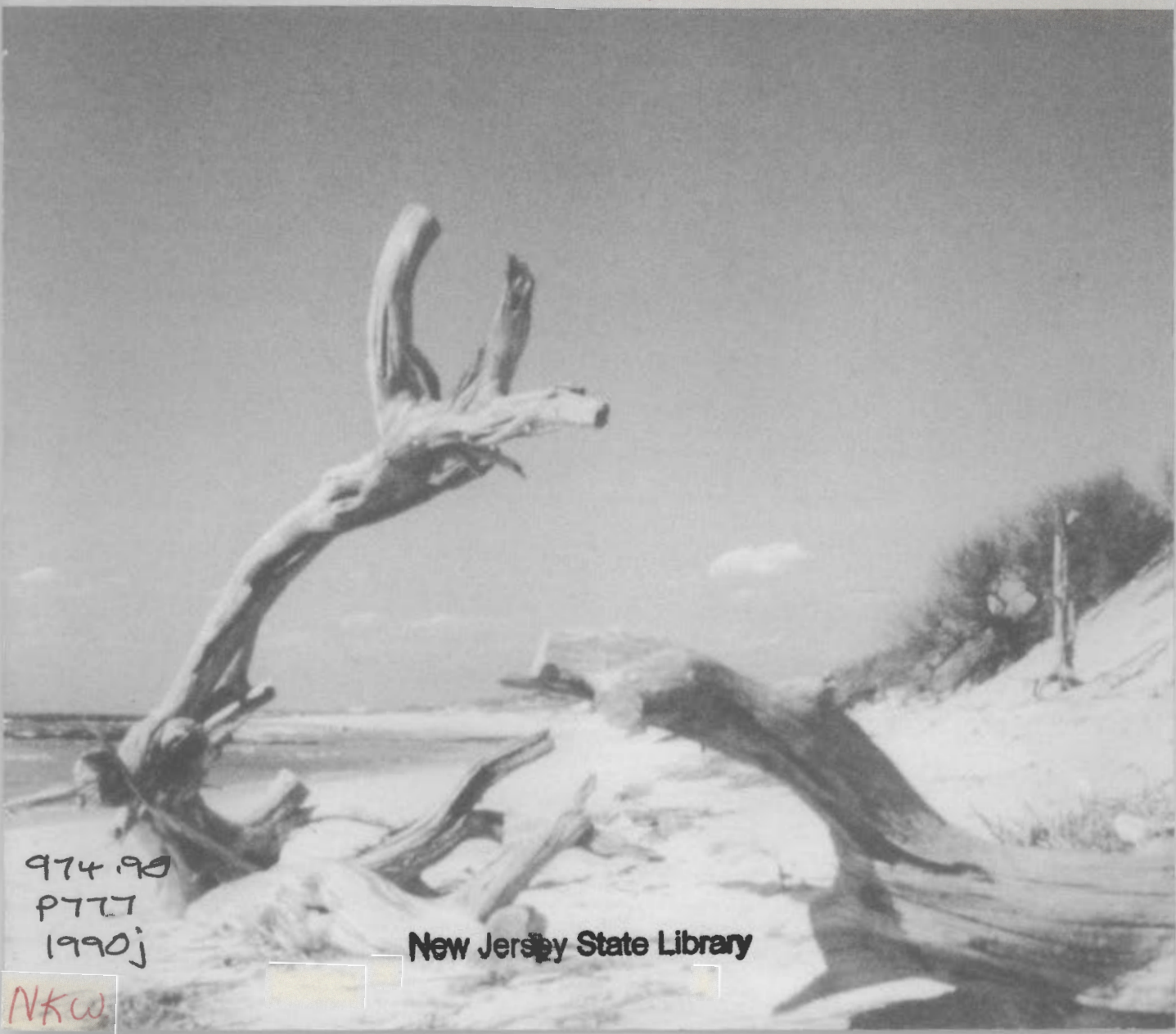
New Jersey Air Quality

New Jersey Department of Environmental Protection ; Division of Environmental Quality



Introduction

The New Jersey Department of Environmental Protection (DEP) maintains a constant watch over air pollution levels throughout the state. A network of 27 continuous air monitoring stations transmits data every minute to a central computer in Trenton. This ensures that the DEP can notify the public promptly should air quality become unhealthful.

