

Air Toxics Modeling
by
Tyler Fox
EPA/OAQPS

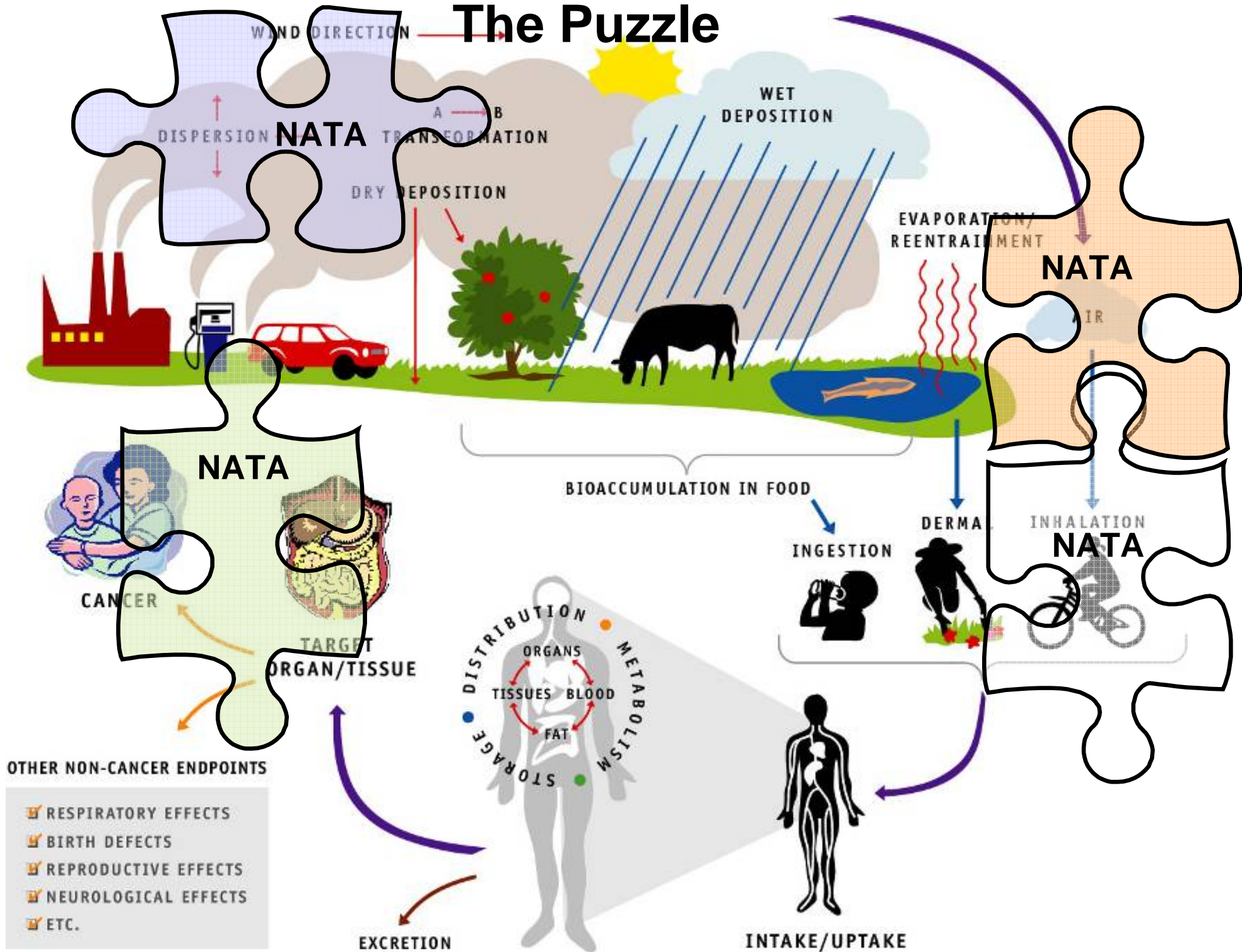
Historical

- Emphasis on facility/pollutant specific assessments
- National level risk estimates generated by
 - National Air Toxics Assessment (NATA)
 - Census tract level risks by pollutant, generated by dispersion modeling and available emissions
 - Results provided guidance for new national air toxics monitoring program...2001

