Air Quality Indicators

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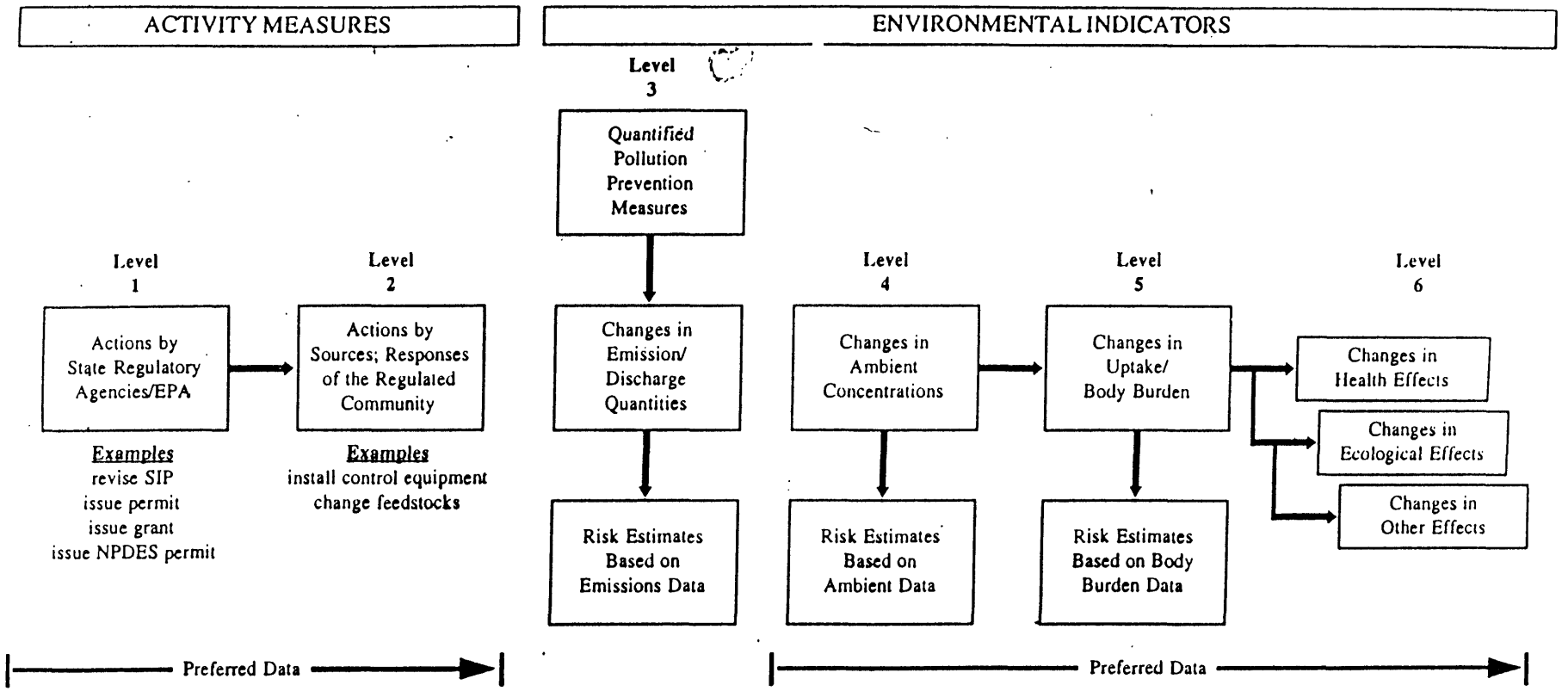
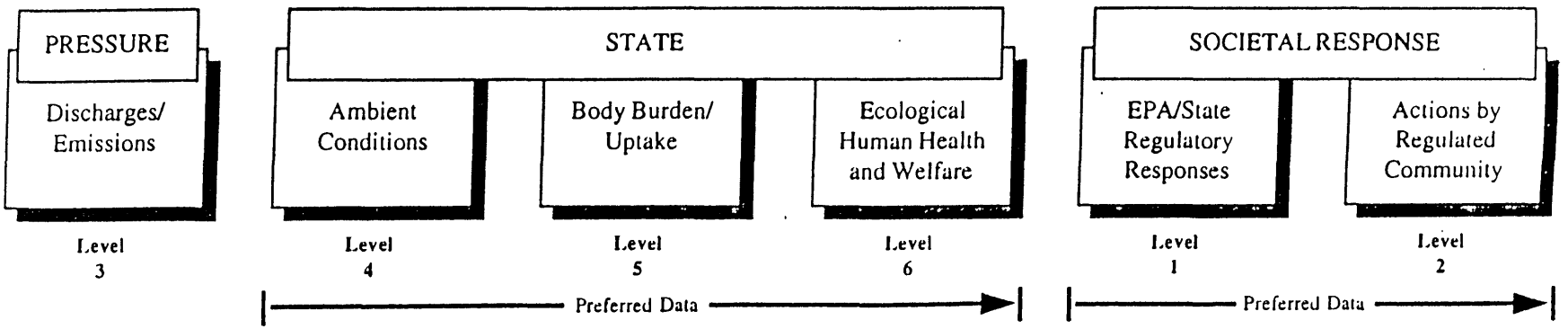
State Environmental Goals and Indicators Project, August 1995, chart is a modification and enhancement of Figures 1 and 2 on page 3 of *Draft Interim 1995 Indicators Report*, U.S. EPA, Office of Policy, Planning and Evaluation, April 1995

Measuring Environmental Changes: Hierarchy of Indicators



Relationship of the Hierarchy of Indicators to the Pressure - State - Response Framework



Environmental Indicators - Air

- Air Quality Index & Ozone Map
- Forecasts and Models
- NAAQS and Unhealthy Days
- Air Toxics and the CEP
- Trends
- Deposition
- Biological

Pollutant Standards Index

- Rates each of 5 pollutants on a standard scale with 100 set equal to the health standard
- 9 Regions in NJ - Worst overall pollutant/site rating is used
- Good - Moderate - *Approaching Unhealthful* - Unhealthful

Strengths of the AQI

- Consistent Nationally
- Common Scaling of Pollutants
- Easy to Understand
- Familiar
- Appropriate for Several Formats

Current air quality as of 1:00 pm, November 18, 1996:

For more detail, select an area on the map or
one of the groups of counties from the list below.

Counties:

Bergen and Passaic
Essex, Hudson, and Union
Middlesex, Morris, and Somerset
Hunterdon, Sussex, and Warren
Burlington and Mercer
Monmouth and Ocean
Atlantic and Cape May
Camden and Gloucester
Cumberland and Salem

Map Legend

More Information:

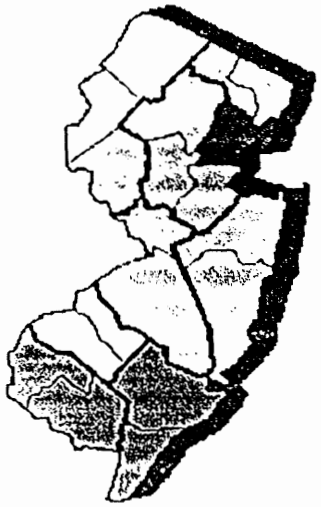
Weather and air quality
Pollutants and their health effects
Trends in air quality
Contacts and feedback

Current air quality as of 2:00 am, November 19, 1996:

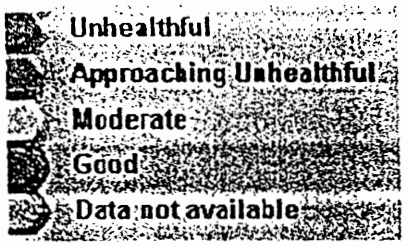
For more detail, select an area on the map or
one of the groups of counties from the list below.

Counties:

Bergen and Passaic
Essex, Hudson, and Union
Middlesex, Morris, and Somerset
Hunterdon, Sussex, and Warren
Burlington and Mercer
Monmouth and Ocean
Atlantic and Cape May
Camden and Gloucester
Cumberland and Salem



Map Legend:



More Information:

Weather and air quality
Pollutants and their health effects
Trends in air quality
Contacts and feedback

Air Quality

The worst pollutant in the region yesterday was ozone, produced mainly by auto emissions.

The first column in the table shows yesterday's code and Pollution Standard Index, the second column shows yesterday's highest pollutant, and the third column shows today's forecast.

Good (G)	0-50	Carbon monoxide	CO
Moderate (M)	51-100	Nitrogen dioxide	NO
Unhealthful (U)	101-200	Suspended particles	SP
Very Unhealthful (V)	201-300	Sulfur dioxide	SO
Hazardous (H)	301-400	Ozone	OZ

At a Pollution Standard Index rating of 100, the general population begins to experience irritation and other unhealthful effects.