This brochure provides an introduction to the DEP's ambient air monitoring program and summarizes 1989 air quality levels recorded in New Jersey. More detailed information on monitoring locations, pollutant levels relative to air quality standards, pollutant trends, and other aspects of the monitoring program are contained in the DEP's Air Quality Report. This report is published annually and may be obtained by writing the

Bureau of Air Monitoring
Division of Environmental Quality
New Jersey Department of
Environmental Protection
CN 027 (401 East State Street)
Trenton, NJ 08625-0027.

Criteria Pollutants

The United States Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) for six pollutants: carbon monoxide (CO), inhalable particulate matter (PM10), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3) and sulfur dioxide (SO_2). These are termed the **Criteria Pollutants**, and some of their characteristics are shown in the following table.

Characteristics of Criteria Pollutants

Carbon Monoxide	A poisonous gas that is odorless, colorless and tasteless.
Health effects:	Headache, mental dullness, dizziness, weakness, nausea, vomiting, loss of muscular control, increased then decreased pulse and respiratory rates, collapse or unconsciousness.
Nitrogen Dioxide	A poisonous reddish-brown to dark brown gas with an irritating odor.
Health effects:	Nose and throat irritation, coughing, choking, headache, nausea, stomach or chest pains, and lung inflammation such as bronchitis or pneumonia.
Ozone	A bluish, explosive gas which has a pleasant odor when the concentration is less than two parts per million (ppm).
Health effects:	Coughing, chest discomfort, respiratory tract and eye irritation, and decreased pulmonary functions.
Lead	A bluish-white to silvery-gray solid.
Health effects:	Decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, constipation, abdominal pains and decreased appetite. At high levels of exposure, it can also result in permanent nervous system damage, seizures, coma and death.
Sulfur Dioxide	A colorless gas with a strong suffocating odor.
Health effects:	Throat and lung irritation, swelling and accumulation of fluid in the throat and lungs, and nasal bleeding.
Inhalable Particulates	A broad class of chemically and physically diverse substances that exist as discrete particles with aerodynamic diameter less than or equal to 10 micrometers.
Health effects:	Increases the prevalence of chronic and the risk of acute respiratory effects.

In setting the NAAQS, EPA set two types of standards:

PRIMARY STANDARDS define air quality levels designed to protect the public health with an adequate margin of safety, while

SECONDARY STANDARDS are designed to protect the public welfare from any known or anticipated adverse effects (e.g., soiling, vegetation damage or material corrosion).

The NAAQS are summarized in the table that follows.

National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary Standard	Secondary Standard
CO	1-hour average: 35 ppm 8-hour average: 9 ppm	No standard established
NO_2	12-month average 0.05 ppm	12-month average 0.05 ppm
Ozone	1-hour average 0.12 ppm	1-hour average 0.12 ppm
Lead	Quarterly average 1.5 ug/m^3	Quarterly average 1.5 ug/m^3
SO_2	24-hour average: 0.14 ppm 12-month average: 0.03 ppm	3-hour average 0.5 ppm
PM_{10}	24-hour average: 150 ug/m^3 Annual average: 50 ug/m^3	24-hour average: 150 ug/m^3 Annual average: 50 ug/m^3

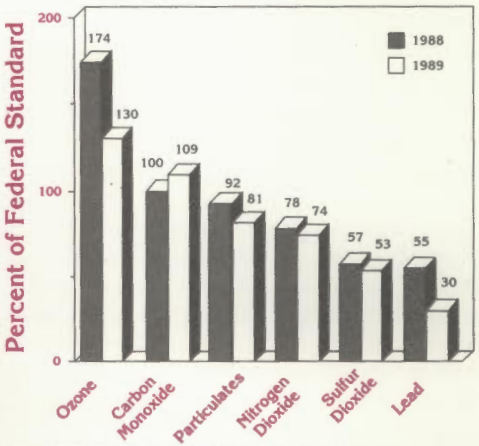
ppm = parts per million and ug/m^3 = micrograms per cubic meter