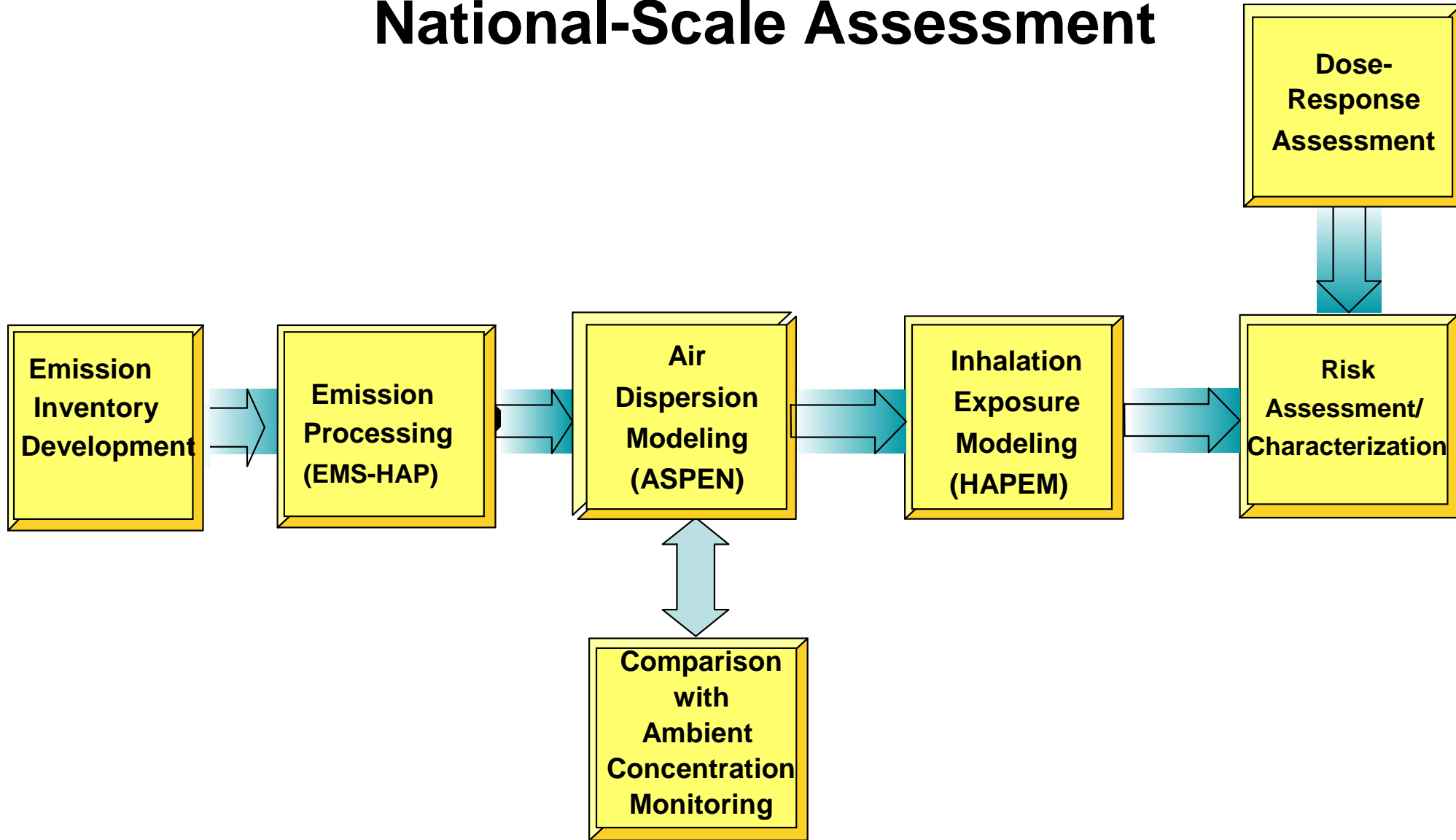
What is NATA?

- **Characterization of air toxics across the nation**
 - Nationwide assessment with census tract resolution for 177 HAPs plus diesel PM
 - Emissions, modeled ambient concentrations and estimated inhalation exposures from outdoor sources
 - Cancer and noncancer risk estimates for the 133 HAPs with health data based on chronic exposures
- **Tools for State/Local/Tribal Agencies (and EPA) to prioritize pollutants, emission sources and locations of interest**
 - Provides a starting point for local-scale assessments
 - Focuses community efforts
 - Informs monitoring programs
- **A few pieces of the air toxic puzzle**