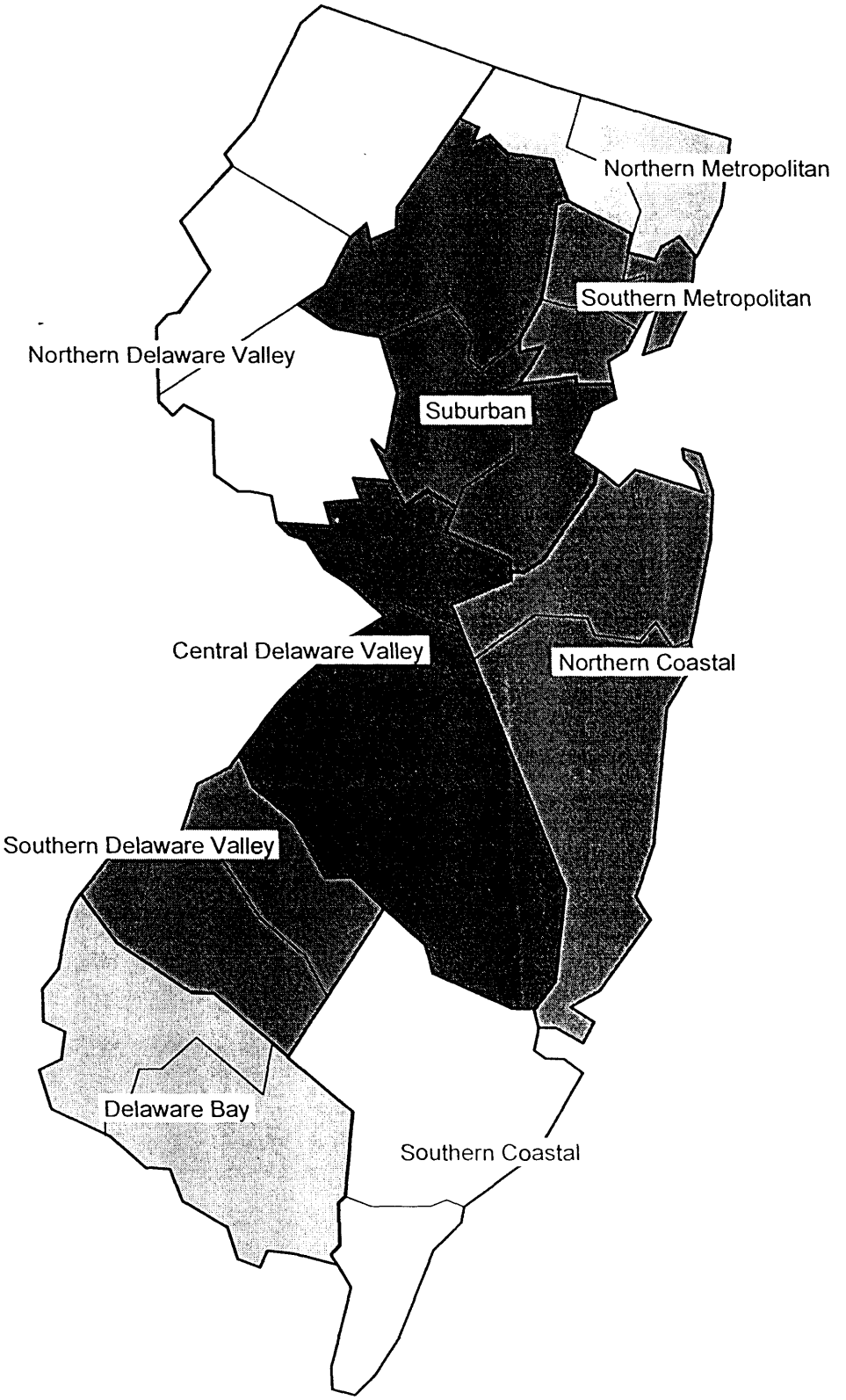
	Yesterday's Pollution Standard Index	High Pollutant Yesterday	Pollution Forecast Today
Bristol	G 24	PA	G
Burlington	G 32	OZ	G
Camden	G 12	CO	G
Chester	G 24	SO	G
Norristown	G 23	PA	G
Philadelphia	G 27	PA	G
Trenton	G 17	OZ	G
Wilmington	G 6	OZ	G

Source: Clean Air Council, 215-567-4004.

Weaknesses of the AQI

- Only Uses 5 Pollutants (less in many areas)
- Not Originally Designed for Use in Real Time
- Averaging Times Can be a Problem
- Density of the Network
- New Standards
- New Scale - especially for PM

State of New Jersey
Pollutant Standards Index Reporting Regions



POLLUTANTS MONITORED ACCORDING TO POLLUTANT STANDARD INDEX REGION

REPORTING REGION	MONITORING SITE	POLLUANTS MONITORED				
		CO	SO2	SS	O3	NO2
NORTHERN METROPOLITAN	Cliffside Park	-	-	-	-	X
	Fort Lee	X	-	X	-	-
	Hackensack	X	X	X	-	-
	Ramapo	-	-	-	X	-
SOUTHERN METROPOLITAN	Bayonne	-	X	-	X	X
	East Orange	X	-	-	-	X
	Elizabeth	X	X	X	-	-
	Elizabeth Lab	X	X	X	-	X
	Jersey City	X	X	X	-	-
	Newark	X	X	X	X	X
	North Bergen	X	-	-	-	-
SUBURBAN	Chester	-	X	-	X	X
	Middlesex	X	-	-	-	-
	Morristown	X	-	X	-	-
	Rutgers University	-	-	-	X	X
	Perth Amboy	X	X	X	-	-
NORTHERN DELAWARE VALLEY	Flemington	-	-	X	X	-
CENTRAL DELAWARE VALLEY	Burlington	X	X	X	-	-
	Colliers Mills	-	-	-	X	-
	Rider University	-	-	-	X	X
NORTHERN COASTAL	Freehold	X	-	X	-	-
	Monmouth University	-	-	-	X	-
	Toms River	X	-	X	-	-
SOUTHERN COASTAL	Nacote Creek R.S.	-	X	-	X	-
	Somers Point	-	X	-	-	X
SOUTHERN DELAWARE VALLEY	Ancora S.H.	X	X	X	X	-
	Camden Lab	X	X	X	X	X
	Clarksboro	-	X	-	X	-
DELAWARE	Millville	-	X	-	X	X

POLLUTANT CODING

CO - Carbon Monoxide

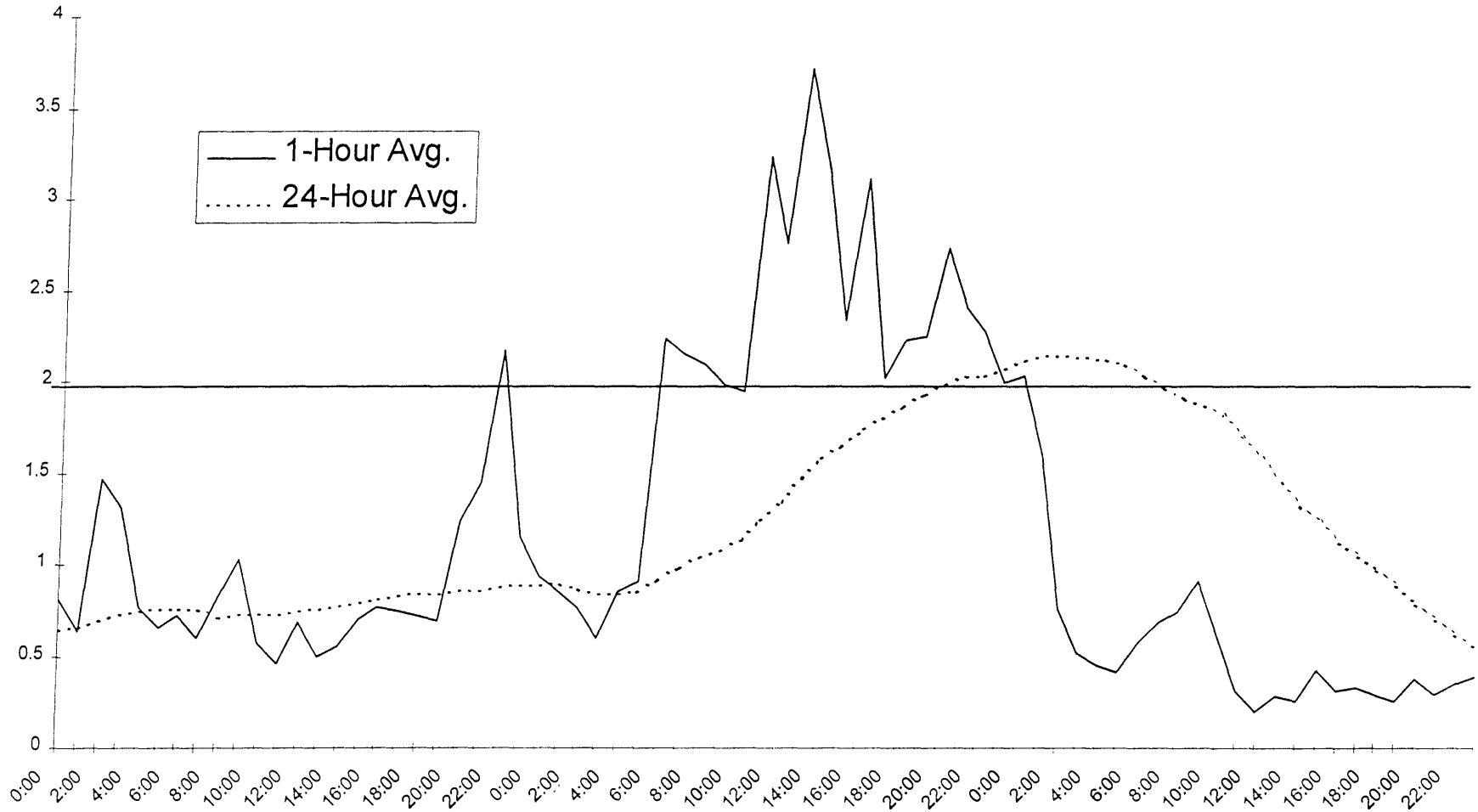
SO2 - Sulfur Dioxide

SS - Smoke Shade

O3 - Ozone

NO2 - Nitrogen Dioxide

Comparison of 1 and 24 Hour Avg. Smoke Shade
Elizabeth, N.J.
November 17 - 19. 1996