The federal Clean Air Act requires each state to attain and maintain both type of standards. To accomplish this goal, State Implementation Plans (SIPs) are developed which define the air pollution control strategies that will be implemented. The SIPs may contain such strategies as expanded use of mass transit systems, motor vehicle inspection and maintenance programs, and the establishment of state-of-the-art emission controls for specific industrial categories.

1989 Air Quality in New Jersey

Air quality in New Jersey showed general improvement in 1989 compared to 1988. As indicated in the following chart, New Jersey's air quality in 1989 complied with the primary NAAQS for all the criteria pollutants except carbon monoxide and ozone.

Maximum Concentrations Recorded in Determining Compliance with Federal Air Quality Standards



The federal ozone standard was exceeded on 18 days in 1989 (45 days in 1988). Ozone exceedances were recorded at most of the monitoring locations. The carbon monoxide exceedances occurred at four monitoring locations during one two-day period of air stagnation.

A total of six (6) exceedances of the eight-hour average CO standard were recorded in 1989: two in Camden, two in Essex, one in Union, and one in Bergen counties. All six exceedances were recorded during a single air pollution episode January 23 - 24, 1989. This episode was the result of severe air stagnation which lasted over the two-day period. These CO violations were the first recorded since 1986.

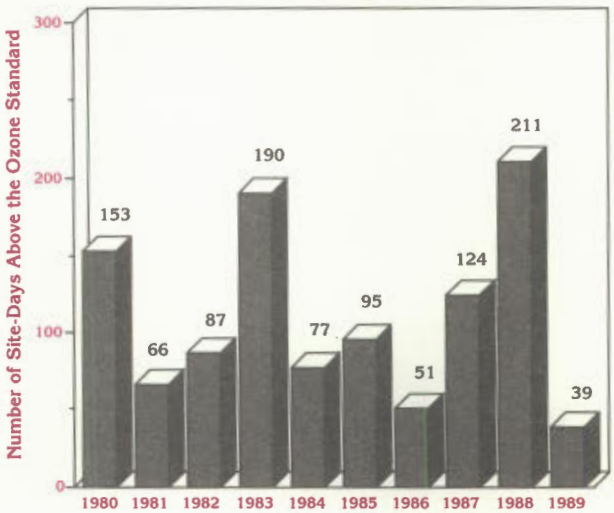
Ozone is the most persistent air quality problem facing New Jersey. Unlike other pollutants, ozone is not emitted directly but forms as a result of the reaction of precursor pollutants (primarily hydrocarbons and oxides of nitrogen) in the presence of strong sunlight. Unhealthful levels generally occur only in the late spring and summer months, as intense sunlight and warm temperatures are essential to the formation of ozone.

The NAAQS for ozone have been exceeded every year since they were established. Levels in 1989, however, were among the lowest ever recorded. This was due primarily to the unseasonably cool, wet weather, although the implementation of newly adopted regulations requiring vapor recovery systems at gas stations and limiting the volatility of gasoline sold in the state may also have had an effect.

The following graph shows the number of site-days on which the health standard for ozone was exceeded over the last 10 years. Site-days are calculated by adding the number of monitoring sites which exceeded the ozone standard each day. Thus, a day on which six monitoring sites recorded levels above the standard would count as six site-days.

Because temperature and sunlight play such an important role in ozone formation, it is difficult to assess the effect New Jersey's program for controlling precursor emissions has had on ozone levels. It is apparent, however, that controlling such emissions from sources in New Jersey alone will not solve the problem. Controls need to be implemented on a regional basis since ozone and its precursors can be transported from one state to another.