The Puzzle



Components of the NATA National-Scale Assessment



1999 National-Scale Assessment

Risk Characterization - Significant Pollutants

- Cancer
 - **National drivers**
 - Benzene
 - **Regional drivers**
 - Arsenic compounds
 - Benzidine
 - 1,3-Butadiene
 - Cadmium compounds
 - Carbon Tetrachloride
 - Chromium 6
 - Coke oven
 - Ethylene oxide
 - Hydrazine
 - Naphthalene
 - Perchloroethylene
 - POM
- Non-Cancer
 - **National drivers**
 - Acrolein
 - **Regional drivers**
 - Antimony
 - Arsenic Compounds
 - 1,3-Butadiene
 - Cadmium compounds
 - Chlorine
 - Chromium 6
 - Diesel PM
 - Formaldehyde
 - Hexamethylene 1-6-diisocyanate
 - Hydrazine
 - Hydrochloric acid
 - Maleic anhydride
 - Manganese compounds
 - Nickel compounds
 - 2,4-Toluene Diisocyanate
 - Triethylamine

¹ At least 25 million people exposed to risk > 10 in 1 million

² At least 1 million people exposed to risk > 10 in 1 million OR At least 10,000 people exposed to risk > 100 in 1 million

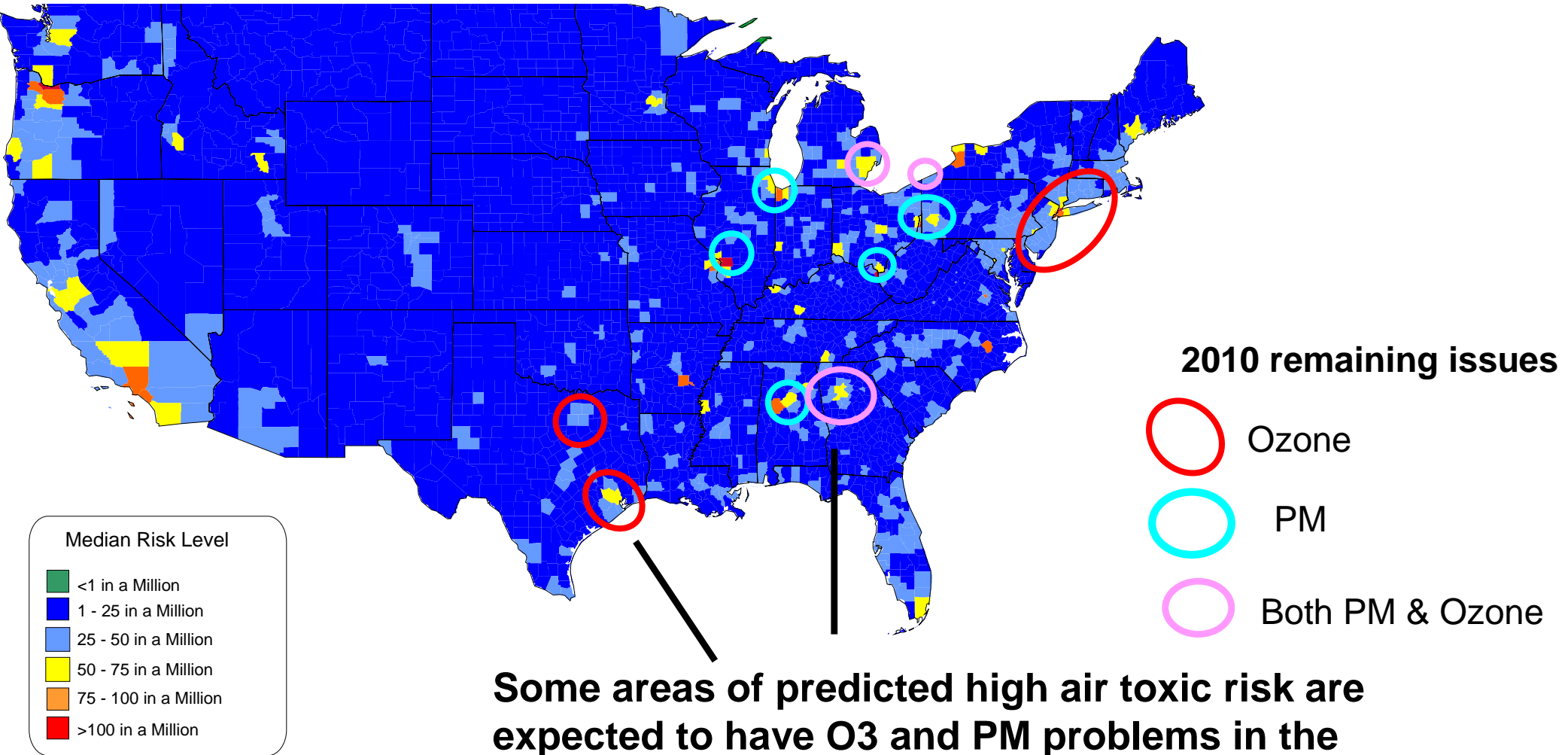
³ At least 25 million people exposed to a hazard quotient (HQ) > 1.0