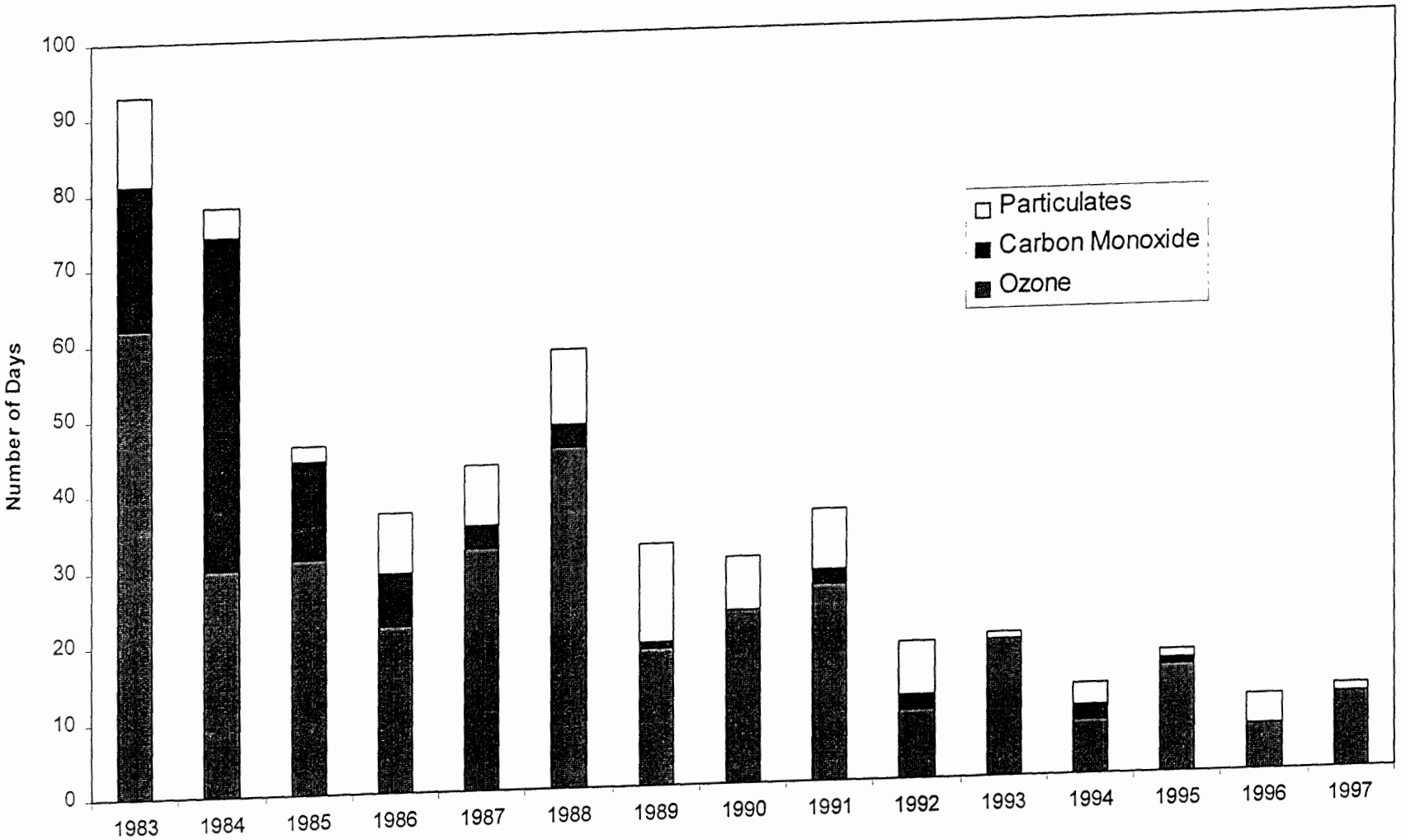
Air Quality Index

Descriptor	**Color**	**Index Value**
Good	Green	0 - 50
Moderate	Yellow	51 - 100
Unhealthy for Sensitive Groups	Orange	101 - 150
Unhealthy	Red	151 - 200
Very Unhealthy	Purple	201 - 300
Hazardous	Maroon	300 and up

AQI - Possibilities for Improvement

- More Pollutants
- Better Surrogates
- More Predictive
- Better Geographic Coverage (and/or better interpolation)

Number of Unhealthy Air Quality Days in New Jersey by Year and Pollutant



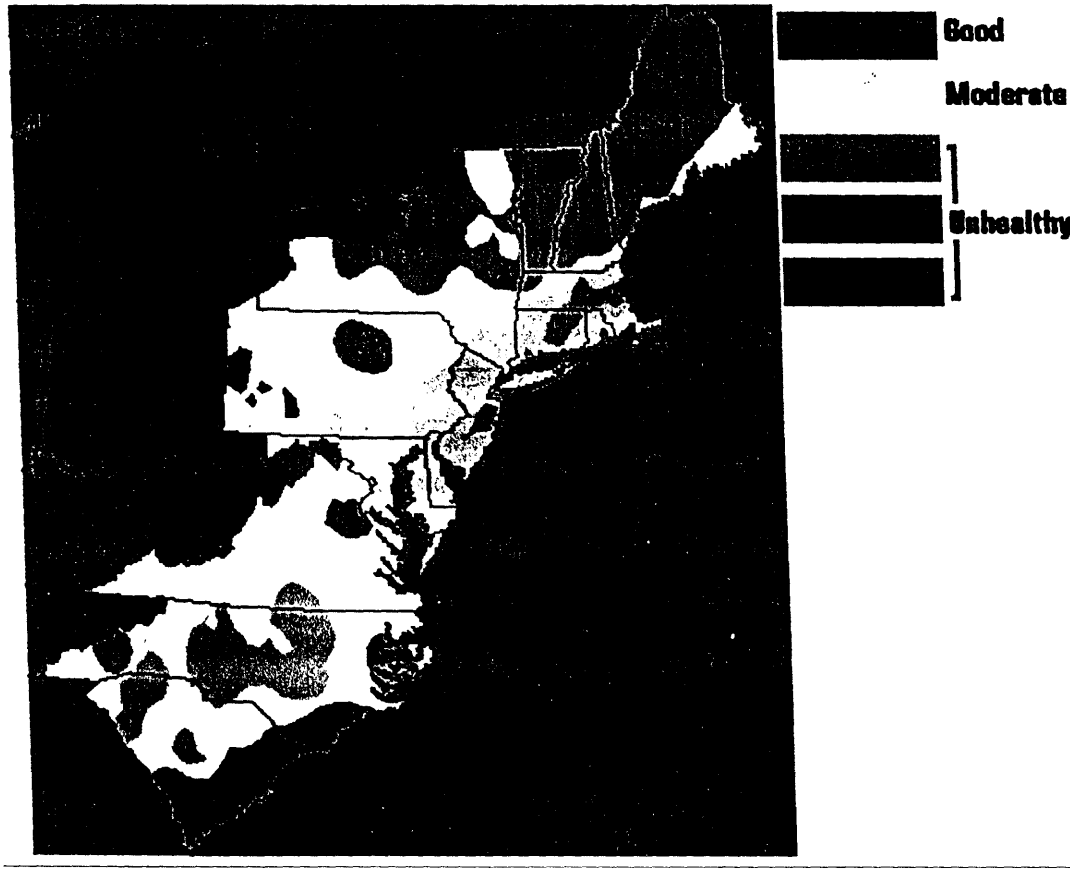
Ozone Map

- Started in New Jersey and Maryland - now a national effort
- Uses Index Scale
- More Sophisticated Interpolation
- Uses 8-hour predictors

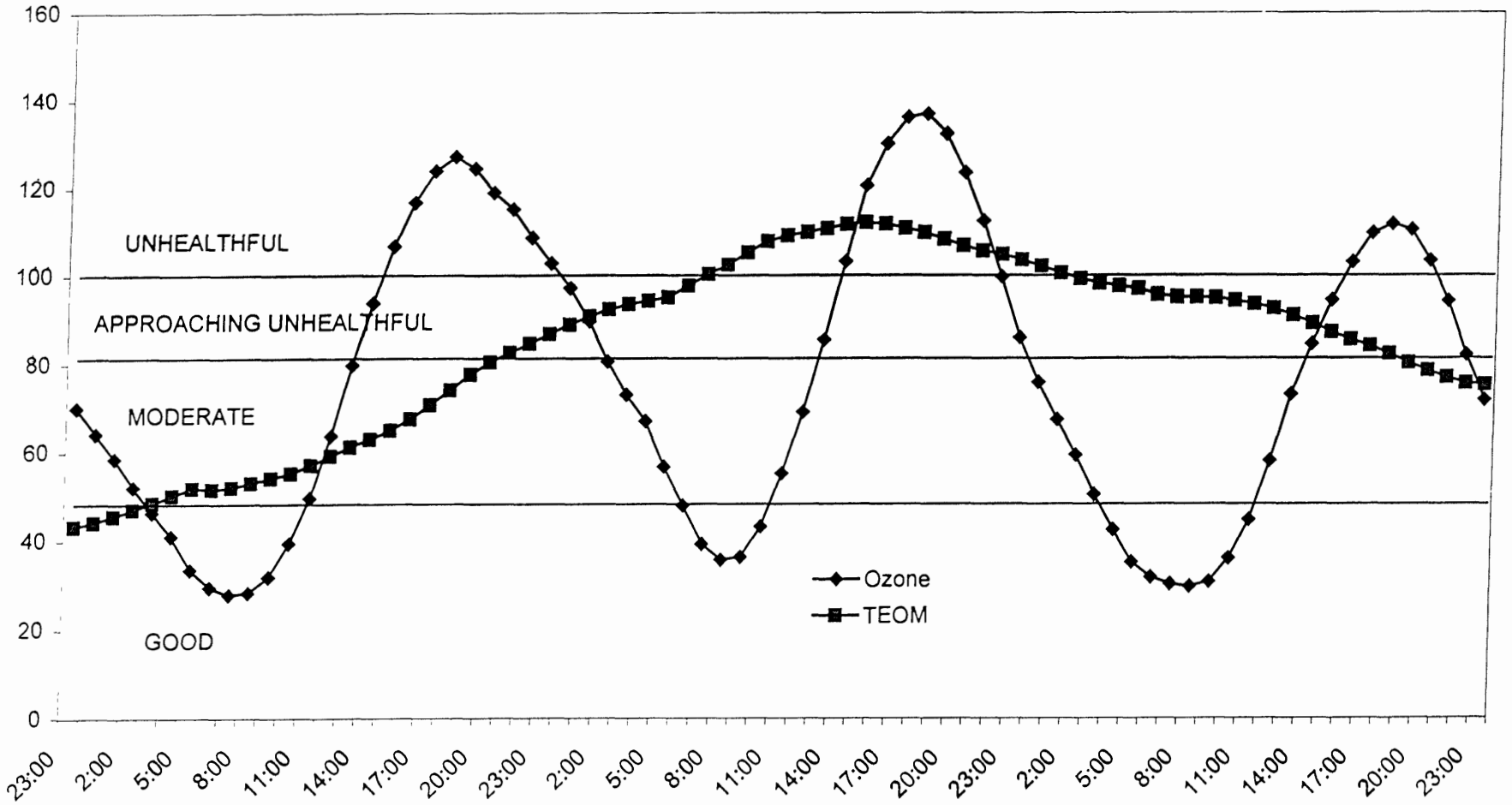
Ozone Peak Values

8-hour Average Concentration

East - Monday, 24 Aug 1998



Ozone and TEOM Data
Converted To PSI Scale
July 14-16, 1997
Camden N. J.