Number of Site-Days* Above the Ozone Health Standard



* Calculated by taking the number of sites above the standard each day and summing them for the year.

The DEP has a short video which describes the ozone problem in more detail. It is available for group or classroom presentation and can be obtained by calling 609-292-6722 or writing the

Bureau of Air Quality
Planning and Evaluation
Division of Environmental Quality
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CN 027 (401 East State Street)
Trenton, NJ 08625-0027.

The Air Monitoring Network

Air quality in New Jersey is continuously tracked by the state's Air Monitoring Network. This network is made up of three components.

The New Jersey Air Monitoring Network

The Continuous Air Monitoring Network consists of 27 automated ambient-air monitoring stations. Each station sends data to a central computer system in Trenton once every minute. The system collects and stores ambient data for sulfur dioxide, carbon monoxide, ozone, nitrogen oxides and smoke shade (an indicator of levels of particulate matter in the air). Six of the stations also monitor one or more of the following meteorological parameters: wind direction and speed, temperature, solar radiation, relative humidity and barometric pressure. The meteorological data aids in understanding the movement and formation of the pollutants.

The Air Sampling Network obtains 24-hour samples of particulates from the air at least once every six days. Twenty-three inhalable particulate sampling stations and eight stations which collected samples for lead analysis were in operation. The inhalable samples are retrieved for gravimetric analyses to determine particulate concentrations, and samples from selected sites are analyzed for metals, benzo(a)pyrene, sulfates and nitrates.

The Acid Precipitation Sampling Network collects weekly precipitation samples at four stations. At the Washington Crossing State Park station, samples are also collected after every storm event. The samples are analyzed in the laboratory for acidity, conductiv-

ity, and concentrations of various ions, such as nitrate, calcium, sulfate, potassium, sodium, magnesium, ammonium and chlorides. The DEP also operates a National Dry Deposition Monitoring Site which measures a number of parameters used to estimate the acidic burden being placed on New Jersey ecosystems in dry form.

Pollutant Episode Watch

To ensure timely notification to the public in the event air pollution levels become unhealthful, the department reviews air pollution data obtained from the Air Monitoring Network seven days a week, year-round. This procedure is known as the **Pollutant Episode Watch.**

Each morning DEP personnel retrieve and review daily and extended weather forecasts. If low pollutant levels are anticipated, data reports are reviewed at least twice daily. If high pollutant levels are expected, a press release is issued and hourly checks of the air quality data initiated. Should a report indicate an exceedance of the episode watch criteria, a health advisory is issued and the hourly watch maintained until levels subside.

The DEP procedures define four stages at which various actions are triggered. These are summarized in the following table. The DEP also participates in a regional air quality reporting network during the summer ozone season. This network was established to ensure that the states involved are aware of episodes occurring in adjacent areas.

Episode Stages	Actions To Be Taken By The Department
Triggering	Issue health advisory.
Alert	Initiate formal procedures to reduce emissions of air pollutant(s).
Warning	Mandate more stringent emission controls on certain industrial sources.
Emergency	Advise the Governor on declaring a state of emergency with possible shutdown of certain industrial sources or driving bans.

The Pollutant Standards Index

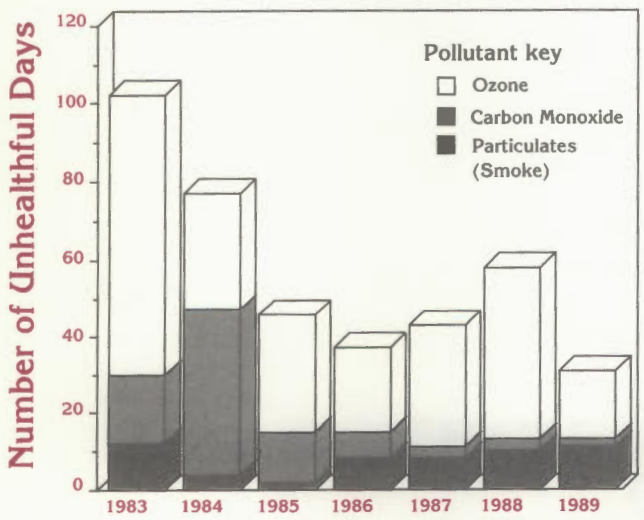
The **Pollutant Standards Index**, or PSI, is a daily air quality summary and forecast. It is available for use in newspaper, radio and television reports. The forecast can also be obtained by calling **1-800-782-0160.** The PSI is based on a numerical rating system in which 100 equals the primary air quality standard for certain criteria pollutants. For example, if the concentration of ozone for a given day reaches 0.12 ppm, which is the primary standard, the PSI rating is 100. If the ozone level is 0.06 ppm, half of the standard, the PSI rating is 50. The rating is based on the one pollutant with the highest PSI number, although more than one pollutant may exceed its standard. The lower the PSI, the better the air quality.

