	*44*	*44*	*44*	*44*	*43*	*42*	*43*	*46*	*50*	*48*
flatwood products	*64*	*76*	*82*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*5*	*5*	*5*
plastic parts	*17*	*18*	*25*	*11*	*11*	*11*	*11*	*11*	*11*	*10*	*10*	*10*	*11*	*11*
large ships	*21*	*20*	*20*	*15*	*16*	*15*	*16*	*15*	*15*	*15*	*15*	*15*	*16*	*13*
aircraft	*1*	*1*	*2*	*27*	*29*	*26*	*31*	*34*	*33*	*33*	*33*	*33*	*34*	*33*
misc. metal parts	*NA*	*NA*	*NA*	*14*	*14*	*14*	*14*	*14*	*14*	*13*	*13*	*14*	*15*	*16*
architectural	*442*	*407*	*477*	*473*	*502*	*503*	*504*	*500*	*495*	*500*	*505*	*510*	*515*	*522*
traffic markings	*NA*	*NA*	*NA*	*100*	*106*	*106*	*107*	*106*	*105*	*106*	*107*	*108*	*109*	*111*
maintenance coatings	*108*	*125*	*106*	*79*	*80*	*80*	*80*	*80*	*79*	*76*	*78*	*81*	*85*	*84*
railroad	*5*	*7*	*9*	*4*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*4*	*4*
auto refinishing	*83*	*143*	*186*	*111*	*132*	*132*	*133*	*132*	*130*	*132*	*137*	*140*	*144*	*142*
machinery	*39*	*51*	*62*	*37*	*28*	*28*	*29*	*28*	*28*	*26*	*26*	*27*	*27*	*25*
electronic & other electrical	*NA*	*NA*	*NA*	*79*	*79*	*79*	*80*	*79*	*78*	*75*	*77*	*80*	*85*	*85*
general	*79*	*61*	*52*	*146*	*147*	*148*	*158*	*154*	*153*	*154*	*157*	*160*	*163*	*167*
miscellaneous	*942*	*392*	*799*	*104*	*109*	*108*	*105*	*103*	*98*	*98*	*98*	*98*	*98*	*98*
thinning solvents	*NA*	*NA*	*NA*	*90*	*92*	*94*	*97*	*96*	*95*	*94*	*96*	*98*	*100*	*103*
other	*372*	*309*	*415*	*306*	*317*	*318*	*320*	*317*	*315*	*307*	*315*	*324*	*336*	*337*
Other Industrial	640	499	690	125	131	132	133	131	126	124	126	126	127	129
miscellaneous	*39*	*30*	*44*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
rubber & plastics mfg	*309*	*245*	*327*	*25*	*29*	*29*	*29*	*29*	*28*	*28*	*28*	*29*	*31*	*31*
other	*292*	*224*	*319*	*100*	*102*	*103*	*104*	*102*	*98*	*96*	*97*	*97*	*97*	*98*
Nonindustrial	1,674	1,243	1,002	1,783	1,717	1,768	1,834	1,867	1,900	1,925	1,952	1,982	2,011	2,048
cutback asphalt	*1,045*	*723*	*323*	*191*	*175*	*186*	*199*	*199*	*199*	*202*	*207*	*214*	*221*	*227*
pesticide application	*241*	*195*	*241*	*212*	*263*	*262*	*262*	*260*	*258*	*264*	*272*	*280*	*289*	*299*

Table A-3. Volatile Organic Compound Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
SOLVENT UTILIZATION (continued)														
Nonindustrial (continued)														
adhesives	*NA*	*NA*	*NA*	*345*	*332*	*332*	*345*	*353*	*361*	*365*	*368*	*372*	*375*	*380*
consumer solvents	*NA*	*NA*	*NA*	*1,035*	*947*	*988*	*1,030*	*1,056*	*1,083*	*1,095*	*1,105*	*1,116*	*1,126*	*1,142*
other	*387*	*325*	*437*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
STORAGE & TRANSPORT	***1,954***	***2,181***	***1,975***	***1,747***	***1,673***	***1,801***	***1,842***	***1,753***	***1,759***	***1,720***	***1,745***	***1,757***	***1,773***	***1,803***
Bulk Terminals & Plants	599	668	517	606	620	632	652	651	658	629	626	614	606	599
fixed roof	*14*	*15*	*12*	*14*	*14*	*14*	*15*	*15*	*15*	*15*	*15*	*16*	*16*	*16*
floating roof	*45*	*50*	*39*	*46*	*47*	*48*	*50*	*50*	*49*	*49*	*49*	*51*	*53*	*52*
variable vapor space	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
underground tanks	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
area source: gasoline	*509*	*569*	*440*	*512*	*526*	*537*	*554*	*553*	*560*	*532*	*527*	*512*	*501*	*494*
other	*30*	*33*	*26*	*32*	*32*	*32*	*33*	*33*	*33*	*33*	*33*	*34*	*36*	*35*
Petroleum & Petroleum Product Storage	300	315	306	223	217	214	215	210	212	213	216	215	216	218
fixed roof gasoline	*47*	*52*	*43*	*26*	*25*	*25*	*24*	*23*	*24*	*24*	*24*	*24*	*24*	*25*
fixed roof crude	*135*	*141*	*148*	*26*	*24*	*22*	*21*	*21*	*21*	*21*	*21*	*21*	*21*	*22*
floating roof gasoline	*49*	*54*	*45*	*27*	*26*	*26*	*25*	*24*	*25*	*25*	*25*	*25*	*25*	*25*
floating roof crude	*32*	*34*	*36*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
efr / seal gasoline	*3*	*4*	*3*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
efr / seal crude	*1*	*2*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
ifr / seal gasoline	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
ifr / seal crude	*2*	*2*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
variable vapor space gasoline	*3*	*3*	*3*	*1*	*1*	*1*	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
other	*25*	*22*	*23*	*133*	*132*	*131*	*135*	*132*	*133*	*134*	*136*	*135*	*136*	*137*
Petroleum & Petroleum Product Transport	92	84	61	126	123	123	125	125	125	126	128	131	134	137
gasoline loading: normal / splash	*3*	*2*	*0*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
gasoline loading: balanced / submerged	*20*	*13*	*2*	*21*	*20*	*21*	*21*	*22*	*21*	*21*	*21*	*22*	*22*	*23*
gasoline loading: normal / submerged	*39*	*26*	*3*	*41*	*41*	*40*	*41*	*42*	*42*	*42*	*43*	*45*	*46*	*47*
gasoline loading: clean / submerged	*2*	*1*	*0*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
marine vessel loading: gasoline & crude	*26*	*38*	*50*	*24*	*23*	*23*	*23*	*22*	*22*	*23*	*23*	*24*	*24*	*25*
other	*2*	*4*	*6*	*35*	*34*	*34*	*35*	*35*	*35*	*35*	*35*	*36*	*36*	*37*
Service Stations: Stage I	416	481	461	207	213	219	223	223	230	226	233	240	247	257
Service Stations: Stage II	521	602	583	485	400	511	522	441	428	420	434	446	458	476
Service Stations: Breathing & Emptying	NA	NA	NA	49	48	51	52	52	53	53	54	56	57	59
Organic Chemical Storage	26	31	46	34	35	34	37	36	36	37	37	38	38	39
Organic Chemical Transport	NA	NA	NA	17	17	16	16	15	16	16	16	16	16	17