Forecasts and Models

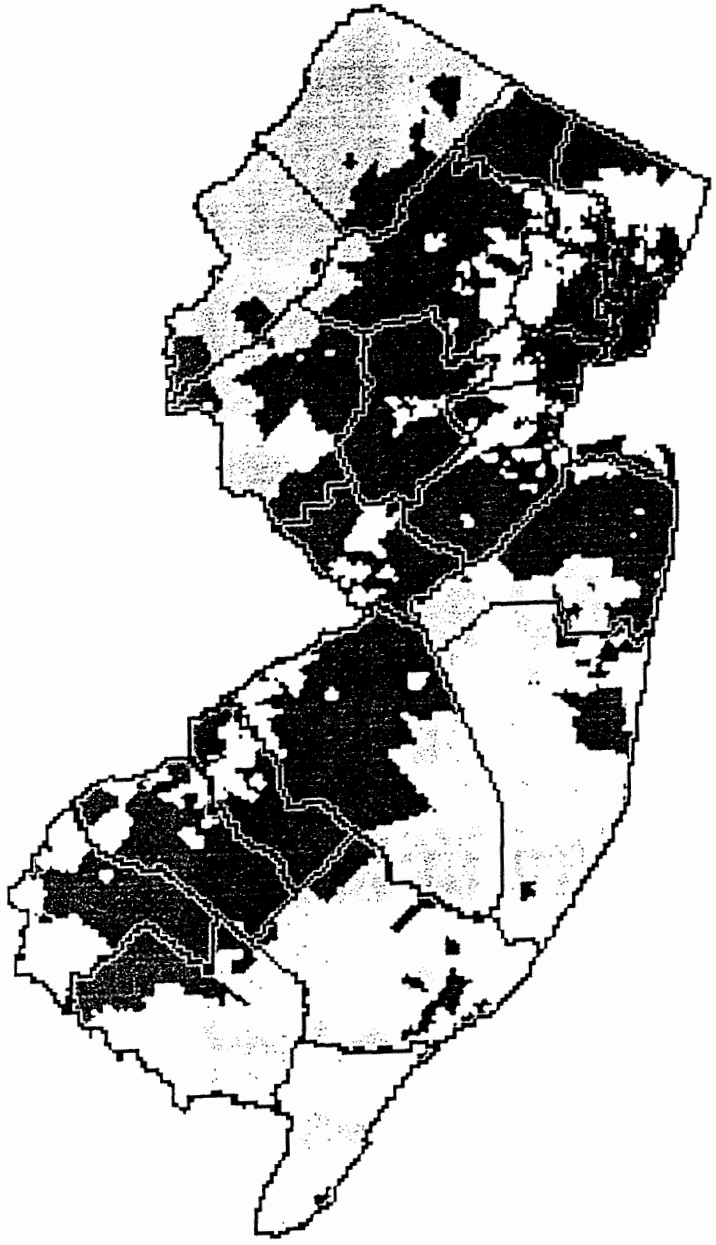
- Retrospective indicators do not allow people to modify their behavior
- Forecasts traditionally made using Index format
- Models to predict over the short term and for "what if" analysis

EPA United States Environmental Protection Agency | AIRNOW | OAQPS Office of Air Quality Planning & Standards

Northeast
Ozone Forecast

FORECAST DISCUSSION

- NOT AVAILABLE AT THIS TIME -



CEP Estimated 1990 Benzene Concentrations In New Jersey

Maximum concentration is
40.98 micrograms per cubic meter or
342 times the health benchmark

1 - 10 times benchmark
10 - 20 times benchmark
20 - 30 times benchmark
30 - 40 times benchmark
Over 40 times benchmark

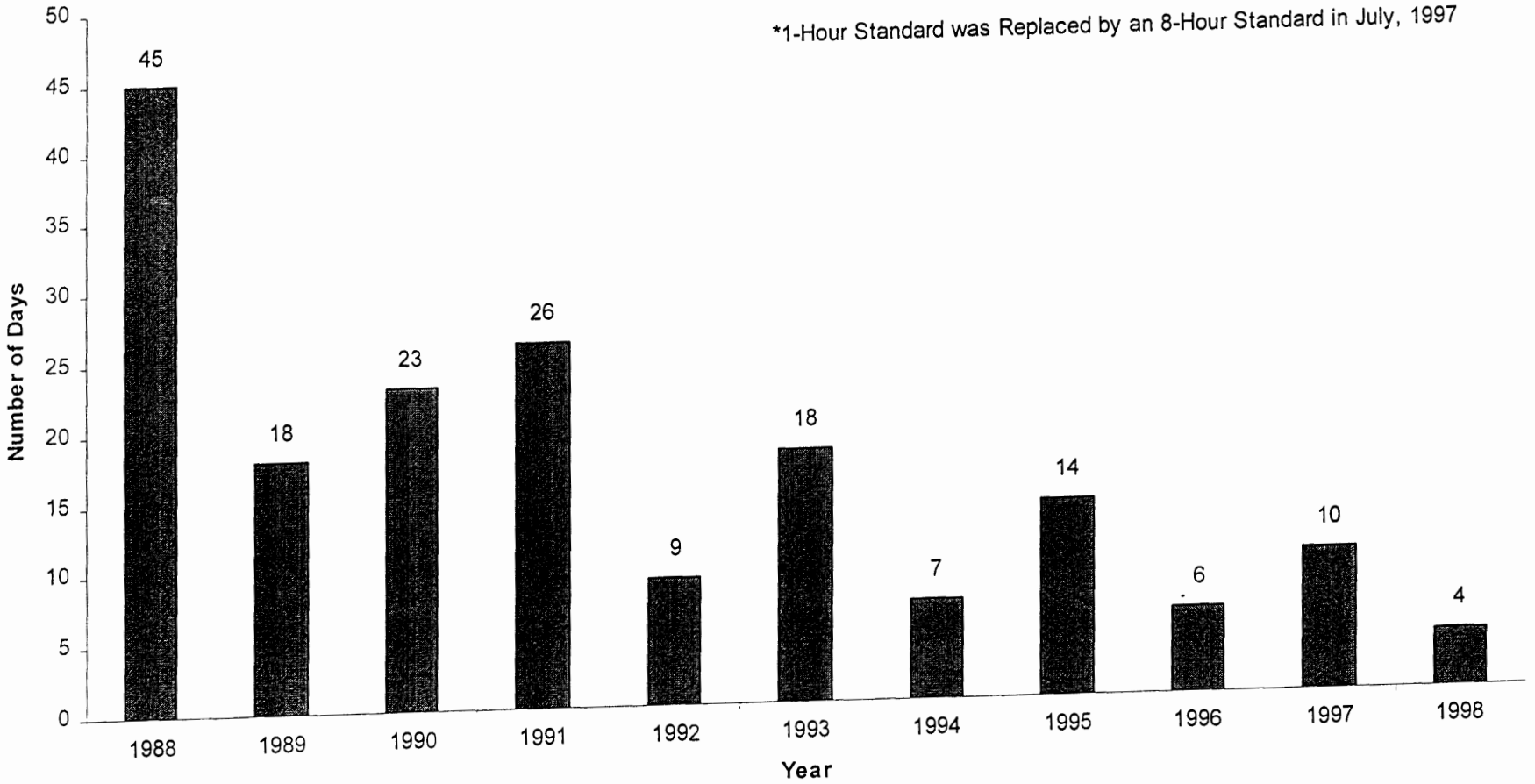
NAAQS and Unhealthy Days

- Standards and Index define "Unhealthy" Days
- Definition has changed

New Standards

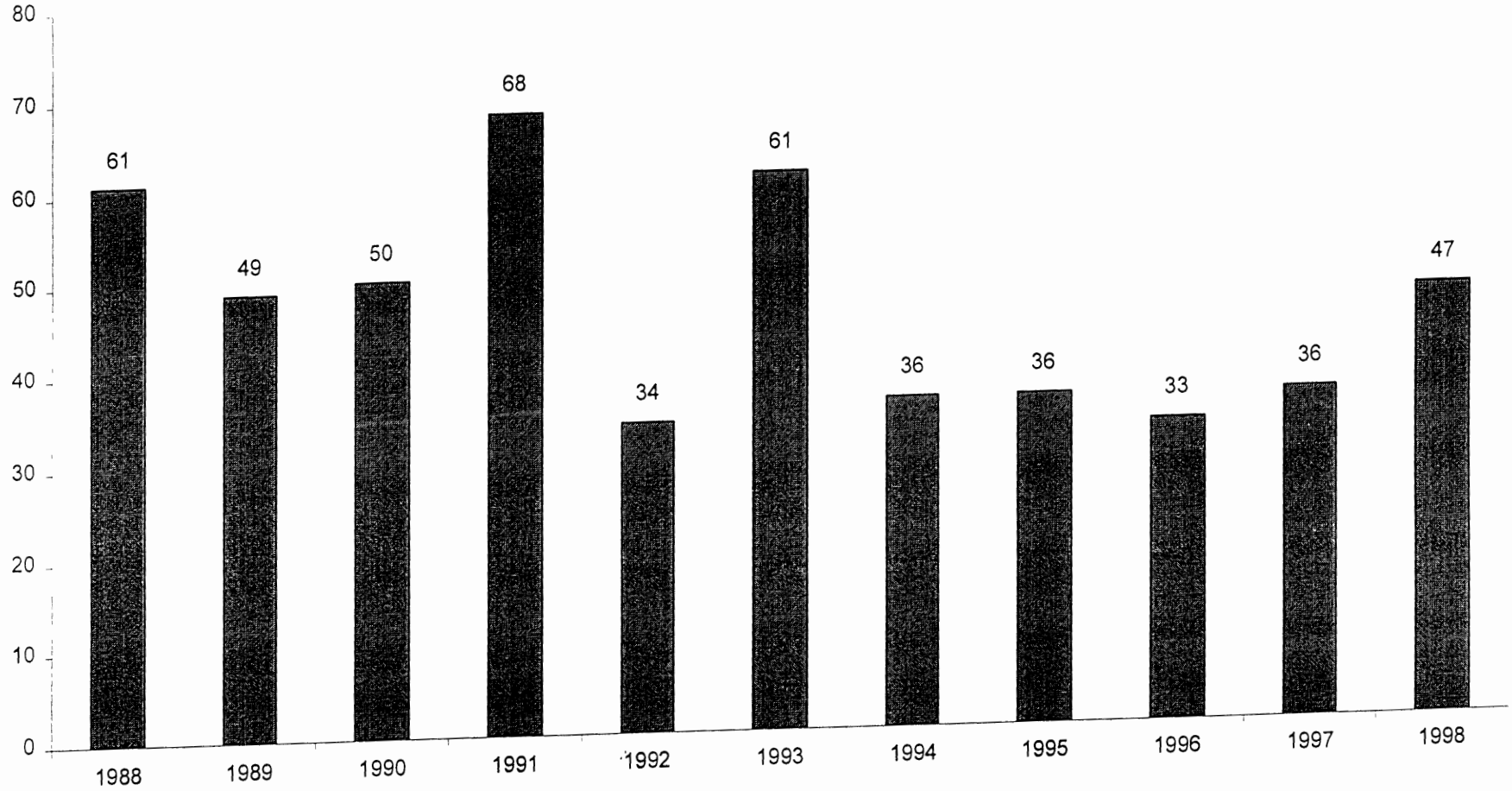
- Ozone standard changed from 0.12 ppm over 1-hour to 0.08 ppm over 8-hours
- Particulate Matter - new standards for particles less than 2.5 micrometers in diameter *added* to current standard for particles 10 micrometers and less
  - 15 ug/m3 Annual average
  - 65 ug/m3 24-hour average

