Air Pollutant Data for Linking Studies

New Jersey Department of Health and Senior Services

New Jersey

View from Space

Close-up View

Air Pollutant/Health Linking Studies in New Jersey

- CDC 03074
  - Air toxics (carcinogens) in relation to:
    - incidence of selected cancers
    - prevalence of selected birth defects
  - Protocols in development

- ATSDR 02112
  - Air toxics (asthmagens), criteria air pollutants and asthma hospitalization

Asthma and Hazardous Air Pollutants

- ## Study A
  - All 566 municipalities
  - Annual asthma hospitalization rates (1995-1997)
  - Average annual air toxics concentrations (NATA modeled estimates, 1996)

- ## Study B
  - 4 municipalities
  - Daily asthma hospitalization rates (1999-2001)
  - Periodic air toxics measurements

- Formaldehyde, cadmium, chromium, nickel

Air Pollutant Exposure Assessment

- Exposure (at x,y,t) determined by:
  - Concentrations in air (ambient, indoor)
  - Individual behaviors
    - Inhalation rate, time/activity patterns
- For linking studies, need surrogates of exposure at appropriate geographic scale and at appropriate times

Ambient Air Pollutant Data Sources

Facility/
Emissions

Monitoring
Stations

Mobile
Sources

Area
Sources

Modeling
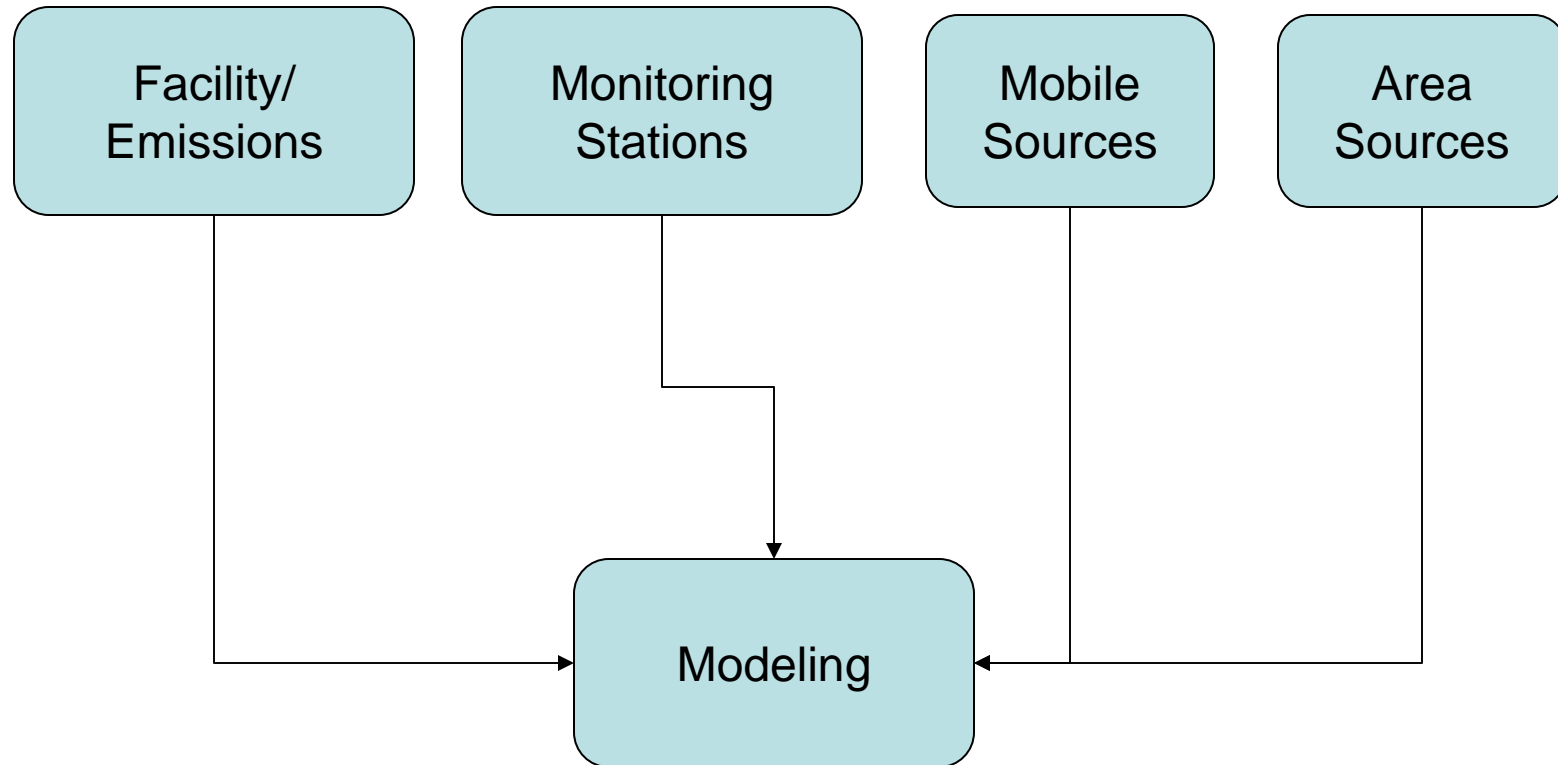
Air Pollutant Monitoring in New Jersey