Table A-3. Volatile Organic Compound Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
STORAGE & TRANSPORT (continued)														
Inorganic Chemical Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Inorganic Chemical Transport	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Bulk Materials Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
WASTE DISPOSAL & RECYCLING	***1,984***	***984***	***758***	***2,310***	***2,293***	***2,256***	***2,310***	***2,290***	***2,262***	***2,265***	***2,268***	***2,271***	***2,273***	***2,411***
Incineration	548	453	366	64	63	61	60	59	57	57	58	58	59	60
Open Burning	1,424	517	372	309	304	292	284	274	263	265	268	270	272	275
industrial	*NA*	*NA*	*NA*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
commmercial/institutional	*NA*	*NA*	*NA*	*1*	*1*	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
residential	*NA*	*NA*	*NA*	*302*	*297*	*285*	*277*	*266*	*256*	*258*	*260*	*262*	*264*	*267*
other	*1,424*	*517*	*372*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
POTW	NA	NA	NA	10	11	11	11	11	11	11	11	11	11	11
Industrial Waste Water	NA	NA	NA	1	2	1	2	2	2	2	2	2	2	2
TSDF	NA	NA	NA	1,925	1,913	1,890	1,953	1,945	1,929	1,929	1,929	1,929	1,929	2,063
Landfills	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other	11	14	20	0	0	0	0	0	0	0	0	0	0	0
ON-ROAD VEHICLES	***12,972***	***10,545***	***8,979***	***9,376***	***8,874***	***8,477***	***8,290***	***7,192***	***6,854***	***6,499***	***6,072***	***6,103***	***6,401***	***6,104***
Light-Duty Gas Vehicles & Motorcycles	9,193	7,248	5,907	5,864	5,537	5,281	5,189	4,462	4,285	4,069	3,832	3,812	3,748	3,621
light-duty gas vehicles	*9,133*	*7,177*	*5,843*	*5,810*	*5,483*	*5,227*	*5,136*	*4,412*	*4,234*	*4,033*	*3,799*	*3,777*	*3,711*	*3,584*
motorcycles	*60*	*71*	*64*	*54*	*54*	*53*	*53*	*50*	*51*	*37*	*33*	*34*	*37*	*37*
Light-Duty Gas Trucks	2,770	2,289	2,059	2,425	2,279	2,185	2,129	1,867	1,769	1,688	1,588	1,647	1,909	1,783
light-duty gas trucks 1	*1,564*	*1,251*	*1,229*	*1,437*	*1,316*	*1,227*	*1,173*	*1,018*	*960*	*906*	*849*	*875*	*1,003*	*943*
light-duty gas trucks 2	*1,206*	*1,038*	*830*	*988*	*963*	*958*	*956*	*849*	*809*	*781*	*739*	*772*	*906*	*840*
Heavy-Duty Gas Vehicles	743	657	611	716	700	662	626	517	470	423	334	326	414	375
Diesels	266	351	402	370	357	350	345	346	330	319	318	318	331	326
heavy-duty diesel vehicles	*266*	*335*	*392*	*360*	*346*	*338*	*332*	*332*	*316*	*304*	*302*	*301*	*313*	*308*
light-duty diesel trucks	*NA*	*0*	*2*	*2*	*2*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*4*	*4*
light-duty diesel vehicles	*NA*	*15*	*8*	*8*	*9*	*9*	*10*	*11*	*12*	*12*	*13*	*13*	*13*	*14*
NON-ROAD SOURCES	***1,542***	***1,676***	***1,869***	***2,008***	***2,039***	***2,038***	***2,106***	***2,103***	***2,120***	***2,122***	***2,159***	***2,206***	***2,255***	***2,252***
Non-Road Gasoline	1,284	1,373	1,474	1,561	1,582	1,601	1,620	1,631	1,646	1,654	1,677	1,704	1,730	1,746
recreational	*138*	*145*	*151*	*156*	*157*	*158*	*159*	*160*	*161*	*163*	*164*	*166*	*167*	*169*
construction	*22*	*24*	*32*	*37*	*37*	*36*	*35*	*35*	*35*	*33*	*35*	*37*	*40*	*36*
industrial	*46*	*50*	*61*	*69*	*71*	*73*	*75*	*77*	*77*	*75*	*77*	*80*	*84*	*82*
lawn & garden	*574*	*614*	*655*	*691*	*699*	*706*	*713*	*720*	*728*	*737*	*745*	*753*	*761*	*774*
farm	*4*	*6*	*7*	*8*	*8*	*4*	*9*	*6*	*6*	*6*	*7*	*7*	*7*	*6*
light commercial	*142*	*151*	*158*	*171*	*178*	*188*	*189*	*190*	*191*	*188*	*194*	*200*	*207*	*207*

Table A-3. Volatile Organic Compound Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
NON-ROAD SOURCES (continued)														
Non-Road Gasoline (continued)														
logging	*3*	*6*	*7*	*8*	*8*	*10*	*9*	*10*	*10*	*9*	*10*	*10*	*10*	*11*
airport service	*4*	*5*	*6*	*6*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*8*	*8*	*8*
recreational marine vessels	*350*	*372*	*395*	*413*	*416*	*419*	*422*	*425*	*429*	*434*	*438*	*442*	*446*	*453*
other	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Non-Road Diesel	129	149	191	216	217	188	223	200	200	195	203	214	226	207
construction	*75*	*81*	*106*	*123*	*122*	*119*	*120*	*119*	*118*	*111*	*117*	*125*	*134*	*120*
industrial	*9*	*10*	*12*	*13*	*14*	*14*	*14*	*15*	*15*	*14*	*15*	*15*	*16*	*16*
lawn & garden	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
farm	*33*	*44*	*56*	*61*	*62*	*34*	*67*	*45*	*46*	*48*	*49*	*51*	*53*	*48*
light commercial	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*4*	*4*	*4*	*4*
logging	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*1*
airport service	*9*	*11*	*13*	*15*	*15*	*15*	*16*	*17*	*17*	*17*	*17*	*18*	*18*	*18*
Aircraft	97	116	146	165	170	176	185	190	192	192	195	203	212	210
Marine Vessels	9	11	25	30	32	34	38	40	39	40	41	42	43	44
coal	*0*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
diesel	*8*	*10*	*23*	*28*	*29*	*31*	*35*	*37*	*36*	*37*	*38*	*38*	*39*	*41*
residual oil	*1*	*1*	*2*	*2*	*2*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Railroads	22	27	33	37	38	39	41	42	42	42	43	43	43	45
MISCELLANEOUS	***1,101***	***716***	***1,134***	***562***	***544***	***652***	***1,227***	***639***	***1,069***	***741***	***466***	***516***	***685***	***446***
Other Combustion	1,101	716	1,134	562	543	651	1,226	638	1,068	740	465	515	684	445
structural fires	*19*	*47*	*40*	*44*	*44*	*44*	*44*	*44*	*44*	*44*	*44*	*44*	*44*	*44*
agricultural fires	*131*	*75*	*70*	*55*	*61*	*67*	*85*	*79*	*77*	*76*	*78*	*79*	*82*	*85*
slash/prescribed burning	*147*	*290*	*285*	*179*	*179*	*179*	*179*	*179*	*179*	*179*	*179*	*179*	*179*	*179*
forest wildfires	*770*	*297*	*739*	*283*	*259*	*361*	*918*	*335*	*768*	*440*	*164*	*212*	*379*	*137*
other	*34*	*7*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Health Services	NA	NA	NA	0	1	0	1	1	1	1	1	1	1	1
TOTAL ALL SOURCES	**30,646**	**25,677**	**25,893**	**25,798**	**24,991**	**24,778**	**25,719**	**23,935**	**23,599**	**22,877**	**22,420**	**22,575**	**23,281**	**22,865**

Note(s): NA = not available. For several source categories, emissions either prior to or beginning with 1985 are not available at the more detailed level but are contained in the more aggregate estimate.

"Other" categories may contain emissions that could not be accurately allocated to specific source categories.

Zero values represent less than 500 short tons/year.

In order to convert emissions to gigagrams (thousand metric tons), multiply the above values by 0.9072.