Days on Which the 1-Hour Ozone Health Standard* Was Exceeded in New Jersey 1988 - 1998



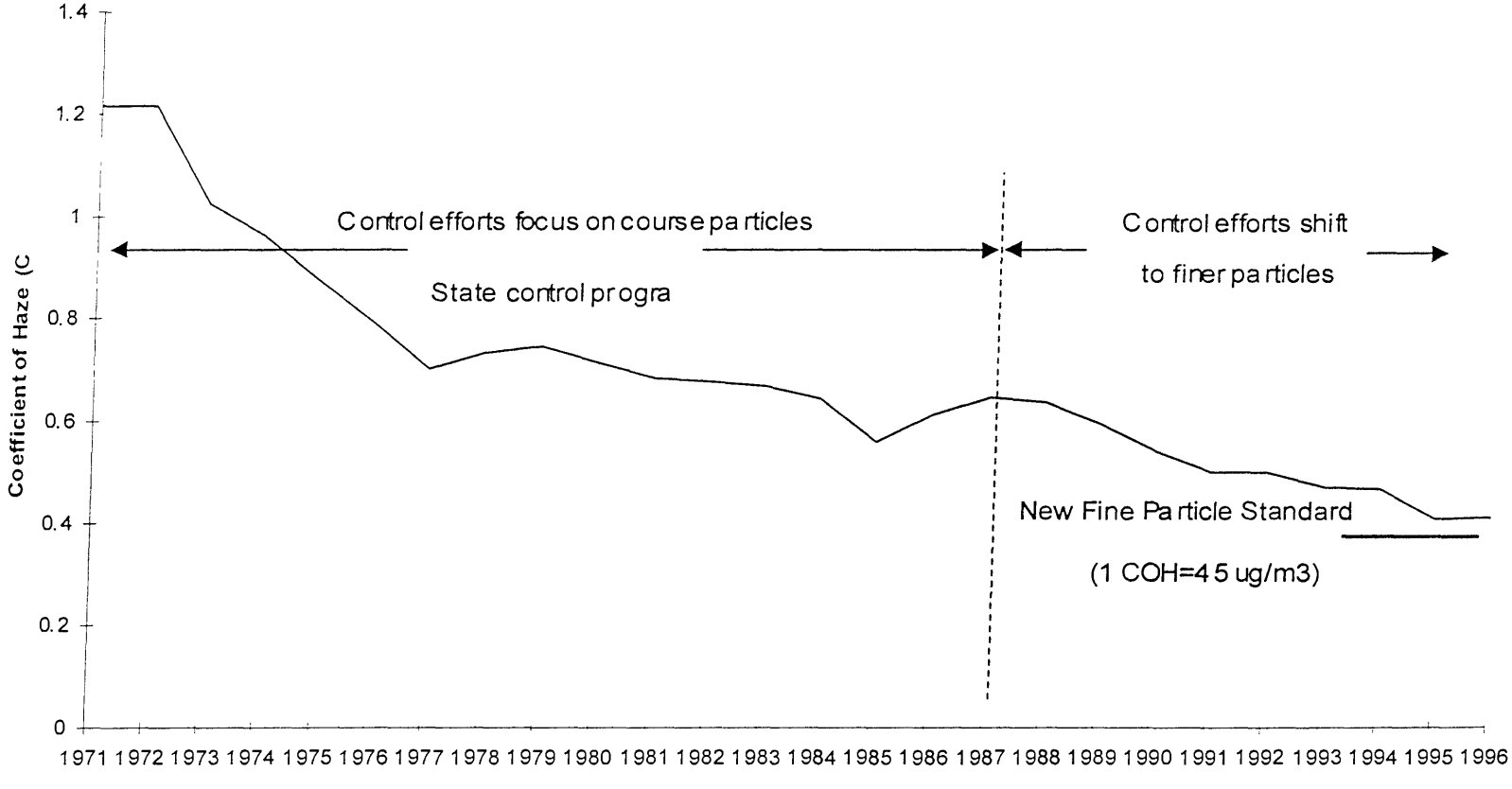
Days on Which the 8-Hour Ozone Health Standard* Was Exceeded in New Jersey 1988 - 1998

*8- Hour Standard was Promulgated in July, 1997



Long Term Trend in Particulate Levels
1971 - 1996

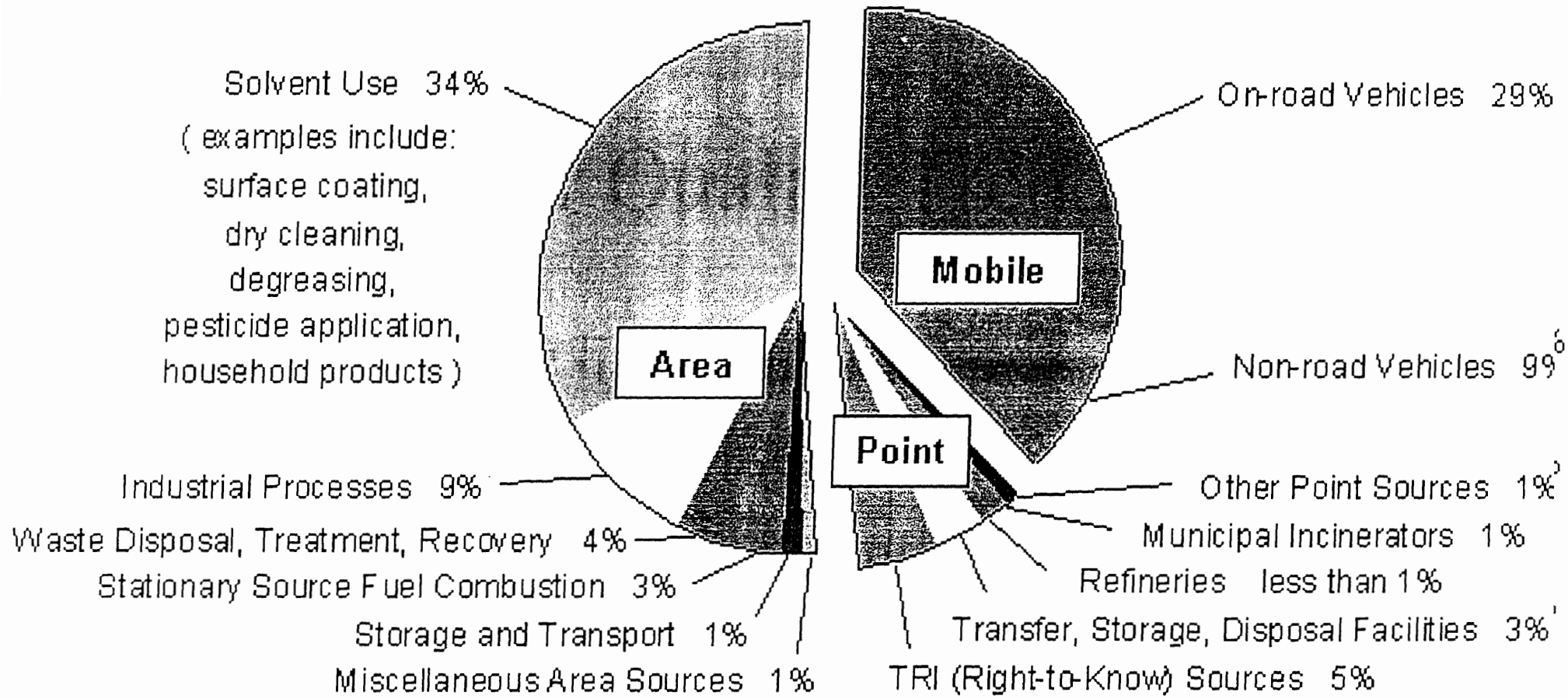
Smoke Shade used as a surrogate for particulate matter



Air Toxics and The Cumulative Exposure Project (CEP)

- What are air toxics?
- CEP provided estimates of over 140 Hazardous Air Pollutants (HAPS) in every census tract in the U.S.
- What are key toxics
- Can/should they be measured in real time?
- How to communicate risk