- ## Network of 47 monitoring sites
  - Continuous monitoring for:
    - CO, NO_x, O_3, SO_2, smoke shade, $PM_{2.5}$
  - Manual monitoring for:
    - $PM_{2.5}$, PM_{10}, lead, TSP, acid deposition, ozone precursors, VOCs, SVOCs, metals (from $PM_{2.5}$ speciation)

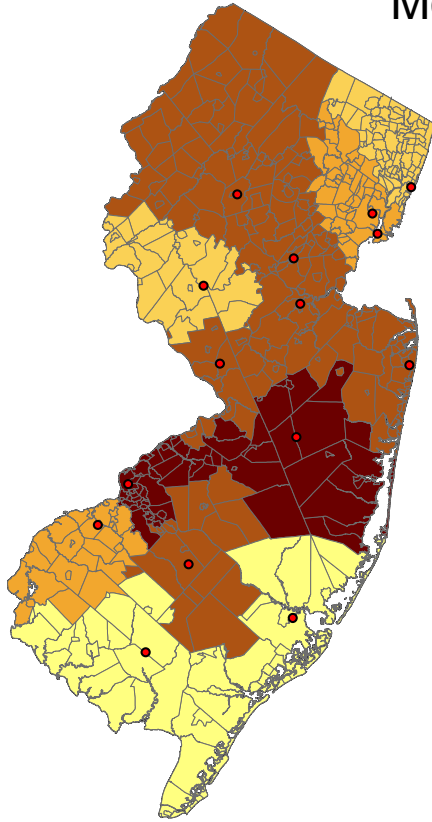- http://www.state.nj.us/dep/airmon/net02.pdf
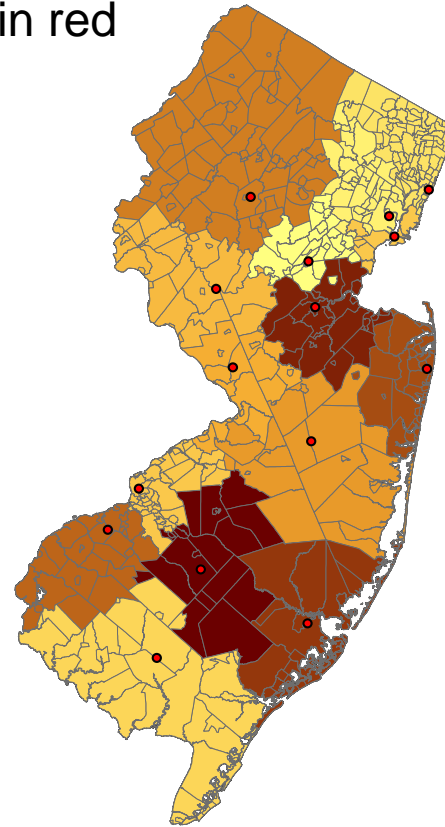
Ozone Modeling
Based on Monitoring Data
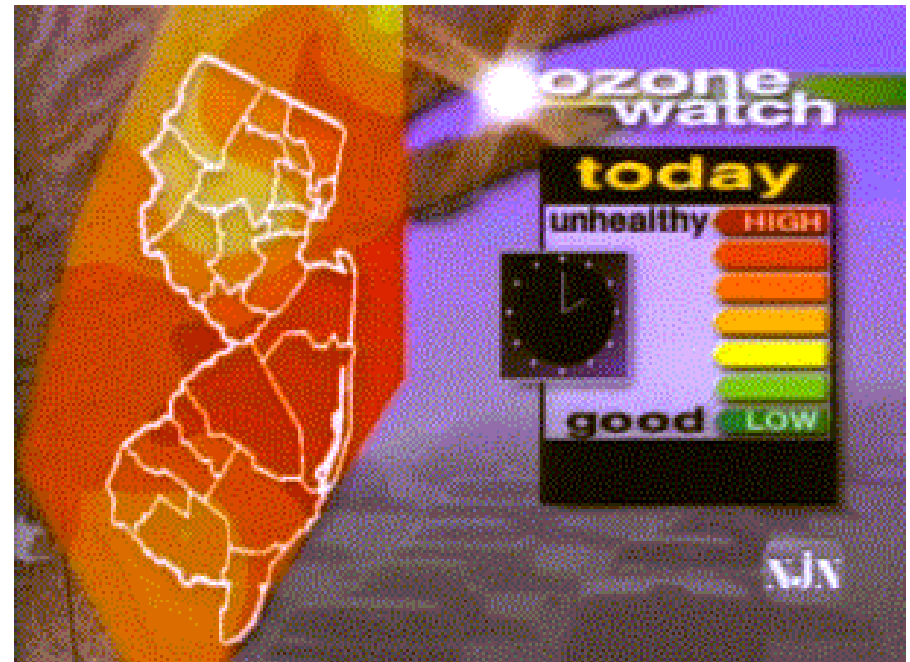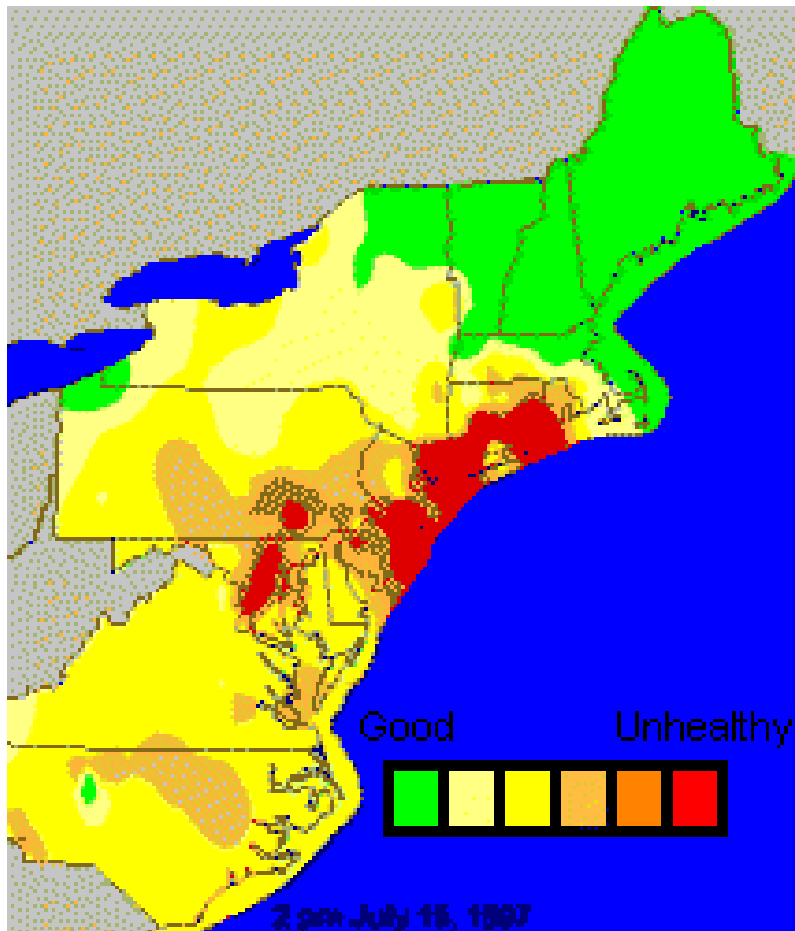
Ozone