No data was available after 1984 to split the emissions from residential wood burning devices between fireplaces and woodstoves.

Table A-4. Sulfur Dioxide Emissions

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. ELEC. UTIL.	***17,398***	***18,268***	***17,469***	***16,273***	***15,701***	***15,715***	***15,990***	***16,218***	***15,898***	***15,788***	***15,418***	***15,191***	***14,792***	***12,013***
Coal	15,799	16,756	16,073	15,630	14,860	15,034	15,224	15,408	15,227	15,101	14,840	14,546	14,236	11,561
bituminous	*9,574*	*10,161*	*NA*	*14,029*	*13,454*	*13,513*	*13,546*	*13,576*	*13,365*	*13,203*	*12,900*	*12,199*	*11,763*	*8,970*
subbituminous	*4,716*	*5,005*	*NA*	*1,292*	*1,048*	*1,182*	*1,311*	*1,423*	*1,425*	*1,381*	*1,456*	*1,796*	*1,988*	*1,951*
anthracite & lignite	*1,509*	*1,590*	*NA*	*309*	*357*	*338*	*368*	*409*	*438*	*517*	*484*	*551*	*484*	*640*
Oil	1,598	1,511	1,395	612	811	651	734	779	639	652	546	612	522	412
residual	*1,578*	*1,462*	*NA*	*604*	*799*	*640*	*722*	*765*	*629*	*642*	*537*	*602*	*512*	*405*
distillate	*20*	*49*	*NA*	*8*	*12*	*11*	*12*	*14*	*10*	*10*	*9*	*10*	*10*	*7*
Gas	1	1	1	1	1	1	1	1	1	1	1	1	1	8
Internal Combustion	NA	NA	NA	30	30	29	31	30	31	35	32	32	34	31
FUEL COMB. INDUSTRIAL	***4,568***	***3,310***	***2,951***	***3,169***	***3,116***	***3,068***	***3,111***	***3,086***	***3,106***	***2,915***	***3,002***	***2,942***	***3,029***	***3,046***
Coal	3,129	1,870	1,527	1,818	1,828	1,817	1,856	1,840	1,843	1,547	1,722	1,661	1,715	1,743
bituminous	*2,171*	*1,297*	*1,058*	*1,347*	*1,375*	*1,374*	*1,395*	*1,384*	*1,382*	*1,162*	*1,294*	*1,248*	*1,289*	*1,310*
subbituminous	*669*	*399*	*326*	*28*	*29*	*29*	*29*	*29*	*29*	*24*	*27*	*26*	*26*	*27*
anthracite & lignite	*289*	*174*	*144*	*90*	*82*	*73*	*79*	*79*	*81*	*67*	*75*	*72*	*75*	*76*
other	*NA*	*NA*	*NA*	*353*	*341*	*341*	*353*	*348*	*351*	*293*	*327*	*315*	*325*	*330*
Oil	1,229	1,139	1,065	862	828	807	806	812	823	935	845	848	882	873
residual	*956*	*825*	*851*	*671*	*637*	*617*	*614*	*625*	*633*	*733*	*656*	*662*	*692*	*686*
distillate	*98*	*144*	*85*	*111*	*109*	*106*	*108*	*107*	*108*	*125*	*112*	*113*	*118*	*118*
other	*175*	*171*	*129*	*80*	*82*	*84*	*84*	*80*	*82*	*77*	*76*	*73*	*71*	*68*
Gas	140	263	299	397	370	356	360	346	352	348	348	346	345	343
Other	70	38	60	86	84	82	83	82	82	79	81	80	80	81
Internal Combustion	NA	NA	NA	7	6	6	6	6	6	6	6	6	6	6
FUEL COMB. OTHER	***1,490***	***1,082***	***971***	***579***	***611***	***662***	***660***	***624***	***595***	***592***	***599***	***599***	***599***	***599***
Commercial/Institutional Coal	109	147	110	158	161	164	172	169	176	175	173	171	169	168
Commercial/Institutional Oil	883	638	637	239	267	310	295	274	233	232	238	241	242	248
Commercial/Institutional Gas	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Misc. Fuel Comb. (Except Residential)	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Residential Wood	6	7	13	13	11	10	11	11	7	7	8	6	6	5
Residential Other	492	290	211	167	169	175	180	167	175	176	177	178	177	176
distillate oil	*212*	*196*	*157*	*128*	*129*	*134*	*137*	*132*	*137*	*141*	*144*	*145*	*145*	*144*
bituminous/subbituminous coal	*260*	*76*	*43*	*29*	*30*	*32*	*33*	*27*	*30*	*26*	*26*	*25*	*25*	*24*
other	*20*	*18*	*11*	*10*	*10*	*10*	*10*	*8*	*9*	*8*	*8*	*8*	*8*	*8*

Table A-4. Sulfur Dioxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
CHEMICAL & ALLIED PRODUCT MFG	***591***	***367***	***280***	***456***	***432***	***425***	***449***	***440***	***440***	***440***	***447***	***450***	***457***	***471***
Organic Chemical Mfg	NA	NA	NA	16	16	17	19	17	17	17	18	18	18	19
Inorganic Chemical Mfg	591	358	271	354	329	322	341	334	333	333	338	341	345	354
sulfur compounds	*591*	*358*	*271*	*346*	*320*	*314*	*333*	*326*	*325*	*325*	*330*	*332*	*336*	*345*
other	*NA*	*NA*	*NA*	*8*	*8*	*8*	*8*	*8*	*9*	*8*	*9*	*9*	*9*	*9*
Polymer & Resin Mfg	NA	NA	NA	7	7	6	7	7	7	7	7	7	7	8
Agricultural Chemical Mfg	NA	NA	NA	4	4	4	4	4	4	4	4	4	4	4
Pharmaceutical Mfg	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other Chemical Mfg	NA	8	10	76	77	75	78	77	79	79	80	81	82	88
METALS PROCESSING	***4,775***	***2,849***	***1,842***	***1,042***	***888***	***648***	***707***	***695***	***663***	***633***	***650***	***667***	***692***	***720***
Nonferrous Metals Processing	4,060	2,165	1,279	853	710	479	529	513	486	463	476	488	506	532
copper	*3,507*	*1,946*	*1,080*	*655*	*525*	*298*	*343*	*327*	*300*	*285*	*292*	*300*	*312*	*324*
lead	*77*	*34*	*34*	*121*	*112*	*111*	*113*	*113*	*112*	*108*	*111*	*114*	*119*	*128*
aluminum	*80*	*72*	*95*	*62*	*59*	*57*	*59*	*60*	*60*	*58*	*59*	*60*	*62*	*66*
other	*396*	*113*	*71*	*14*	*13*	*13*	*14*	*13*	*13*	*12*	*13*	*13*	*13*	*14*
Ferrous Metals Processing	715	684	562	172	161	153	162	165	160	153	158	162	168	171
Metals Processing NEC	NA	NA	NA	18	17	15	16	17	17	17	17	17	18	18
PETROLEUM & RELATED INDUSTRIES	***881***	***727***	***734***	***505***	***469***	***445***	***443***	***429***	***440***	***422***	***417***	***409***	***406***	***385***
Oil & Gas Production	111	173	157	204	176	155	159	156	164	159	156	155	158	141
natural gas	*111*	*173*	*157*	*202*	*175*	*154*	*157*	*155*	*163*	*157*	*154*	*154*	*156*	*140*
other	*NA*	*NA*	*NA*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Petroleum Refineries & Related Industries	770	554	577	300	291	289	283	272	274	262	260	253	248	243
fluid catalytic cracking units	*480*	*318*	*330*	*212*	*207*	*207*	*202*	*195*	*196*	*185*	*183*	*177*	*172*	*168*
other	*290*	*236*	*247*	*88*	*84*	*82*	*81*	*77*	*78*	*77*	*77*	*76*	*75*	*75*
Asphalt Manufacturing	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
OTHER INDUSTRIAL PROCESSES	***846***	***740***	***918***	***425***	***427***	***418***	***411***	***405***	***401***	***391***	***401***	***413***	***431***	***438***
Agriculture, Food, & Kindred Products	NA	NA	NA	3	3	3	3	3	3	3	3	3	3	4
Textiles, Leather, & Apparel Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Wood, Pulp & Paper, & Publishing Products	169	168	223	131	135	135	135	136	137	137	139	141	145	149
Rubber & Miscellaneous Plastic Products	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Mineral Products	677	571	694	286	285	276	268	261	257	247	254	265	279	282
cement mfg	*618*	*511*	*630*	*192*	*190*	*183*	*177*	*172*	*169*	*163*	*169*	*176*	*186*	*189*
other	*59*	*60*	*64*	*95*	*95*	*93*	*91*	*89*	*87*	*84*	*86*	*89*	*93*	*93*
Machinery Products	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Electronic Equipment	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous Industrial Processes	NA	NA	NA	3	3	3	3	3	3	3	3	3	3	3