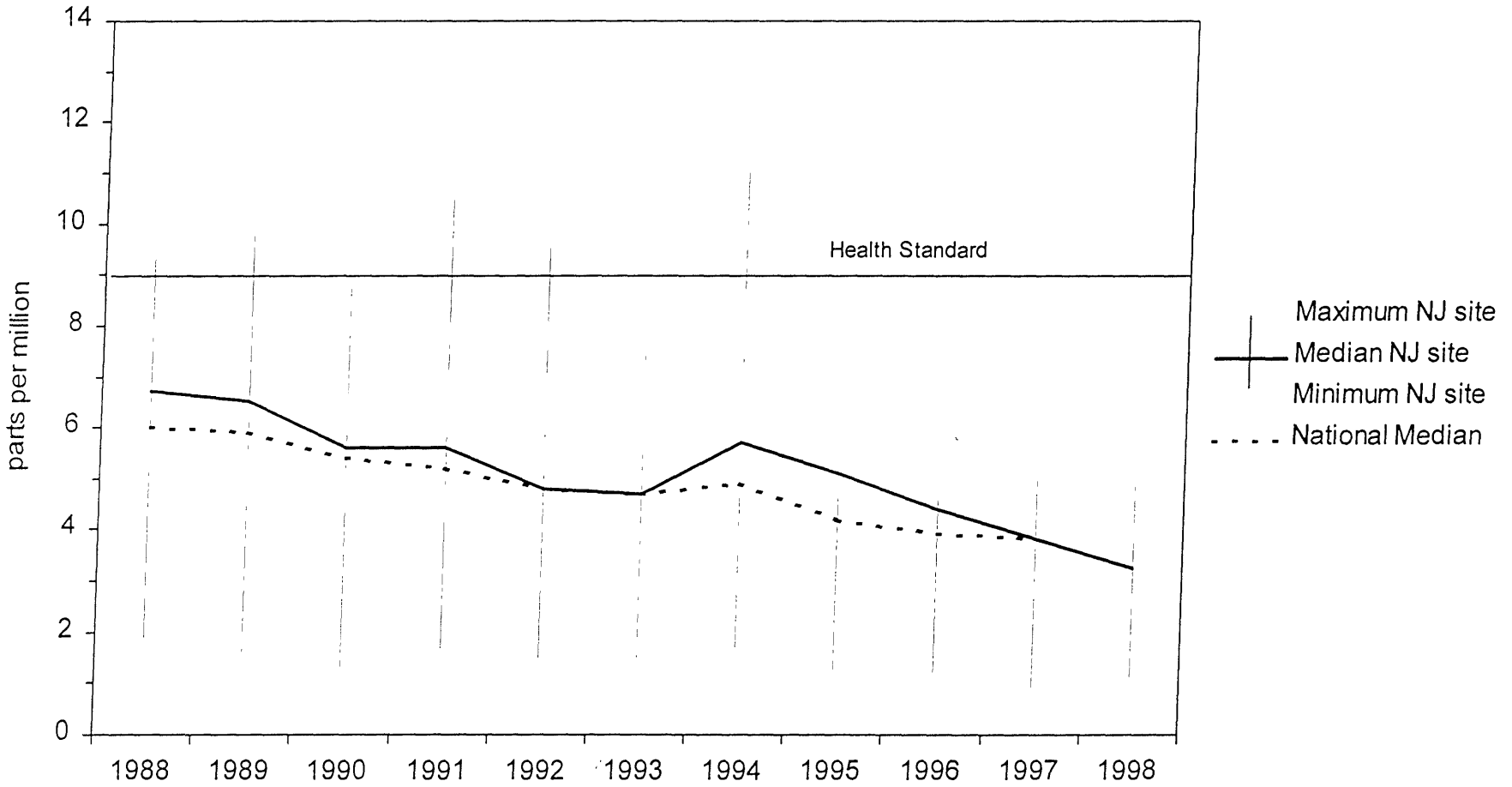
U.S. EPA's 1990 Air Toxics Inventory for New Jersey



Air Quality Trends

- What do we have data for?
- How to factor out meteorology
- Significance of consistently low levels
- When is a trend significant?

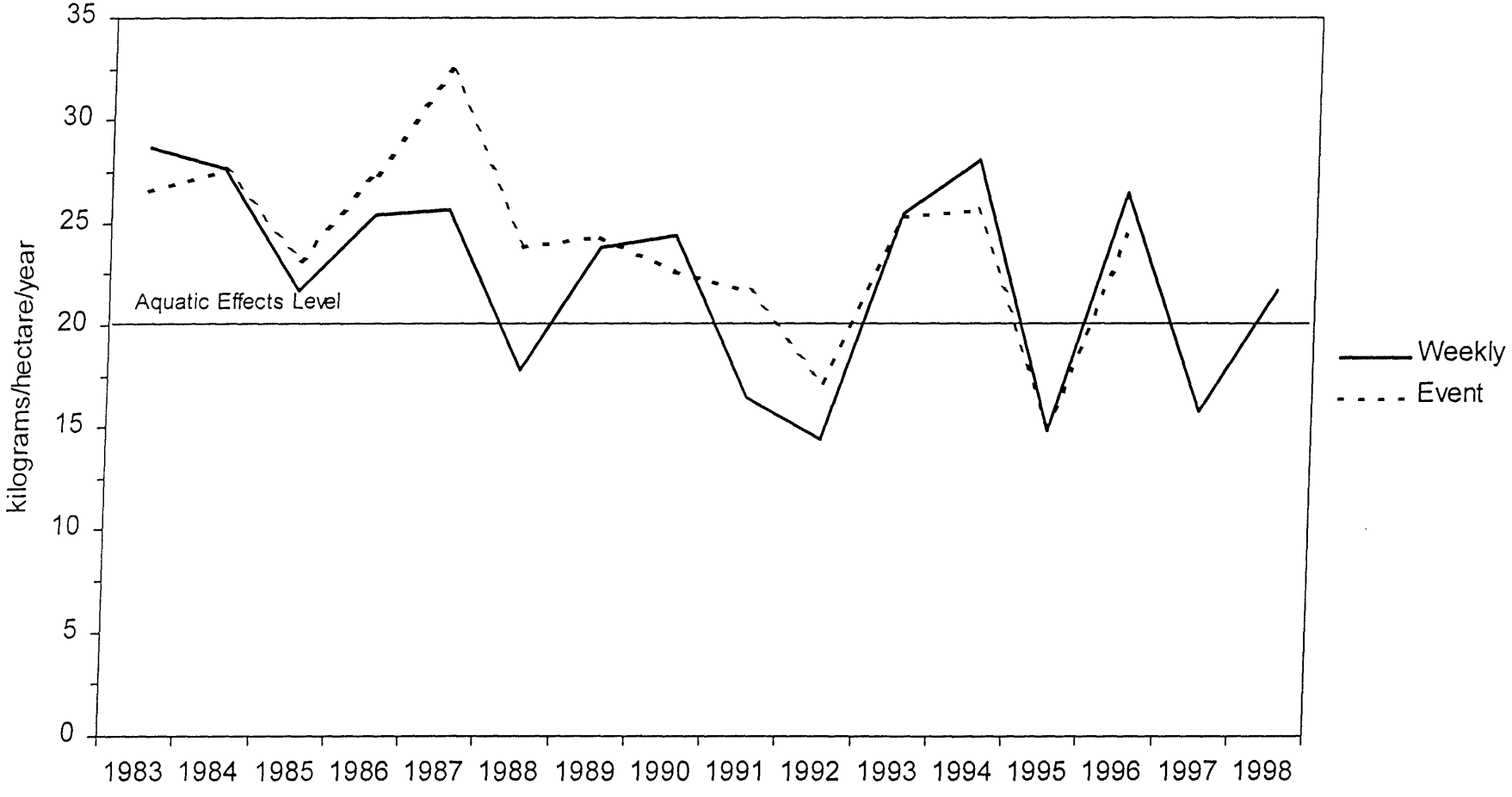
Figure 8a. Trend in Carbon Monoxide Concentrations in New Jersey, 1988 - 1998: Second Highest 8-Hour Averages



Air Deposition

- How to estimate deposition
- Relevance to health or ecosystem effect

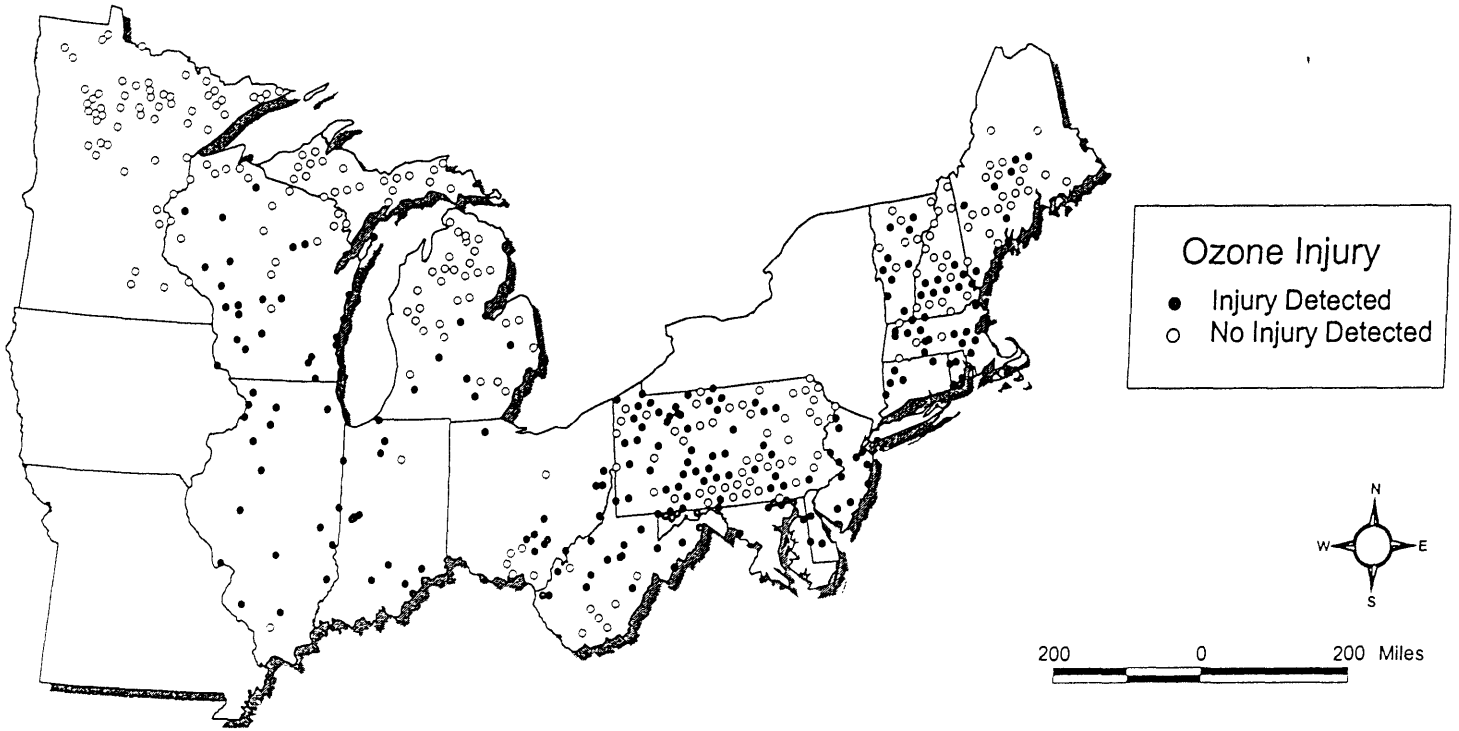
Figure 19. Trend in Sulfate Deposition in Precipitation at Washington Crossing State Park, New Jersey, 1988 - 1998: Annual Loading



Biological Indicators

- Measures of biological activity (Ames testing, enzyme tests)
- Asthma and other biological responses
- Forest studies

Regional Distribution of Biomonitoring Sites - 1998



The regional distribution of ozone biomonitoring sites in the Northern FHM Region in 1998. Red symbols indicate where ozone-induced foliar injury was detected on sensitive plants. Open symbols indicate no injury.