Municipal populations assigned value from nearest monitor

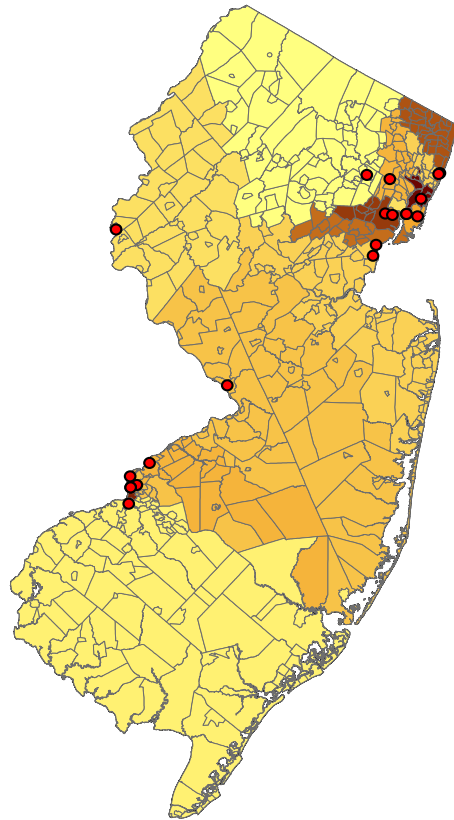Monitor locations in red

Quartiles: Number of
Hours > 0.08 ppm

Quartiles: Maximum
Hourly Concentration

PM$_{10}$

Municipal populations assigned value from nearest monitor
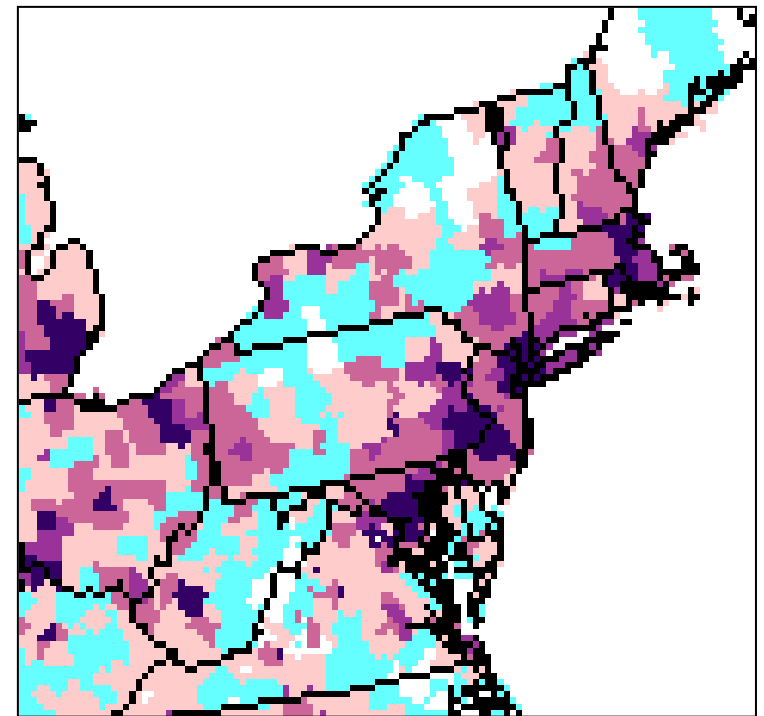
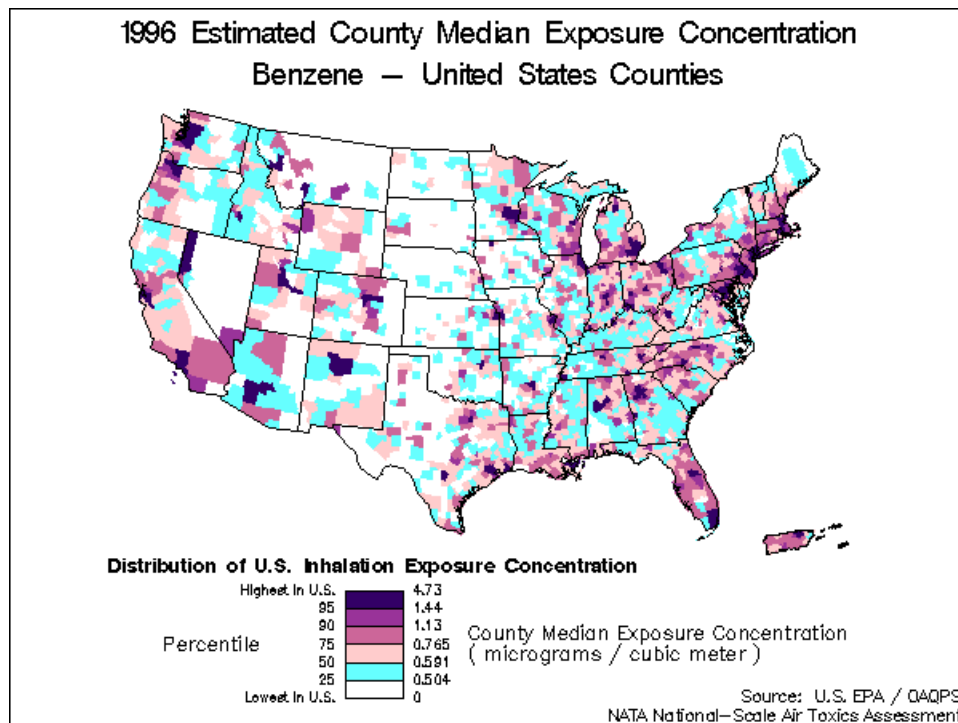### Monitor locations in red

Quartiles: Annual Average Concentration

Air Toxics Multi-source Modeling: National Air Toxics Assessment