Table A-4. Sulfur Dioxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
SOLVENT UTILIZATION	***NA***	***NA***	***NA***	***1***	***1***	***1***	***1***	***1***	***1***	***1***	***1***	***1***	***1***	***1***
Degreasing	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Graphic Arts	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Surface Coating	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Other Industrial	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
STORAGE & TRANSPORT	***NA***	***NA***	***NA***	***4***	***4***	***4***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***
Petroleum & Petroleum Product Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Petroleum & Petroleum Product Transport	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Organic Chemical Storage	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Inorganic Chemical Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Inorganic Chemical Transport	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Bulk Materials Storage	NA	NA	NA	1	2	2	2	2	2	2	2	2	2	2
WASTE DISPOSAL & RECYCLING	***8***	***46***	***33***	***34***	***35***	***35***	***36***	***36***	***36***	***36***	***37***	***37***	***37***	***37***
Incineration	4	29	21	25	26	26	28	28	29	28	29	29	29	29
industrial	*NA*	*NA*	*NA*	*10*	*10*	*10*	*11*	*10*	*10*	*10*	*10*	*10*	*10*	*10*
other	*4*	*29*	*21*	*15*	*16*	*16*	*17*	*18*	*18*	*18*	*18*	*19*	*19*	*19*
Open Burning	4	17	12	9	8	8	8	8	7	7	7	7	7	8
industrial	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
other	*4*	*17*	*12*	*8*	*8*	*8*	*8*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
Landfills	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
industrial	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
other	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Other	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
ON-ROAD VEHICLES	***411***	***503***	***521***	***522***	***527***	***538***	***553***	***570***	***571***	***570***	***578***	***517***	***301***	***304***
Light-Duty Gas Vehicles & Motorcycles	132	158	159	146	143	142	144	145	144	143	146	147	141	142
light-duty gas vehicles	*132*	*158*	*158*	*145*	*143*	*142*	*144*	*145*	*144*	*142*	*146*	*146*	*140*	*141*
motorcycles	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Light-Duty Gas Trucks	40	48	50	55	55	56	58	58	58	59	59	61	70	71
light-duty gas trucks 1	*26*	*32*	*33*	*36*	*36*	*36*	*37*	*38*	*38*	*38*	*38*	*39*	*45*	*46*
light-duty gas trucks 2	*13*	*16*	*16*	*19*	*19*	*20*	*21*	*21*	*21*	*21*	*21*	*22*	*25*	*25*
Heavy-Duty Gas Vehicles	8	9	10	11	11	11	11	11	11	10	10	11	12	12
Diesels	231	288	303	311	318	328	340	356	358	358	363	299	79	80
heavy-duty diesel vehicles	*231*	*277*	*291*	*298*	*305*	*314*	*325*	*341*	*342*	*342*	*347*	*286*	*75*	*76*
light-duty diesel trucks	*NA*	*NA*	*2*	*2*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*2*	*1*	*1*
light-duty diesel vehicles	*NA*	*11*	*10*	*11*	*11*	*11*	*12*	*12*	*13*	*13*	*13*	*11*	*3*	*3*

Table A-4. Sulfur Dioxide Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
NON-ROAD SOURCES	***83***	***99***	***175***	***208***	***221***	***233***	***253***	***267***	***265***	***266***	***273***	***278***	***283***	***292***
Aircraft	4	4	6	6	6	7	7	7	7	7	7	8	8	8
Marine Vessels	43	52	117	143	154	164	181	193	190	191	197	201	206	212
Railroads	36	43	53	59	60	62	65	67	68	68	69	69	69	72
MISCELLANEOUS	***110***	***20***	***11***	***11***	***9***	***13***	***27***	***10***	***14***	***10***	***9***	***8***	***14***	***8***
Other Combustion	110	20	11	11	9	13	27	10	14	10	9	8	14	8
TOTAL ALL SOURCES	**31,161**	**28,011**	**25,905**	**23,230**	**22,442**	**22,204**	**22,647**	**22,785**	**22,433**	**22,068**	**21,836**	**21,517**	**21,047**	**18,319**

Note(s): NA = not available. For several source categories, emissions either prior to or beginning with 1985 are not available at the more detailed level but are contained in the more aggregate estimate.

"Other" categories may contain emissions that could not be accurately allocated to specific source categories.

Zero values represent less than 500 short tons/year.

In order to convert emissions to gigagrams (thousand metric tons), multiply the above values by 0.9072.

Table A-5. Particulate Matter (PM-10) Emissions

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. ELEC. UTIL.	***1,775***	***1,191***	***879***	***284***	***288***	***284***	***279***	***273***	***282***	***248***	***247***	***268***	***262***	***258***
Coal	1,680	1,091	796	272	273	271	264	258	269	234	236	255	248	248
bituminous	*1,041*	*661*	*483*	*219*	*219*	*214*	*191*	*194*	*187*	*168*	*167*	*184*	*182*	*183*
subbituminous	*513*	*326*	*238*	*36*	*34*	*35*	*50*	*40*	*40*	*40*	*44*	*46*	*45*	*43*
anthracite & lignite	*126*	*104*	*75*	*17*	*20*	*21*	*23*	*24*	*42*	*25*	*24*	*23*	*21*	*22*
other	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Oil	89	93	76	8	11	9	10	11	9	10	8	9	9	5
residual	*85*	*87*	*74*	*8*	*11*	*9*	*10*	*11*	*9*	*10*	*8*	*9*	*9*	*5*
distillate	*3*	*6*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Gas	7	6	7	1	1	1	1	1	1	1	1	1	1	1
Internal Combustion	NA	NA	NA	3	3	3	3	3	3	4	3	3	3	3
FUEL COMB. INDUSTRIAL	***641***	***564***	***679***	***247***	***244***	***239***	***244***	***243***	***241***	***236***	***237***	***235***	***238***	***239***
Coal	83	23	18	71	71	67	70	70	69	57	64	62	64	65
bituminous	*52*	*14*	*12*	*48*	*48*	*48*	*49*	*49*	*48*	*40*	*45*	*43*	*45*	*45*
subbituminous	*16*	*4*	*4*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
anthracite & lignite	*15*	*4*	*2*	*7*	*6*	*6*	*6*	*6*	*6*	*5*	*6*	*6*	*6*	*6*
other	*NA*	*NA*	*NA*	*15*	*15*	*13*	*14*	*14*	*13*	*11*	*12*	*12*	*12*	*13*
Oil	89	69	67	52	49	48	48	48	48	55	49	50	52	51
residual	*83*	*62*	*63*	*43*	*40*	*38*	*38*	*39*	*39*	*45*	*40*	*41*	*42*	*42*
distillate	*6*	*7*	*4*	*5*	*5*	*5*	*5*	*5*	*5*	*6*	*6*	*6*	*6*	*6*
other	*0*	*0*	*0*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*3*	*3*	*3*
Gas	27	25	23	47	45	44	45	44	45	44	44	44	43	43
natural	*24*	*22*	*20*	*24*	*23*	*23*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*
process	*4*	*3*	*3*	*22*	*21*	*20*	*20*	*20*	*20*	*20*	*19*	*19*	*19*	*19*
other	*NA*	*NA*	*NA*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*
Other	441	447	571	75	77	78	79	78	77	77	77	77	77	77
wood/bark waste	*415*	*444*	*566*	*67*	*69*	*70*	*71*	*71*	*69*	*69*	*69*	*69*	*69*	*69*
liquid waste	*NA*	*NA*	*NA*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
other	*26*	*3*	*5*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Internal Combustion	NA	NA	NA	3	3	3	3	3	3	3	3	3	3	3
FUEL COMB. OTHER	***455***	***492***	***887***	***1,009***	***889***	***812***	***862***	***869***	***553***	***594***	***626***	***540***	***530***	***408***
Commercial/Institutional Coal	13	10	8	13	13	13	14	13	14	14	14	14	13	13
Commercial/Institutional Oil	52	34	30	12	14	16	15	13	12	12	12	12	12	12
Commercial/Institutional Gas	4	4	4	4	4	4	5	5	5	5	5	5	5	5
Misc. Fuel Comb. (Except Residential)	NA	NA	NA	3	3	3	3	3	3	3	3	3	3	3