PSI Rating	Air Quality
1 — 50	= Good
51 — 100	= Moderate
101 — 200	= Unhealthful
201 — 300	= Very Unhealthful

1989 was the first year the PSI rating did not reach the "very unhealthful" stage since the PSI procedure was developed. Normally, "very unhealthful" ratings are due to high ozone levels in the summer. As stated earlier, ozone levels were not as high in 1989 primarily because of the cooler weather.

There were a total of 31 unhealthful days in 1989, down from the 58 recorded in 1988. The following graph shows the trend in the number of unhealthful days over the past seven years.

Pollutant Standards Index
Number of Unhealthful Days by Pollutant



Note: Although the pollutant with the worst rating for each day is used, more than one pollutant may have been in the unhealthful range.

To Obtain Information On The Air Monitoring Network, Call 609-292-0138.

Other Pollutants

In addition to the six criteria air pollutants, the DEP also monitors some pollutants for which air quality standards have not been set **(Non-criteria Pollutants).** At present, data is collected on selected metals, benzo(a)pyrene, sulfates and nitrates.

There is increasing public concern about such non-criteria pollutants and their possible effects on human health and the environment. Consequently, the DEP will expand its efforts to identify and monitor key non-criteria pollutants.

Metals: Arsenic, Barium, Cadmium, Chromium, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Vanadium and Zinc data is obtained by analyzing the filters collected from the air sampling network. These metals, in certain chemical forms and at certain concentrations, have harmful effects on the respiratory and nervous systems. Some are known to be human carcinogens.

Benzo(a)pyrene: A by-product from various combustion sources, benzo(a)pyrene (BaP) is a known human carcinogen. BaP data is also obtained by analyzing the filters collected from the air sampling network.

Sulfates and Nitrates: These inorganic compounds formed in the atmosphere are generally part of fine (less than 2.5 microns in diameter) particulate matter. The adverse environmental effects which they contribute to include increased acidity of lakes through deposition and impaired visibility.