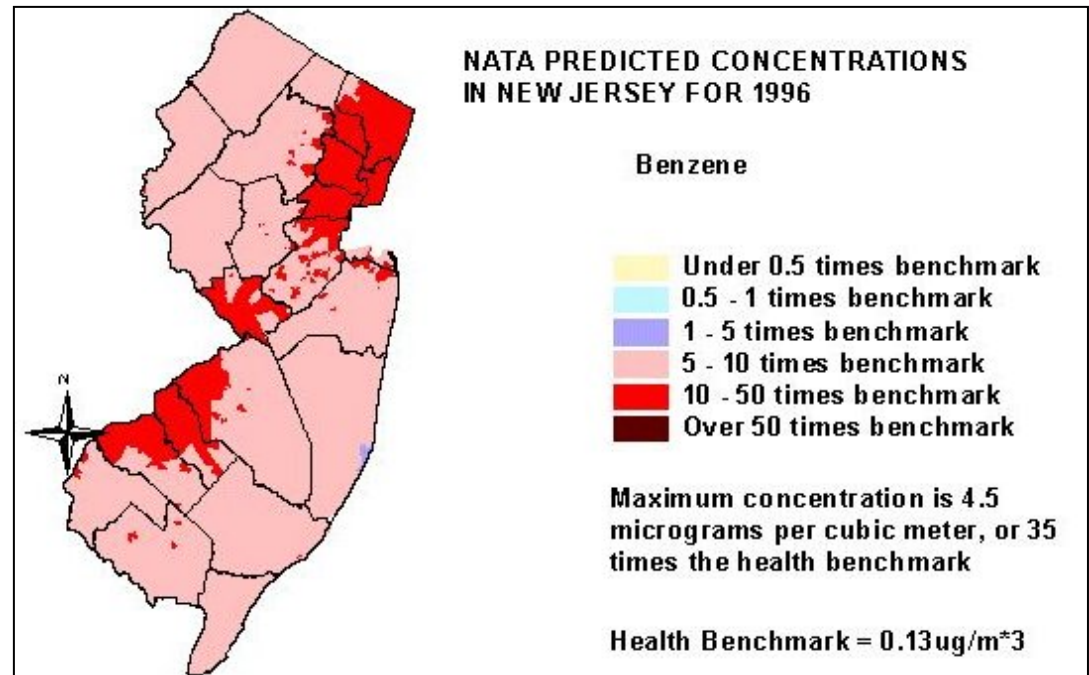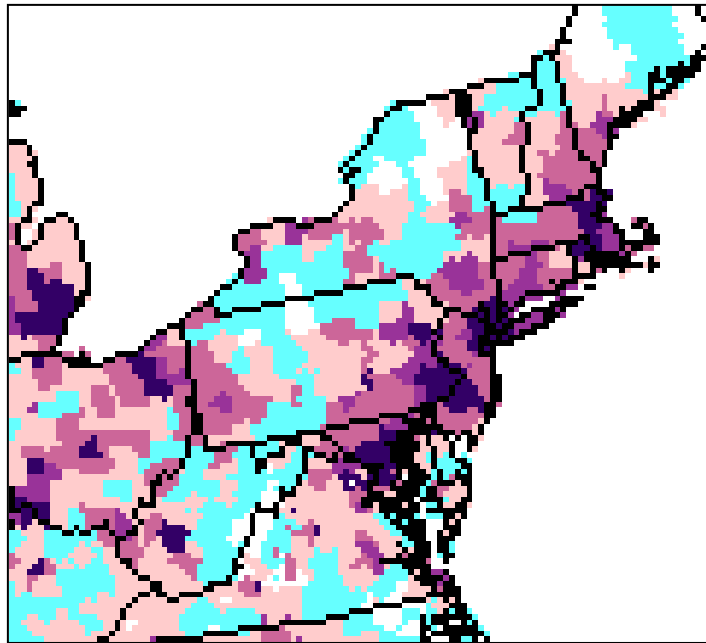- USEPA conducted national-scale multi-source modeling of estimated concentrations of 32 air toxics + diesel PM for year 1996
- Assessment steps:
  - Compile national emissions inventory
    - Point, area and mobile sources
  - Estimate ambient concentrations by census tract
    - ASPEN dispersion model
  - Estimate population exposure
    - HAPEM4 model
  - Characterize risk