Table A-5. Particulate Matter (PM-10) Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. OTHER (continued)														
Residential Wood	384	407	818	959	837	758	807	817	501	542	574	488	478	356
fireplaces	*90*	*95*	*191*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
woodstoves	*294*	*312*	*626*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Residential Other	3	37	27	18	18	18	19	18	18	18	18	18	18	18
CHEMICAL & ALLIED PRODUCT MFG	***235***	***127***	***148***	***58***	***59***	***58***	***62***	***63***	***63***	***62***	***64***	***64***	***65***	***66***
Organic Chemical Mfg	43	21	19	19	20	20	21	22	22	22	22	22	23	24
Inorganic Chemical Mfg	61	31	25	7	7	7	8	8	8	7	8	8	8	8
Polymer & Resin Mfg	NA	NA	NA	4	4	4	5	5	5	5	5	5	5	5
Agricultural Chemical Mfg	46	38	61	9	9	9	9	10	10	10	10	10	10	10
Paint, Varnish, Lacquer, Enamel Mfg	NA	NA	NA	0	0	0	0	0	0	0	0	0	1	1
Pharmaceutical Mfg	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other Chemical Mfg	86	37	42	18	18	17	18	18	19	18	18	18	19	19
METALS PROCESSING	***1,316***	***825***	***622***	***142***	***132***	***126***	***136***	***137***	***136***	***130***	***133***	***136***	***141***	***145***
Nonferrous Metals Processing	593	229	130	46	44	42	45	45	45	43	44	45	46	49
copper	*343*	*66*	*32*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*4*
lead	*53*	*31*	*18*	*4*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*4*
zinc	*20*	*11*	*3*	*3*	*2*	*2*	*3*	*3*	*3*	*2*	*3*	*3*	*3*	*3*
other	*177*	*121*	*77*	*36*	*35*	*33*	*36*	*36*	*36*	*34*	*35*	*35*	*36*	*39*
Ferrous Metals Processing	198	275	322	91	83	80	86	88	86	83	85	87	90	91
primary	*31*	*198*	*271*	*70*	*63*	*60*	*65*	*67*	*66*	*63*	*65*	*66*	*69*	*71*
secondary	*167*	*77*	*51*	*21*	*20*	*20*	*21*	*21*	*20*	*19*	*20*	*20*	*21*	*21*
other	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Metals Processing NEC	525	321	170	5	5	4	5	5	4	4	4	4	5	5
PETROLEUM & RELATED INDUSTRIES	***286***	***179***	***138***	***33***	***31***	***31***	***30***	***29***	***29***	***28***	***28***	***27***	***27***	***26***
Oil & Gas Production	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Petroleum Refineries & Related Industries	69	56	41	28	27	26	25	24	24	23	23	23	22	22
fluid catalytic cracking units	*69*	*56*	*41*	*24*	*23*	*23*	*22*	*21*	*21*	*20*	*20*	*19*	*19*	*18*
other	*NA*	*NA*	*NA*	*4*	*4*	*4*	*4*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Asphalt Manufacturing	217	123	97	4	4	4	4	4	4	4	4	4	4	4
OTHER INDUSTRIAL PROCESSES	***5,832***	***2,572***	***1,846***	***382***	***390***	***384***	***386***	***378***	***374***	***362***	***368***	***377***	***391***	***393***
Agriculture, Food, & Kindred Products	485	429	402	28	29	29	30	30	30	30	31	31	32	34
country elevators	*257*	*247*	*258*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*4*
terminal elevators	*147*	*111*	*86*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
feed mills	*5*	*3*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
soybean mills	*25*	*27*	*22*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*8*	*8*	*8*	*8*

Table A-5. Particulate Matter (PM-10) Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
OTHER INDUSTRIAL PROCESSES (continued)														
Agriculture, Food, & Kindred Products (continued)														
wheat mills	*5*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
other grain mills	*9*	*8*	*6*	*6*	*6*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*8*
other	*38*	*32*	*26*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*10*
Textiles, Leather, & Apparel Products	NA	NA	NA	0	0	1	1	0	0	0	0	0	0	0
Wood, Pulp & Paper, & Publishing Products	727	274	183	99	103	104	106	105	104	103	105	107	111	116
sulfate (kraft) pulping	*668*	*228*	*142*	*67*	*69*	*69*	*69*	*70*	*69*	*69*	*70*	*71*	*73*	*76*
other	*59*	*46*	*41*	*32*	*34*	*35*	*37*	*35*	*35*	*34*	*35*	*36*	*38*	*40*
Rubber & Miscellaneous Plastic Products	NA	NA	NA	4	4	4	4	4	4	4	4	4	4	4
Mineral Products	4,620	1,869	1,261	224	228	222	221	215	212	202	205	212	220	215
cement mfg	*1,731*	*703*	*417*	*36*	*36*	*34*	*33*	*32*	*32*	*30*	*31*	*33*	*35*	*35*
surface mining	*134*	*111*	*127*	*22*	*21*	*18*	*17*	*16*	*17*	*16*	*16*	*17*	*17*	*17*
stone quarrying/processing	*957*	*508*	*421*	*80*	*85*	*84*	*87*	*84*	*84*	*79*	*79*	*80*	*83*	*78*
other	*1,798*	*547*	*296*	*86*	*87*	*85*	*84*	*82*	*80*	*77*	*79*	*82*	*86*	*84*
Machinery Products	NA	NA	NA	3	3	3	3	4	4	4	4	4	4	4
Electronic Equipment	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Transportation Equipment	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous Industrial Processes	NA	NA	NA	22	22	20	19	19	18	18	18	18	18	18
SOLVENT UTILIZATION	***NA***	***NA***	***NA***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***
Degreasing	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Graphic Arts	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Dry Cleaning	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Surface Coating	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2
Other Industrial	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
STORAGE & TRANSPORT	***NA***	***NA***	***NA***	***59***	***58***	***56***	***56***	***56***	***57***	***55***	***56***	***57***	***59***	***60***
Bulk Terminals & Plants	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Petroleum & Petroleum Product Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Petroleum & Petroleum Product Transport	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Organic Chemical Storage	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1
Organic Chemical Transport	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Inorganic Chemical Storage	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Bulk Materials Storage	NA	NA	NA	58	56	54	55	54	55	53	54	55	57	58
storage	*NA*	*NA*	*NA*	*20*	*21*	*20*	*20*	*19*	*19*	*18*	*18*	*19*	*20*	*20*
transfer	*NA*	*NA*	*NA*	*37*	*35*	*34*	*34*	*35*	*35*	*34*	*35*	*36*	*37*	*38*
combined	*NA*	*NA*	*NA*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Bulk Materials Transport	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0