Acid Precipitation

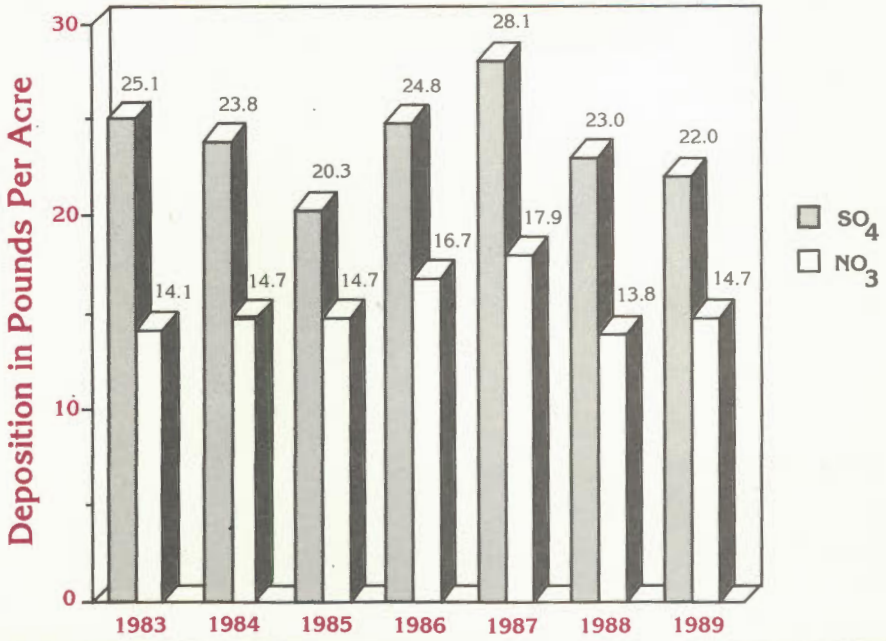
Acid precipitation, commonly referred to as "Acid Rain," is caused primarily by sulfur dioxide and nitrogen oxide emissions from utilities, industry and motor vehicles. These emissions are transformed in the air into sulfuric and nitric acids, which ultimately return to the ground in rain, snow or as "dry deposition" (fine sulfate and nitrate particles). This dry phase may aggravate respiratory ailments in humans, but acid deposition — both wet and dry — is better known for harming some freshwater and forest ecosystems and damaging certain types of stone and metal in buildings and monuments.

Acidity is a measure of the hydrogen ion concentration reported in pH units on a scale from 1 to 14, where 1 is very acidic, 14 very alkaline, and 7 neutral. Each decreasing unit is 10 times more acidic. Rainwater naturally contains some acidic compounds and normally has a pH range of 5.0 to 5.6.

Precipitation from 84 storm events in 1989 collected at Washington Crossing State Park had an average pH of 4.29, the lowest acidity level recorded since 1985. Fifty-one inches of rain were recorded at this site, approximately 20 percent above the normal rainfall for the Northeast.

The following graph shows the trend in wet sulfate and nitrate deposition as an average for New Jersey's three monitoring sites. Although wet nitrate deposition increased slightly in 1989 compared to 1988, wet sulfate deposition was the second lowest since the inception of the acid precipitation monitoring program in 1983.

Wet Sulfate and Nitrate Deposition Trend



Visibility

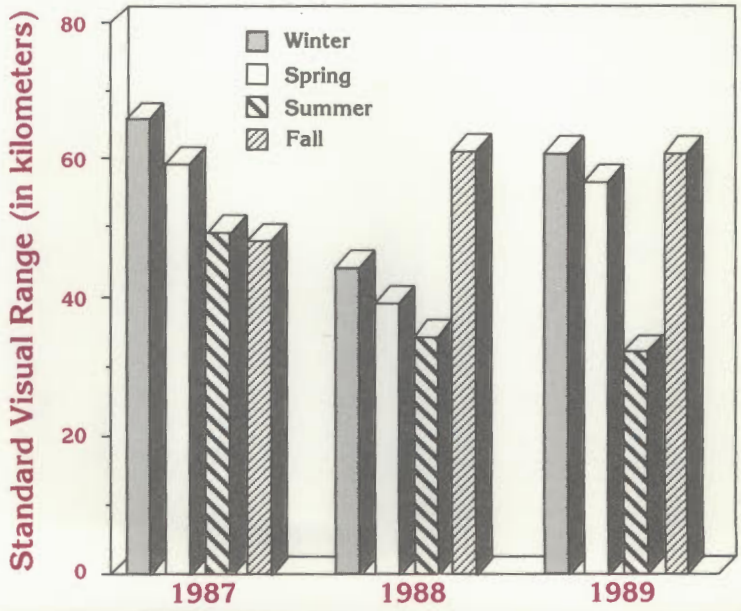
Visibility has been identified as an important factor in the public's enjoyment of pristine areas. As a result, federal law protects visibility within certain national parks and wildlife refuges around the nation. The Edwin B. Forsythe National Wildlife Refuge near Atlantic City is such an area.