Source: http://www.epa.gov/ttn/atw/nata

NATA Estimates for Benzene

1996 Estimated County Median Exposure Concentration
Benzene — United States Counties

Distribution of U.S. Inhalation Exposure Concentration

Percentile		
Highest in U.S.		4.73
95		1.44
90		1.13
75		0.765
50		0.591
25		0.504
Lowest in U.S.		0

County Median Exposure Concentration
(micrograms / cubic meter)

Source: U.S. EPA / OAQPS
NATA National-Scale Air Toxics Assessment

NATA Estimates for Benzene at County and Census Tract Scales

NATA PREDICTED CONCENTRATIONS IN NEW JERSEY FOR 1996

Benzene

- Under 0.5 times benchmark
- 0.5 - 1 times benchmark
- 1 - 5 times benchmark
- 5 - 10 times benchmark
- 10 - 50 times benchmark
- Over 50 times benchmark

Maximum concentration is 4.5 micrograms per cubic meter, or 35 times the health benchmark

Health Benchmark = 0.13ug/m*3

Low Background and Area Sources

NATA PREDICTED CONCENTRATIONS
IN NEW JERSEY FOR 1996

7-PAH

Under 0.5 times benchmark
0.5 - 1 times benchmark
1 - 5 times benchmark
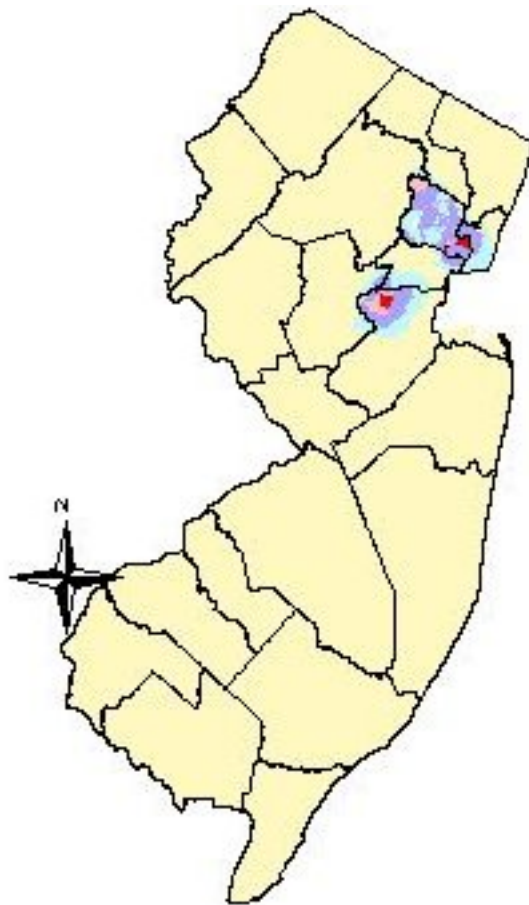5 - 10 times benchmark
10 - 50 times benchmark
Over 50 times benchmark
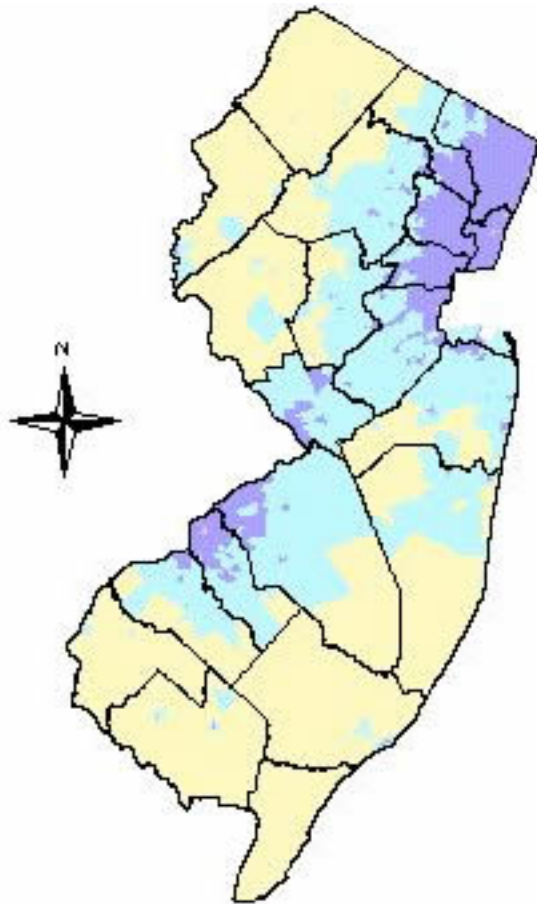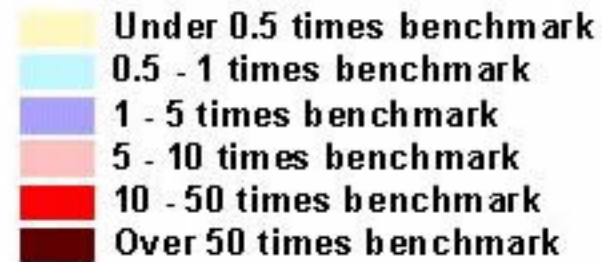
Maximum concentration is 0.03
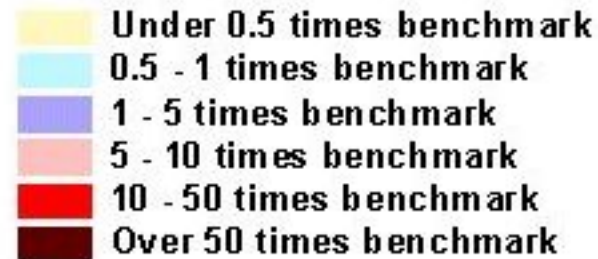micrograms per cubic meter, or 6
times the health benchmark