Table A-5. Particulate Matter (PM-10) Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
WASTE DISPOSAL & RECYCLING	***999***	***371***	***273***	***278***	***274***	***265***	***259***	***251***	***242***	***244***	***246***	***248***	***251***	***253***
Incineration	229	95	75	52	52	51	51	50	49	50	50	51	51	52
residential	*51*	*49*	*42*	*39*	*38*	*37*	*36*	*35*	*34*	*34*	*34*	*35*	*35*	*35*
other	*178*	*46*	*32*	*13*	*14*	*14*	*15*	*15*	*16*	*16*	*16*	*16*	*16*	*16*
Open Burning	770	276	198	225	222	214	208	200	192	194	196	197	199	201
residential	*770*	*276*	*198*	*221*	*217*	*209*	*203*	*195*	*188*	*189*	*191*	*193*	*194*	*196*
other	*NA*	*NA*	*NA*	*4*	*4*	*4*	*5*	*5*	*5*	*4*	*5*	*5*	*5*	*5*
Industrial Waste Water	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Landfills	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
Other	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
ON-ROAD VEHICLES	***443***	***471***	***397***	***363***	***356***	***360***	***369***	***367***	***357***	***349***	***343***	***321***	***320***	***304***
Light-Duty Gas Vehicles & Motorcycles	225	207	120	77	69	66	66	65	64	63	64	65	62	62
light-duty gas vehicles	*224*	*206*	*119*	*77*	*69*	*65*	*66*	*64*	*63*	*63*	*63*	*64*	*61*	*61*
motorcycles	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Light-Duty Gas Trucks	70	72	55	43	39	37	37	34	32	32	31	31	35	32
light-duty gas trucks 1	*41*	*39*	*25*	*19*	*17*	*17*	*16*	*16*	*15*	*15*	*15*	*15*	*17*	*17*
light-duty gas trucks 2	*29*	*34*	*29*	*24*	*22*	*21*	*20*	*19*	*17*	*17*	*17*	*16*	*18*	*15*
Heavy-Duty Gas Vehicles	13	15	15	14	13	12	12	11	11	10	9	10	10	10
Diesels	136	177	208	229	236	245	254	257	250	245	239	215	213	200
heavy-duty diesel vehicles	*136*	*166*	*194*	*219*	*226*	*235*	*244*	*247*	*240*	*234*	*228*	*205*	*204*	*190*
light-duty diesel trucks	*0*	*0*	*2*	*1*	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
light-duty diesel vehicles	*0*	*10*	*12*	*8*	*8*	*8*	*9*	*9*	*9*	*9*	*9*	*8*	*8*	*8*
NON-ROAD SOURCES	***223***	***256***	***329***	***368***	***372***	***350***	***387***	***372***	***372***	***367***	***379***	***395***	***411***	***393***
Non-Road Gasoline	35	38	41	43	43	44	44	44	45	45	46	46	47	47
recreational	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
construction	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*
industrial	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*
lawn & garden	*10*	*11*	*11*	*12*	*12*	*12*	*13*	*13*	*13*	*13*	*13*	*13*	*13*	*14*
farm	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
light commercial	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
logging	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
airport service	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
other	*21*	*23*	*24*	*25*	*25*	*26*	*26*	*26*	*26*	*26*	*27*	*27*	*27*	*28*

Table A-5. Particulate Matter (PM-10) Emissions (continued)

(thousand short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
NON-ROAD SOURCES (continued)														
Non-Road Diesel	135	155	202	227	227	200	231	211	211	205	214	227	240	219
recreational	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
construction	*85*	*93*	*123*	*141*	*139*	*134*	*134*	*134*	*133*	*127*	*133*	*142*	*152*	*137*
industrial	*11*	*12*	*14*	*16*	*16*	*17*	*17*	*18*	*18*	*17*	*18*	*18*	*19*	*19*
lawn & garden	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
farm	*29*	*38*	*49*	*53*	*54*	*30*	*59*	*40*	*40*	*42*	*43*	*45*	*46*	*42*
light commercial	*2*	*2*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
logging	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
airport service	*8*	*10*	*12*	*13*	*14*	*14*	*15*	*15*	*15*	*15*	*16*	*16*	*17*	*17*
Aircraft	21	26	33	37	38	40	42	43	44	44	44	46	48	48
Marine Vessels	6	7	17	20	21	23	25	27	26	26	27	28	29	29
coal	*1*	*1*	*2*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
diesel	*4*	*4*	*10*	*12*	*13*	*13*	*15*	*16*	*16*	*16*	*16*	*16*	*17*	*17*
residual oil	*2*	*2*	*5*	*6*	*6*	*7*	*7*	*8*	*8*	*8*	*8*	*8*	*8*	*9*
Railroads	25	30	37	41	42	43	45	47	47	47	48	48	48	50
NATURAL	***NA***	***NA***	***NA***	***4,047***	***10,324***	***1,577***	***18,110***	***12,101***	***4,362***	***10,095***	***4,626***	***1,978***	***2,593***	***2,163***
Geogenic	NA	NA	NA	4,047	10,324	1,577	18,110	12,101	4,362	10,095	4,626	1,978	2,593	2,163
wind erosion	*NA*	*NA*	*NA*	*4,047*	*10,324*	*1,577*	*18,110*	*12,101*	*4,362*	*10,095*	*4,626*	*1,978*	*2,593*	*2,163*
MISCELLANEOUS	***839***	***569***	***852***	***37,715***	***37,056***	***37,432***	***39,423***	***37,440***	***36,267***	***36,136***	***36,367***	***37,905***	***39,332***	***37,925***
Agriculture & Forestry	NA	NA	NA	7,108	7,183	7,326	7,453	7,320	7,364	7,332	7,223	7,231	7,121	8,389
agricultural crops	*NA*	*NA*	*NA*	*6,833*	*6,899*	*6,996*	*7,077*	*6,923*	*6,983*	*6,952*	*6,838*	*6,837*	*6,716*	*7,957*
agricultural livestock	*NA*	*NA*	*NA*	*275*	*285*	*330*	*376*	*396*	*381*	*380*	*386*	*394*	*405*	*432*
Other Combustion	839	569	852	873	798	967	1,683	891	1,178	921	760	743	1,017	727
wildfires	*385*	*206*	*514*	*308*	*226*	*389*	*1,086*	*300*	*590*	*333*	*171*	*152*	*424*	*130*
managed burning	*390*	*325*	*315*	*506*	*513*	*519*	*538*	*532*	*529*	*529*	*530*	*532*	*535*	*538*
other	*64*	*37*	*23*	*59*	*59*	*59*	*59*	*59*	*59*	*59*	*59*	*59*	*59*	*59*
Fugitive Dust	NA	NA	NA	29,734	29,075	29,139	30,287	29,229	27,725	27,883	28,384	29,930	31,194	28,809
wind erosion	*NA*	*NA*	*NA*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
unpaved roads	*NA*	*NA*	*NA*	*11,644*	*11,673*	*11,110*	*12,379*	*11,798*	*11,338*	*11,873*	*11,540*	*12,482*	*12,043*	*11,997*
paved roads	*NA*	*NA*	*NA*	*5,080*	*5,262*	*5,530*	*5,900*	*5,769*	*5,992*	*5,969*	*5,942*	*6,095*	*6,380*	*6,468*
other	*NA*	*NA*	*NA*	*13,009*	*12,139*	*12,499*	*12,008*	*11,662*	*10,396*	*10,042*	*10,901*	*11,353*	*12,771*	*10,343*
TOTAL ALL SOURCES	**13,044**	**7,414**	**7,050**	**44,986**	**50,476**	**41,976**	**60,605**	**52,581**	**43,337**	**48,908**	**43,721**	**42,552**	**44,621**	**42,636**

Note(s): NA = not available. For several source categories, emissions either prior to or beginning with 1985 are not available at the more detailed level but are contained in the more aggregate estimate.
"Other" categories may contain emissions that could not be accurately allocated to specific source categories.
Zero values represent less than 500 short tons/year.
In order to convert emissions to gigagrams (thousand metric tons), multiply the above values by 0.9072.
No data was available after 1984 to split the emissions from residential wood burning devices between fireplaces and woodstoves.