⁴ At least 10,000 people exposed to HQ > 1
Blue indicates new drivers since 1996

High Risk Counties often Coincide with Locations where Criteria Pollutant Issues are Significant -

Impetus for multi-pollutant strategies

1999 NATA - National Scale Assessment
Predicted County Level Carcinogenic Risk



Some areas of predicted high air toxic risk are expected to have O3 and PM problems in the future (2010)

Emerging focus

- Integration of HAPs and CAPs through CMAQ-based multi-pollutant modeling framework
 - Harmonize emissions processes resulting in integrated inventories
 - Provide chemical linkage across HAPs and CAPs
 - Enable assessment of emission strategy options considering co-benefits and tradeoffs across pollutant categories and ecosystem deposition

Multipollutant Modeling Capability

For Strategy Analysis: Illustrative Example

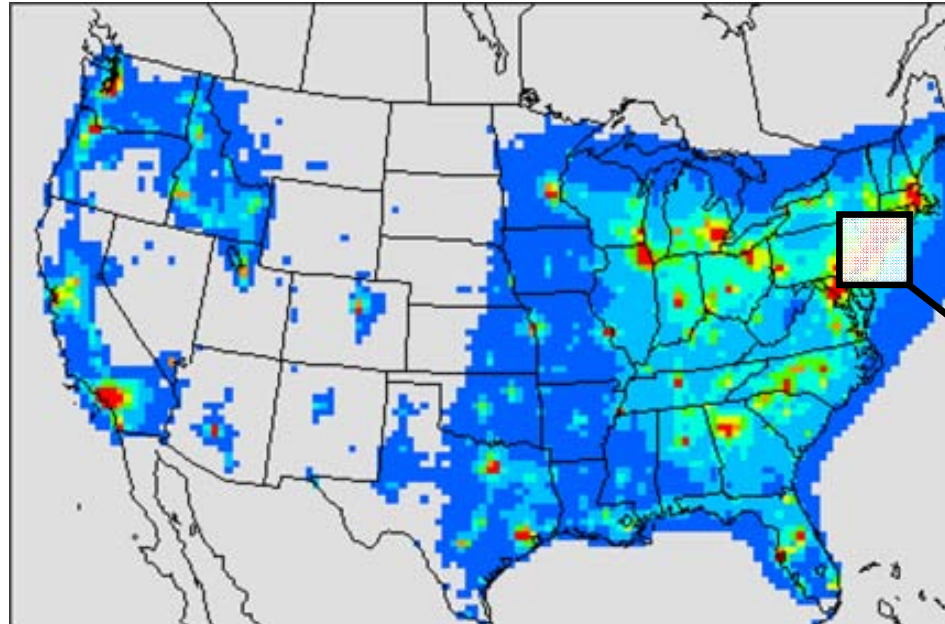
Possible Strategy: Pulp and Paper

Flue gas desulfurization (wet scrubber)
limit SO₂ to 2 lb/ ODTP (oven-dried
tons pulp production)

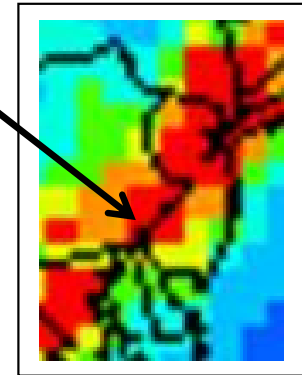
**Resulting reductions (industry
average)**

Pollutant	Reduction
SO ₂	78%
PM _{2.5}	99%
Organic HAP	89 to 94%
non-hg metal HAP	70 to 99%
HCl	100%
Hg	70-90%

Nationwide CMAQ Predicted Change in PM_{2.5} or Ozone



Philadelphia county



Urban scale AERMOD/CMAQ Toxics Concentrations for particular HAP