Health Benchmark = 0.005ug/m*3

Low Background and Point Sources

NATA PREDICTED CONCENTRATIONS
IN NEW JERSEY FOR 1996

Hydrazine

- Under 0.5 times benchmark
- 0.5 - 1 times benchmark
- 1 - 5 times benchmark
- 5 - 10 times benchmark
- 10 - 50 times benchmark
- Over 50 times benchmark

Maximum concentration is 0.01 micrograms per cubic meter, or 57 times the health benchmark

Health Benchmark = 0.0002ug/m*3

High Background and Point Sources

NATA PREDICTED CONCENTRATIONS
IN NEW JERSEY FOR 1996

Chloroform

N

Under 0.5 times benchmark
0.5 - 1 times benchmark
1 - 5 times benchmark
5 - 10 times benchmark
10 - 50 times benchmark
Over 50 times benchmark

Maximum concentration is 2.3
micrograms per cubic meter, or 54
times the health benchmark

Health Benchmark = 0.0435 ug/m*3

High Background and Mobile Sources
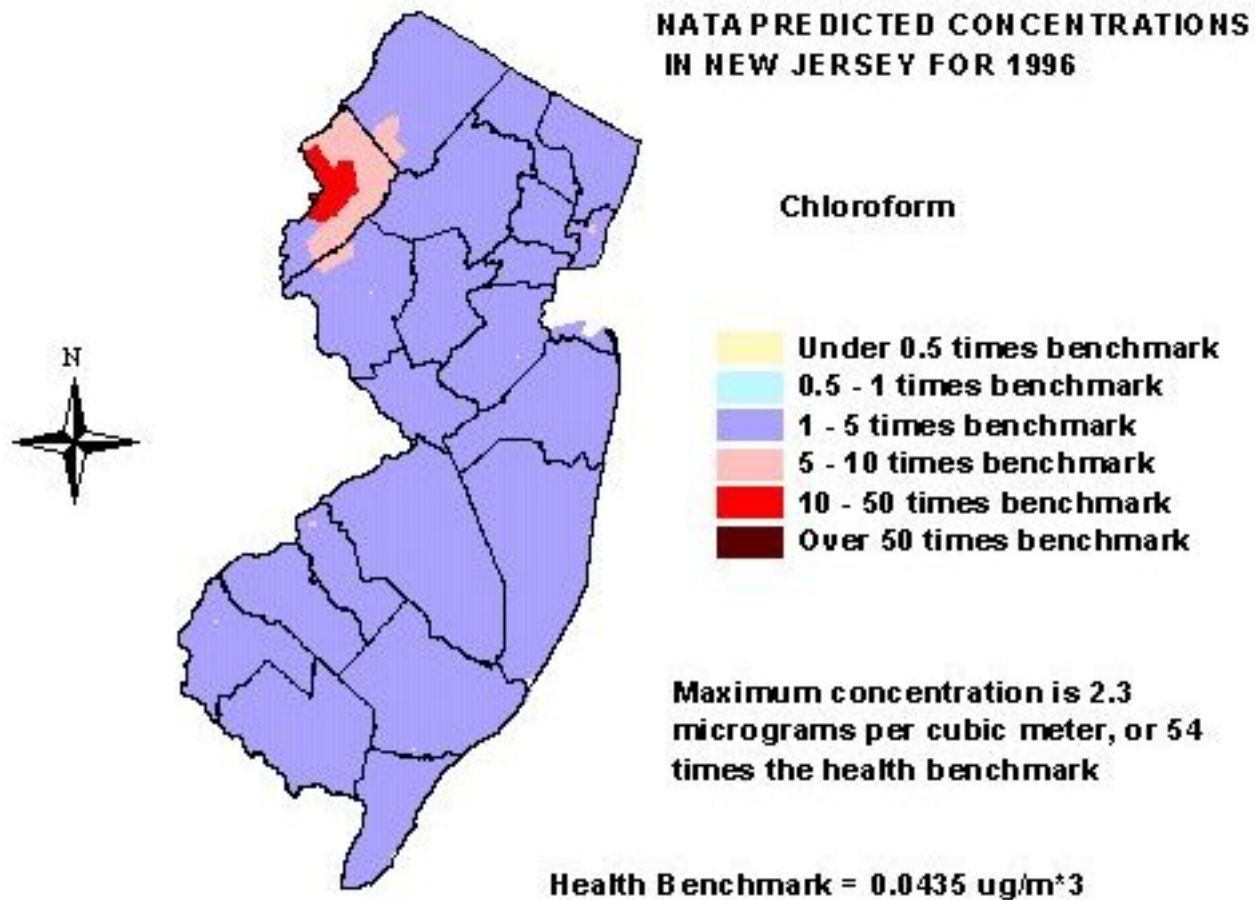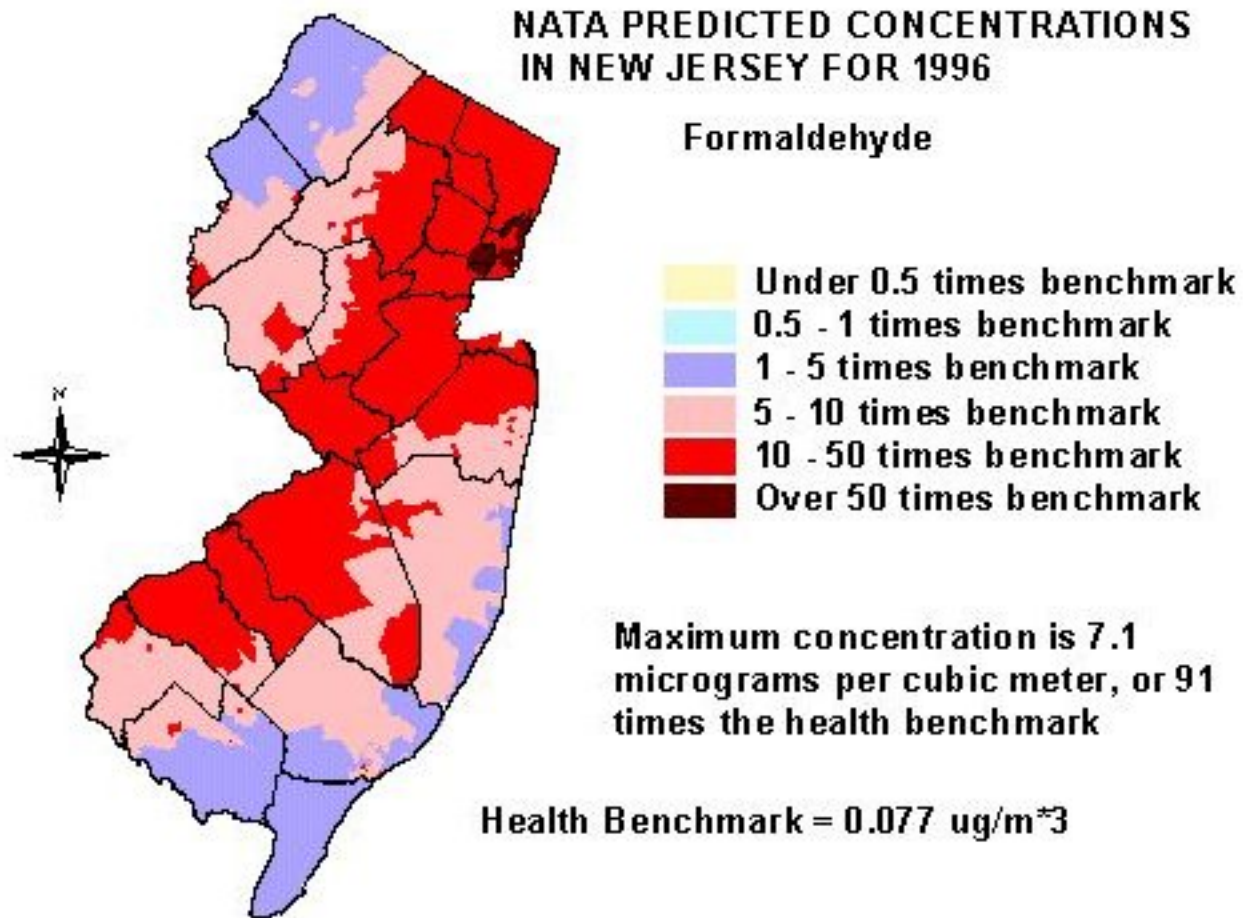