Table A-6. Lead Emissions

(short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
FUEL COMB. ELEC. UTIL.	***327***	***230***	***129***	***64***	***69***	***64***	***66***	***67***	***64***	***61***	***59***	***61***	***61***	***63***
Coal	300	189	95	51	50	48	46	46	46	46	47	49	49	49
bituminous	*181*	*114*	*57*	*31*	*30*	*29*	*28*	*28*	*28*	*28*	*28*	*30*	*30*	*30*
subbituminous	*89*	*56*	*28*	*15*	*15*	*14*	*14*	*14*	*14*	*14*	*14*	*15*	*15*	*15*
anthracite & lignite	*30*	*19*	*9*	*5*	*5*	*5*	*4*	*4*	*4*	*4*	*4*	*5*	*5*	*5*
Oil	28	41	34	13	19	16	20	21	18	15	12	12	12	14
residual	*27*	*40*	*34*	*13*	*19*	*16*	*20*	*21*	*18*	*15*	*12*	*12*	*12*	*14*
distillate	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
FUEL COMB. INDUSTRIAL	***237***	***75***	***60***	***30***	***25***	***22***	***19***	***18***	***18***	***18***	***18***	***19***	***18***	***17***
Coal	218	60	45	22	17	14	14	14	14	15	14	14	14	14
bituminous	*146*	*40*	*31*	*15*	*12*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*
subbituminous	*45*	*12*	*10*	*5*	*4*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
anthracite & lignite	*27*	*7*	*4*	*2*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Oil	19	16	14	8	8	8	5	4	3	3	4	5	4	3
residual	*17*	*14*	*14*	*7*	*7*	*7*	*5*	*3*	*3*	*2*	*3*	*4*	*4*	*2*
distillate	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
FUEL COMB. OTHER	***10,052***	***10,042***	***4,111***	***421***	***422***	***425***	***426***	***420***	***418***	***416***	***414***	***415***	***415***	***413***
Commercial/Institutional Coal	1	16	12	6	6	5	5	4	4	3	4	4	3	3
bituminous	*1*	*6*	*6*	*4*	*4*	*3*	*3*	*3*	*3*	*2*	*2*	*2*	*2*	*2*
subbituminous	*NA*	*2*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
anthracite, lignite	*NA*	*7*	*4*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	*0*	*0*
Commercial/Institutional Oil	4	11	10	4	5	5	5	4	4	4	4	3	3	4
residual	*3*	*10*	*9*	*3*	*4*	*4*	*4*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
distillate	*NA*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
other	*1*	*0*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Misc. Fuel Comb. (Except Residential)	10,000	10,000	4,080	400	400	400	400	400	400	400	400	400	400	400
Residential Other	47	16	9	11	11	14	16	12	10	9	7	8	8	6
CHEMICAL & ALLIED PRODUCT MFG	***103***	***120***	***104***	***118***	***108***	***123***	***136***	***136***	***136***	***132***	***93***	***92***	***96***	***80***
Inorganic Chemical Mfg	103	120	104	118	108	123	136	136	136	132	93	92	96	80
lead oxide and pigments	*103*	*120*	*104*	*118*	*108*	*123*	*136*	*136*	*136*	*132*	*93*	*92*	*96*	*80*

Table A-6. Lead Emissions (continued)

(short tons)

Source Category	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
METALS PROCESSING	***24,224***	***9,923***	***3,026***	***2,097***	***1,820***	***1,835***	***1,965***	***2,088***	***2,169***	***1,975***	***1,773***	***1,899***	***1,979***	***1,937***
Nonferrous Metals Processing	15,869	7,192	1,826	1,376	1,161	1,204	1,248	1,337	1,409	1,258	1,111	1,211	1,239	1,238
primary lead production	*12,134*	*5,640*	*1,075*	*874*	*660*	*673*	*684*	*715*	*728*	*623*	*550*	*637*	*633*	*658*
primary copper production	*242*	*171*	*20*	*19*	*16*	*16*	*17*	*19*	*19*	*19*	*20*	*21*	*22*	*22*
primary zinc production	*1,019*	*224*	*24*	*16*	*11*	*7*	*8*	*9*	*9*	*11*	*11*	*13*	*12*	*13*
secondary lead production	*1,894*	*821*	*481*	*288*	*296*	*347*	*353*	*433*	*449*	*414*	*336*	*341*	*357*	*333*
secondary copper production	*374*	*200*	*116*	*70*	*63*	*31*	*61*	*37*	*75*	*65*	*73*	*70*	*76*	*79*
lead battery manufacture	*41*	*49*	*50*	*65*	*66*	*73*	*73*	*74*	*78*	*77*	*77*	*81*	*94*	*89*
lead cable coating	*127*	*55*	*37*	*43*	*47*	*56*	*50*	*50*	*50*	*48*	*44*	*47*	*44*	*44*
other	*38*	*32*	*24*	*3*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Ferrous Metals Processing	7,395	2,196	911	577	553	499	554	582	576	517	461	495	540	492
coke manufacturing	*11*	*8*	*6*	*3*	*3*	*3*	*4*	*4*	*4*	*3*	*3*	*2*	*0*	*0*
ferroalloy production	*219*	*104*	*13*	*7*	*13*	*14*	*14*	*20*	*18*	*14*	*14*	*12*	*13*	*12*
iron production	*266*	*93*	*38*	*21*	*16*	*17*	*18*	*19*	*18*	*16*	*17*	*18*	*18*	*19*
steel production	*3,125*	*1,082*	*481*	*209*	*200*	*128*	*157*	*138*	*138*	*145*	*139*	*145*	*160*	*154*
gray iron production	*3,773*	*910*	*373*	*336*	*320*	*337*	*361*	*401*	*397*	*339*	*288*	*319*	*349*	*307*
Metals Processing NEC	960	535	289	144	107	132	164	169	184	199	201	193	200	207
metal mining	*353*	*268*	*207*	*141*	*106*	*131*	*163*	*169*	*184*	*198*	*201*	*193*	*199*	*206*
other	*606*	*268*	*82*	*3*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
OTHER INDUSTRIAL PROCESSES	***2,028***	***1,337***	***808***	***316***	***199***	***202***	***172***	***173***	***169***	***167***	***56***	***54***	***53***	***55***
Mineral Products	540	217	93	43	25	28	23	23	26	24	26	27	28	28
cement manufacturing	*540*	*217*	*93*	*43*	*25*	*28*	*23*	*23*	*26*	*24*	*26*	*27*	*28*	*28*
Miscellaneous Industrial Processes	1,488	1,120	715	273	174	174	149	150	143	143	30	28	26	26
WASTE DISPOSAL & RECYCLING	***2,200***	***1,595***	***1,210***	***871***	***844***	***844***	***817***	***765***	***804***	***807***	***812***	***824***	***829***	***842***
Incineration	2,200	1,595	1,210	871	844	844	817	765	804	807	812	824	829	842
municipal waste	*581*	*396*	*161*	*79*	*52*	*52*	*49*	*45*	*67*	*70*	*68*	*69*	*68*	*75*
other	*1,619*	*1,199*	*1,049*	*792*	*792*	*792*	*768*	*720*	*738*	*738*	*744*	*756*	*762*	*768*
ON-ROAD VEHICLES	***171,961***	***130,206***	***62,189***	***15,978***	***3,589***	***3,121***	***2,700***	***2,161***	***1,690***	***1,519***	***1,444***	***1,401***	***1,388***	***1,387***
Light-Duty Gas Vehicles & Motorcycles	142,918	106,868	48,501	12,070	2,689	2,325	2,018	1,614	1,263	1,134	1,078	1,046	1,037	1,036
Light-Duty Gas Trucks	22,683	19,440	11,996	3,595	841	748	637	512	400	364	346	336	333	332
Heavy-Duty Gas Vehicles	6,361	3,898	1,692	313	59	48	44	36	28	20	19	19	19	19
NON-ROAD SOURCES	***8,340***	***5,012***	***3,320***	***229***	***219***	***222***	***211***	***207***	***197***	***186***	***193***	***179***	***189***	***191***
Non-Road Gasoline	8,340	5,012	3,320	229	219	222	211	207	197	186	193	179	189	191
TOTAL ALL SOURCES	**219,471**	**158,541**	**74,956**	**20,124**	**7,296**	**6,857**	**6,513**	**6,034**	**5,666**	**5,280**	**4,862**	**4,945**	**5,028**	**4,986**