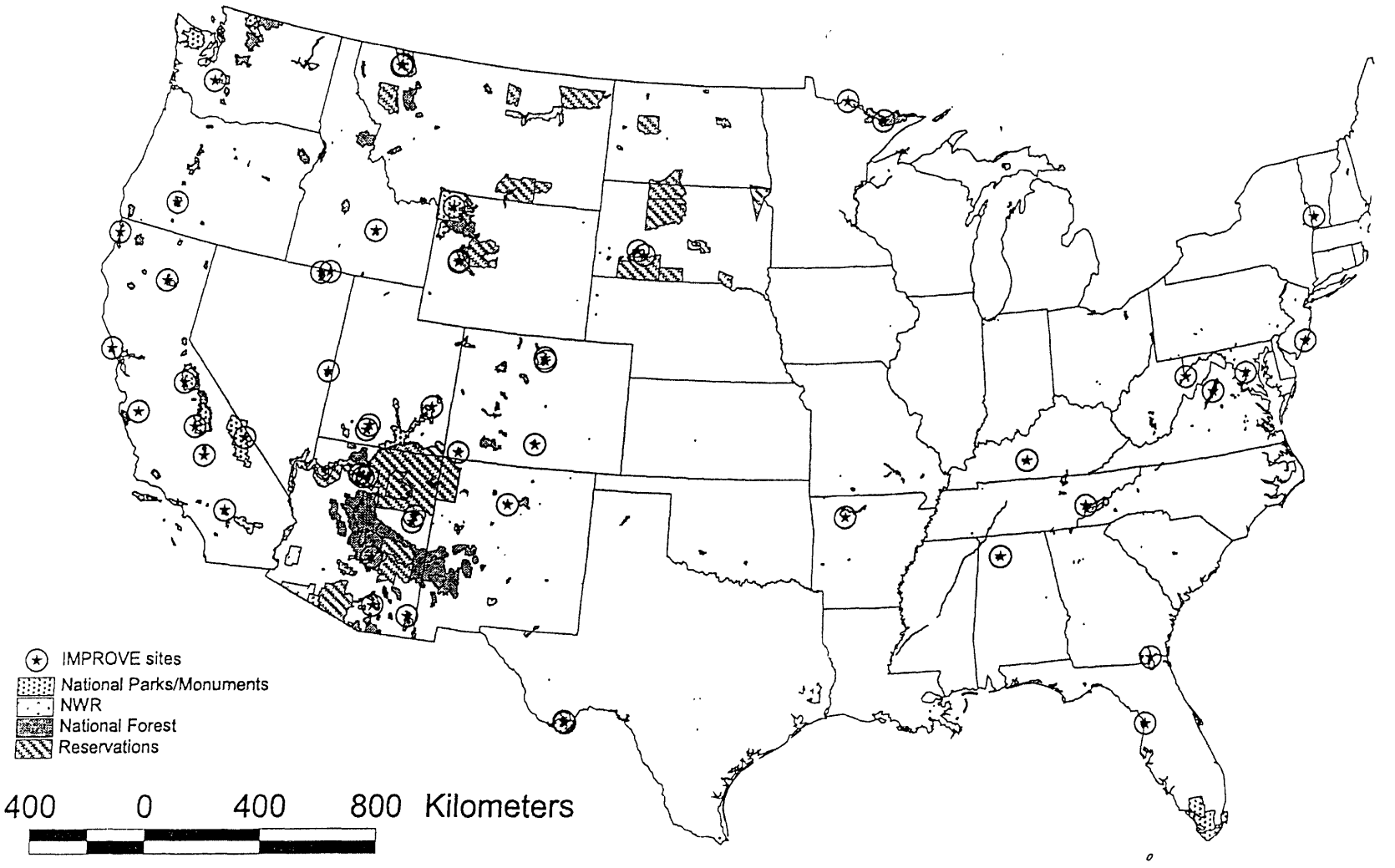
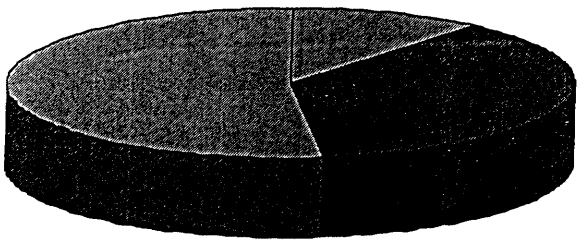


Figure 3-6. National parks and monuments, national wildlife refuges, national forests, Indian reservations, and IMPROVE background monitoring sites.

Composition of Fine Particles Brigantine, N.J.

Formed from NOx Emitted From Regional and Local Sources, Highway Vehicles and Off-Road Diesel Mobile Sources, reacting with ammonia



Diesels - Highway
Diesels - Off Read
Aircraft & Railway
Gasoline Combustion
Incineration, Open Burning
Residential Wood Burning
Structural Fires
Utility/Commercial Fuel Combustion
PM formed from Organic Gases

Formed From SO2 Transported from Regional and Local Sources; Oil and Coal-fired Utility and Commercial/ Institutional Boilers, Small Combustion Sources, reacting with Ammonia

Wind Erosion, Agricultural Tilling, Paved and Unpaved Roads and Construction Activities

Source: IMPROVE Report - July 1996

Pressure Indicators

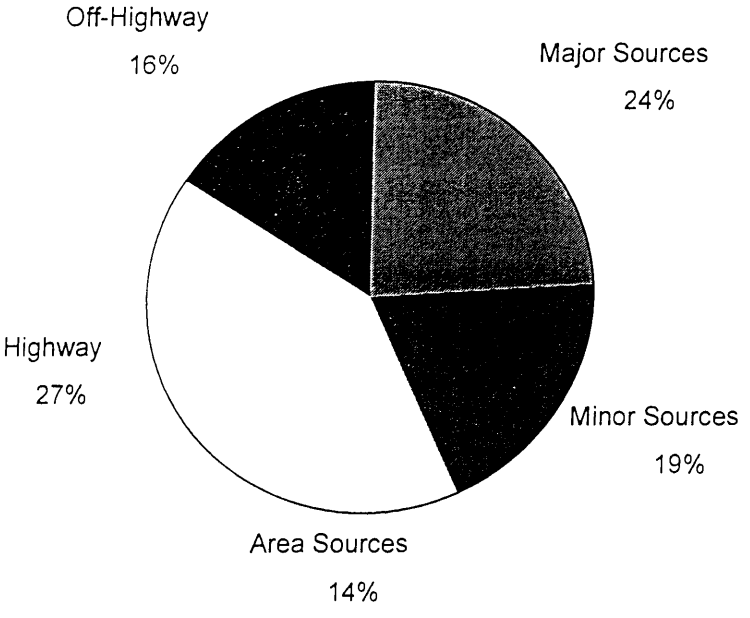
- Emissions Inventories
- Sector Analyses
- Vehicle Miles Traveled
- GNP, Population, Employment, etc.

Emissions Inventories

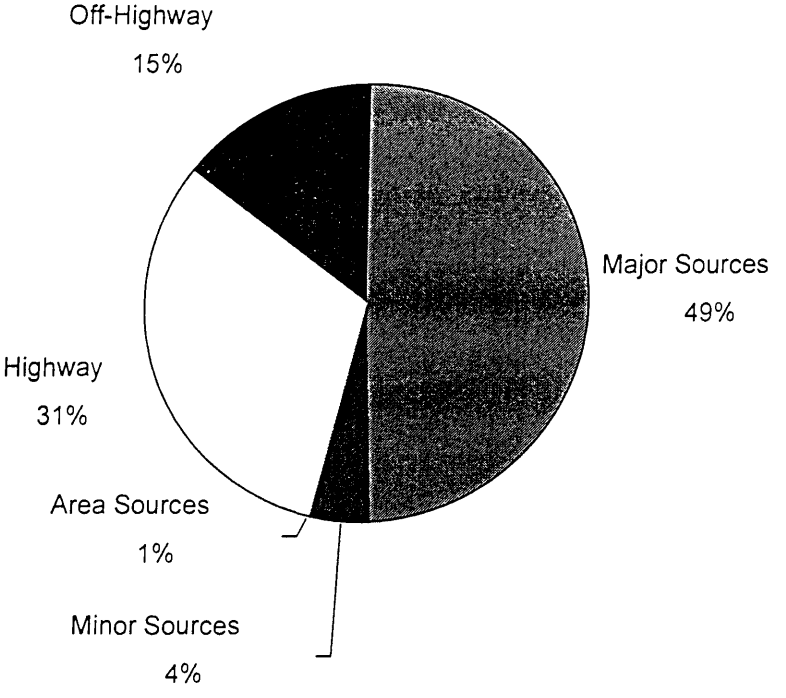
- Essential for developing control strategies and tracking their effectiveness
- Some sources difficult to estimate
- Consistency
- Accuracy
- Never right, never complete

1999 VOC and NOx Projection Year Inventories

VOC



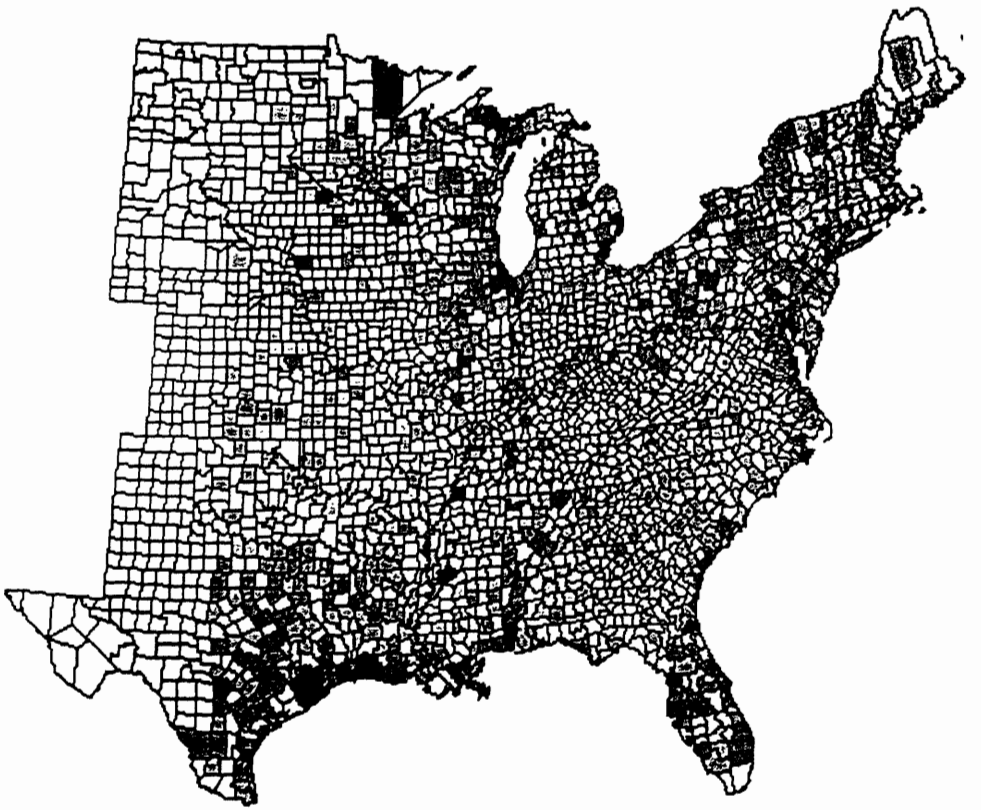
NOx



County Total Point Source Emissions: NOX

File Used For Summary: ems_run.ptcntl

Total Emissions: 22811.67



County emissions on edge of domain reflect only the area within OTAG.