NATA PREDICTED CONCENTRATIONS
IN NEW JERSEY FOR 1996

Formaldehyde

Under 0.5 times benchmark
0.5 - 1 times benchmark
1 - 5 times benchmark
5 - 10 times benchmark
10 - 50 times benchmark
Over 50 times benchmark

Maximum concentration is 7.1
micrograms per cubic meter, or 91
times the health benchmark

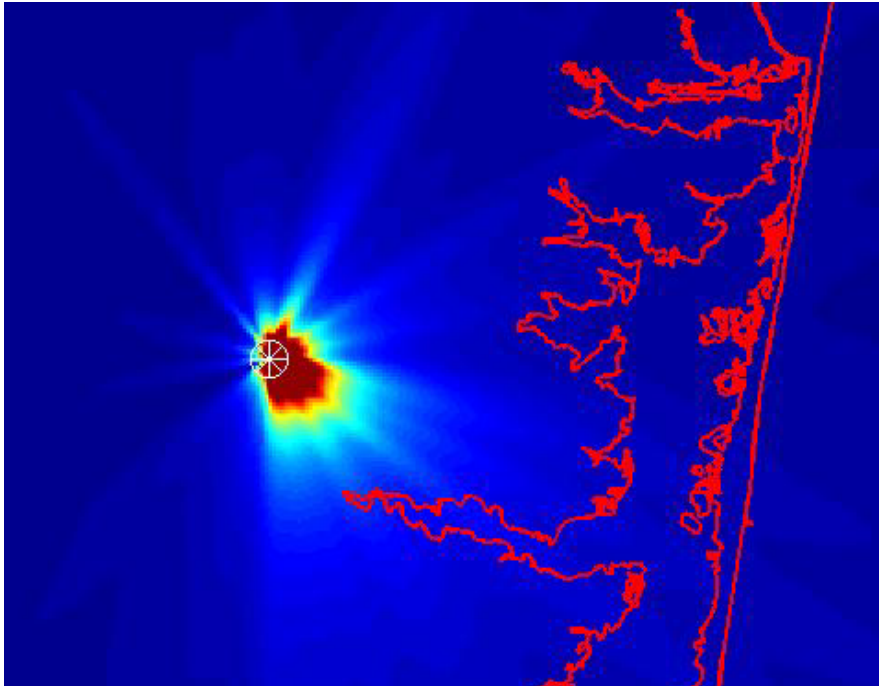Health Benchmark = 0.077 ug/m*3

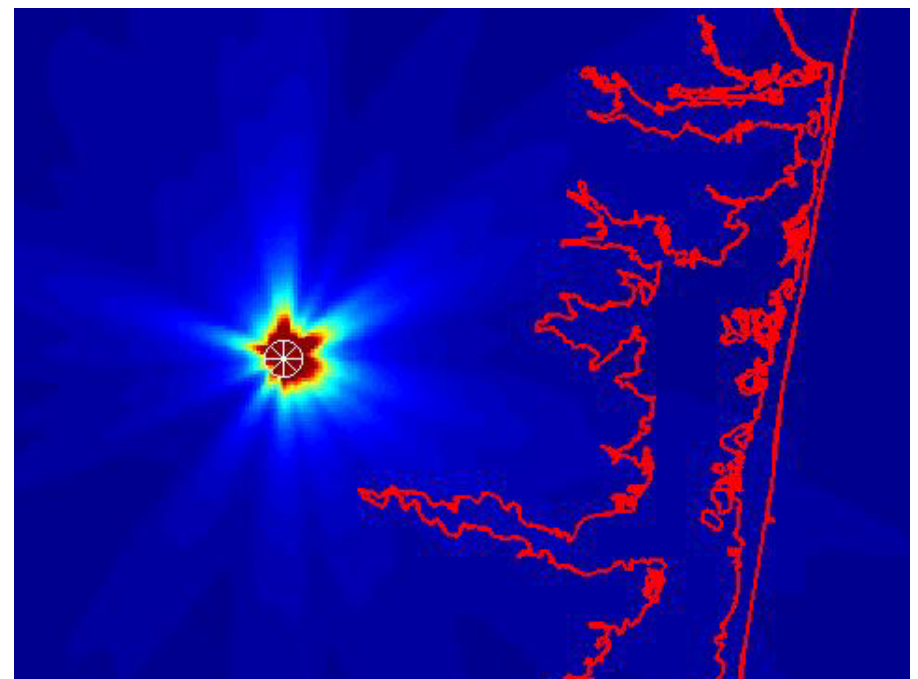# Facility-specific
Air Dispersion Modeling

- Emissions and facility operations data
  - Composition of emissions
  - Rates of emissions; hourly, daily and seasonal variability
  - Physical characteristics of the facility
- Meteorological data
  - Location relative to study area
  - Availability, completeness and reliability of hourly data
- Locations of receptors relative to the source

ISC-ST Monthly Average Estimates for Chemical Plant Emissions
From EOHSI

January 1984

July 1986