Note(s): NA = not available. "Other" categories may contain emissions that could not be accurately allocated to specific source categories.
In order to convert emissions to megagrams (metric tons), multiply the above values by 0.9072.

Table A-7. United States 1990 Ammonia Emissions by Environmental Protection Agency Region

(short tons)

Source Category	Region I	Region II	Region III	Region IV	Region V	Region VI	Region VII	Region VIII	Region IX	Region X	National Total
FUEL COMB. ELEC. UTIL.	***22***	***75***	***22***	***67***	***36***	***4,758***	***4***	***2***	***46***	***1***	***5,033***
Coal	0	0	0	0	0	19	0	0	0	0	19
Oil	19	18	11	26	8	195	1	0	8	0	286
Gas	3	57	11	40	28	4,544	4	2	38	0	4,727
FUEL COMB. INDUSTRIAL	***399***	***845***	***934***	***1,926***	***2,062***	***5,370***	***452***	***407***	***4,045***	***830***	***17,271***
Coal	0	1	2	4	6	2	1	1	0	0	18
Oil	294	574	322	832	385	1,088	54	89	528	127	4,292
Gas	105	270	610	1,091	1,671	4,280	397	317	3,516	703	12,960
FUEL COMB. OTHER	***1,362***	***1,804***	***1,347***	***827***	***1,263***	***405***	***213***	***171***	***388***	***193***	***7,973***
Commercial/Institutional Coal	0	0	0	0	1	0	0	0	0	0	2
Commercial/Institutional Oil	375	637	324	369	184	181	39	50	153	72	2,384
Commercial/Institutional Gas	26	79	61	68	189	78	50	32	79	16	677
Residential Other	961	1,089	962	390	889	145	125	90	156	104	4,910
CHEMICAL & ALLIED PRODUCT MFG	***0***	***0***	***4,277***	***48,478***	***10,193***	***73,825***	***41,477***	***52***	***3,319***	***954***	***182,574***
Agricultural Chemical Mfg	0	0	4,277	48,478	10,193	73,825	41,477	52	3,319	954	182,574
METALS PROCESSING	***0***	***43***	***1,154***	***338***	***4,060***	***0***	***9***	***288***	***0***	***0***	***5,893***
Ferrous Metals Processing	0	43	1,154	338	4,060	0	9	288	0	0	5,893
PETROLEUM & RELATED INDUSTRIES	***0***	***0***	***2,176***	***1,498***	***8,689***	***19,195***	***934***	***1,739***	***8,007***	***607***	***42,845***
Petroleum Refineries & Related Industries	0	0	2,176	1,498	8,689	19,195	934	1,739	8,007	607	42,845
OTHER INDUSTRIAL PROCESSES	***0***	***0***	***2***	***17***	***3,113***	***22,929***	***6,899***	***2***	***1,088***	***3,524***	***37,574***
Agriculture, Food, & Kindred Products	0	0	0	0	0	0	0	0	0	2,079	2,079
Miscellaneous Industrial Processes	0	0	2	17	3,113	22,929	6,899	2	1,088	1,445	35,495
WASTE DISPOSAL & RECYCLING	***5,540***	***10,176***	***8,421***	***11,566***	***20,675***	***7,032***	***3,677***	***2,501***	***9,479***	***2,694***	***81,761***
POTW	5,540	10,176	8,421	11,566	20,675	7,032	3,677	2,501	9,479	2,694	81,761
HIGHWAY VEHICLES	***10,065***	***15,645***	***19,640***	***39,258***	***36,488***	***24,609***	***10,165***	***6,327***	***28,761***	***7,522***	***198,479***
Light-Duty Gas Veh. & Motorcycles	8,433	13,159	16,352	32,633	30,416	20,513	8,413	5,238	24,203	6,254	165,614
Light-Duty Gas Trucks	1,599	2,438	3,218	6,480	5,942	4,009	1,712	1,065	4,470	1,240	32,173
Heavy-Duty Gas Vehicles	20	29	42	85	76	52	23	15	53	16	411
Diesels	13	19	29	59	53	35	16	10	35	11	281
NONROAD ENGINES & EQUIPMENT	***44***	***119***	***249***	***451***	***348***	***684***	***219***	***152***	***480***	***179***	***2,926***
Marine Vessels	11	69	117	170	31	365	20	0	285	71	1,139
Railroads	33	50	132	281	317	319	199	152	195	108	1,788
AGRICULTURE & FORESTRY	***19,725***	***43,076***	***192,594***	***633,536***	***830,200***	***794,897***	***1,065,173***	***643,068***	***252,207***	***158,565***	***4,633,041***
Fertilizer Application	546	370	9,780	64,346	114,564	63,957	111,811	26,219	25,291	2,860	419,744
Animal Husbandry	19,180	42,705	182,814	569,190	715,635	730,941	953,362	616,848	226,916	155,705	4,213,297
TOTAL ALL SOURCES	**37,157**	**71,783**	**230,816**	**737,961**	**917,128**	**953,703**	**1,129,223**	**654,711**	**307,822**	**175,067**	**5,215,370**

Note(s): NA = not available.
"Residential Other" is residential combustion of all fuels except wood.
Zero values represent less than 0.5 short tons/year.
In order to convert emissions to megagrams (metric tons), multiply the above values by 0.9072.

TECHNICAL REPORT DATA

(Please read Instructions on reverse before completing)

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EPA-454/R-96-007		

4. TITLE AND SUBTITLE	5. REPORT DATE
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15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report presents the latest estimates of national emissions for criteria air pollutants: carbon monoxide, lead, nitrogen oxides, fine particulate matter, sulfur dioxide, particulate matter, and volatile organic compounds. Estimates are presented for the years 1940 to 1995, with greater detail in more recent years. This report also includes sections on state emissions, air toxics, biogenics, and emission for Canada.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Emission Trends	Nitrogen Oxides	Air Pollution Control	
Air Pollution	Ozone	Air Pollution Research	
Ammonia	Particulate Matter	Air Pollution Trends	
Biogenics	Sulfur Dioxide		
Canada	Total Suspended Particulates		
Carbon Monoxide	Volatile Organic Compounds		
Lead			
Nitrogen Dioxide			

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