Canada and offshore emissions are not shown.

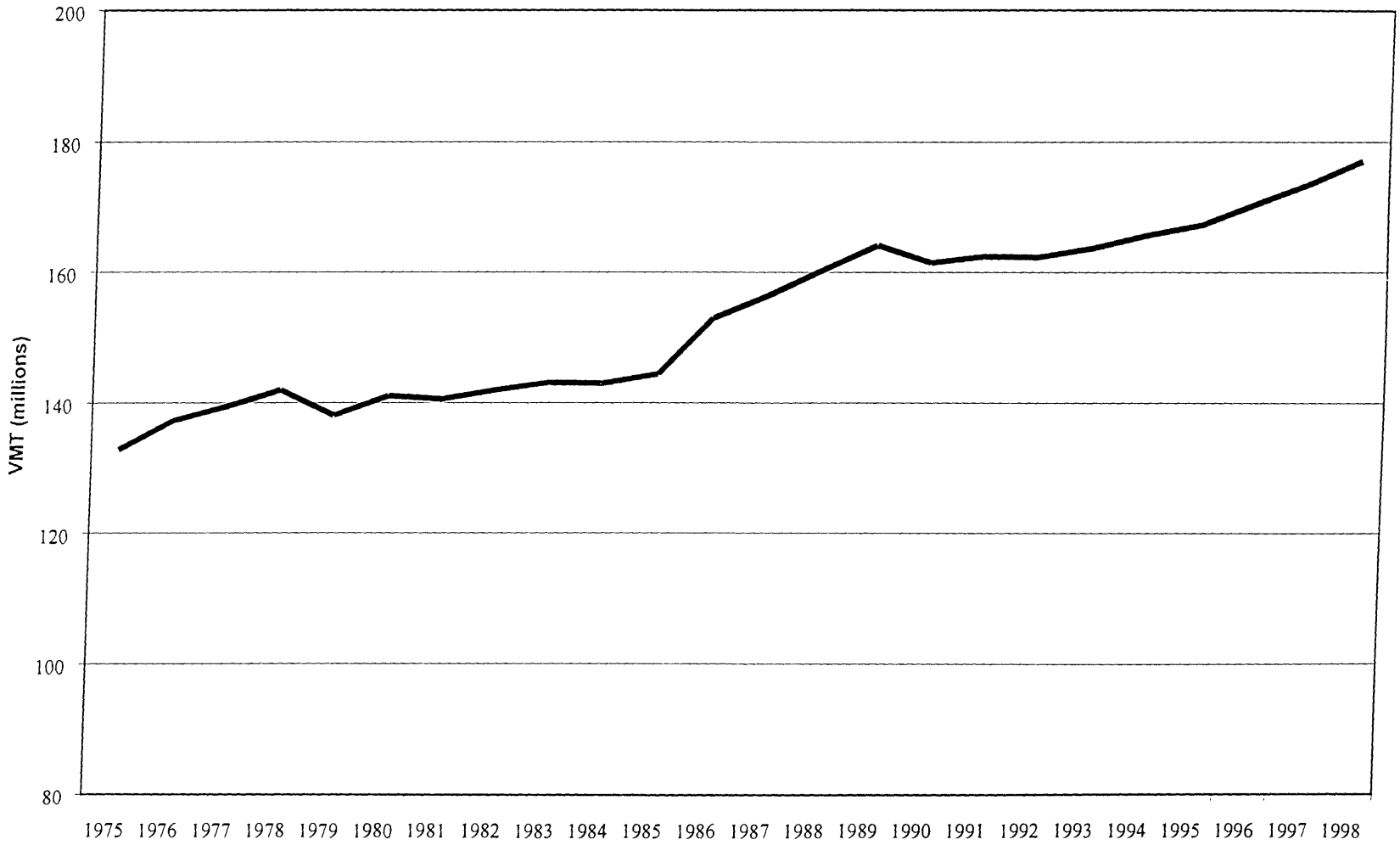
Emissions list can be found in file: ptcyems.thur.base1c.lst

Vehicle Miles Traveled

- Motor vehicle emissions difficult to estimate
- Not the whole story
- Shows competing pressures - emissions per mile down, miles driven up

Estimate of Daily Vehicle Use in New Jersey

1975 - 1998



Response Indicators

- Strategies
- Activity Tracking
- Enhanced I/M
- Are they effective?

PERFORMANCE PARTNERSHIP AGREEMENT
AIR POLLUTION CONTROL PROGRAM
ENVIRONMENTAL GOALS/INDICATOR SUMMARY TABLE

SUBGOAL #1: BRING THE ENTIRE STATE INTO ATTAINMENT FOR ALL CRITERIA AIR POLLUTANTS BY 2007 AND MAINTAIN AIR QUALITY IN AREAS ALREADY MEETING HEALTH STANDARDS.

MILESTONE/OBJECTIVE	PRESSURE INDICATORS (EMISSIONS, ETC.)	STATE INDICATORS (AIR CONCENTRATIONS, DEPOSITION,ETC.)	RESPONSE INDICATORS (ACTIVITIES, OUTCOMES)
ATTAIN THE AIR QUALITY STANDARDS FOR OZONE	BASE YEAR EMISSION INVENTORY FOR VOC AND NOX PROJECTED EMISSIONS FOR VOC AND NOX AFTER SIP IMPLEMENTATION VEHICLE MILES TRAVELED	AMBIENT OZONE LEVELS AT 16 SITES # OF EXCEEDANCES	PROGRESS ON COMPLETION OF ATTAINMENT PLAN (SIP)
ATTAIN AND MAINTAIN THE CO STANDARDS	VEHICLE MILES TRAVELED	AMBIENT CO LEVELS AT 16 SITES # OF EXCEEDANCES[1]	STATUS OF ENHANCED I/M PROGRAM STATUS OF MECHANICS TRAINING FOR I/M
MAINTAIN CURRENT ATTAINMENT STATUS FOR PARTICULATE MATTER		PM-10 CONCENTRATIONS AT 24 SITES # OF EXCEEDANCES	
MAINTAIN CURRENT ATTAINMENT STATUS FOR LEAD (PB)		PB DATA AT 10 SITES # OF EXCEEDANCES	
MAINTAIN CURRENT ATTAINMENT STATUS FOR NO2		NO2 DATA AT 10 SITES # OF EXCEEDANCES	
ATTAIN SO2 STANDARD STATEWIDE		SO2 DATA AT 16 SITES # OF EXCEEDANCES	
ALERT PUBLIC TO UNHEALTHFUL AIR QUALITY CONDITIONS		AIR POLLUTION LEVELS CONVERTED TO POLLUTANT STANDARDS INDEX (PSI)	

PERFORMANCE PARTNERSHIP AGREEMENT
AIR POLLUTION CONTROL PROGRAM
ENVIRONMENTAL GOALS/INDICATOR SUMMARY TABLE

SUBGOAL #2: MINIMIZE EXPOSURE TO TOXIC AIR CONTAMINANTS

MILESTONE/OBJECTIVE	PRESSURE INDICATORS (EMISSIONS, ETC)	STATE INDICATORS (AIR CONCENTRATIONS, DEPOSITION,ETC.)	RESPONSE INDICATORS (ACTIVITIES, OUTCOMES)
REDUCE HAZARDOUS AIR POLLUTANTS (HAPS) EMITTED BY MAJOR SOURCES BY IMPLEMENTING THE NATIONAL AIR TOXICS PROGRAM (TITLE III OF THE CAAA)[4]			NUMBER OF MACT STANDARDS DELEGATED NUMBER OF MACT WORKSHOPS FOR AFFECTED PARTIES & DEP STAFF
REDUCE TOXICS EMISSIONS FROM MOTOR VEHICLES		AMBIENT AIR CONCENTRATIONS OF BENZENE, ETC, AT 2 PAMS SITES	
IDENTIFY AND CORRECT MERCURY PROBLEMS RELATED TO AIR EMISSIONS			
IDENTIFY HOTSPOTS OF EXPOSURE TO AIR TOXICS AND REDUCE EMISSIONS WHICH LEAD TO THOSE EXPOSURES		METALS CONCENTRATION DATA AT 9 SITES BAP CONCENTRATION DATA AT 6 SITES	

What's Next in Air Indicators

- Deal effectively with the standard changes
- Develop consistent, comprehensive inventory data
- Present data in more understandable terms
- Revising the air quality index
- Continuum of health effects - no bright line
- Expanding Public Awareness - Involving the health community

What's Next - continued

- Communicating risk for non criteria pollutants
- Determining biologically active components of particles
- Begin to develop health based indicators
  - Science and research has a project to look at making hospital admissions and some other health data more readily available

How Is Data Reported?

- Pollutant Standards Index
- Web Page - www.state.nj.us/dep/airmon
- DEP Bulletin Board - 609 292-2006
- Toll Free Recording - 1-800-782-0160
- Publications
  - Annual report
  - Air Quality Update