The DEP began a visibility monitoring program at the refuge in 1987. A target is photographed three times a day using an automatic 35 mm camera. The photographs are quantitatively analyzed, and the standard visual range (SVR) of each is determined. SVR can be interpreted as the greatest distance, in kilometers, that an observer could see a large black horizon feature against the sky. The following graph depicts the visibility trend over the past three year.

To Report Abuses Of The Environment, Call **The DEP Environmental Action Line** 24-hours A Day. **609-292-7172**

In addition to air pollution, visibility is also affected by atmospheric conditions such as humidity and cloud cover. The observations which were obscured due to rain and snow are included in this analysis. Therefore, it is difficult to draw firm conclusions without a more refined analysis of the data. However, it does appear that the visibility is generally lower during the summer months and was the poorest in 1988.

Visibility Trend Recorded in New Jersey



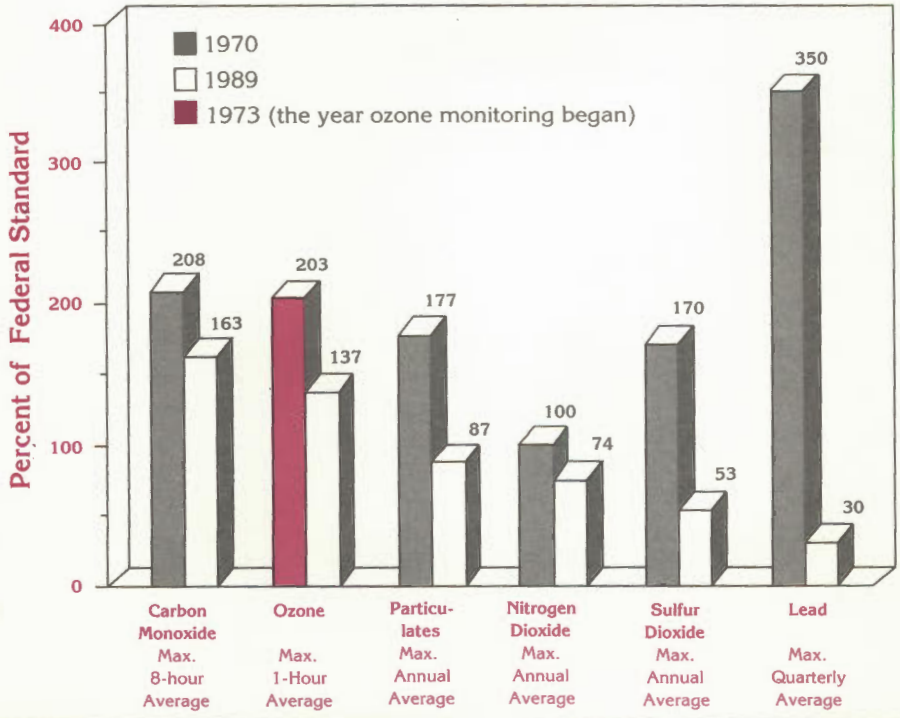
Long-Term Trends

Remarkable improvements in air quality have been made since the first Earth Day in 1970. As indicated in the following graph, reductions in carbon monoxide concentrations of 22 percent, nitrogen dioxide concentrations of 26 percent, and particulate concentrations of 51 percent have been achieved. The greatest reductions achieved thus far are in sulfur dioxide and lead concentrations, which have decreased 69 and 91 percent respectively. These reductions can be attributed to the state's aggressive air pollution control programs.

New Jersey's air pollution regulations are among the toughest in the country, and real improvements in air quality have resulted. Problems remain, however, not only because the ozone and carbon monoxide standards continue to be exceeded but also because the magnitude and nature of non-criteria pollutant problems still need to be assessed. It is likely that all New Jersey residents will have to contribute to the efforts to ensure that our air quality goals are met.

To Obtain Daily Air Quality Readings, Call 1-800-782-0160.

Air Quality Improvement



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Charles Pietarinen and Steven Quan
Editors

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Division of Environmental Quality
New Jersey Department of Environmental Protection
CN 027 (401 East State Street)
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