The US Air Toxic Program & Results from the National Evaluation of Air Toxics

III Workshop on recent scientific findings on air pollution
 and implications on policy making: Air toxics
Monterrey, Nuevo León, Mexico

Ted Palma, USEPA-OAQPS
palma.ted@epa.gov
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Purpose of briefing

- Provide an overview of the US Clean Air Act for Air Toxics

- Provide background information on NATA

- Provide summary of NATA 2002 results

Clean Air Act - Air Toxic Program

- MACT Standards (112(d))
  - Technology based standards for each source category. Promulgated 96 MACT standards covering 174 source categories. Completed in 2004

- Area Source Standards (112(k))
  - EPA has identified a total of 70 area source categories which represent 90 percent of the emissions of the 30 listed air toxics. Of these 70 area source categories, 53 had been regulated by June 2009

- Section 112(f)(2) Residual Risk
  - Assess risks that remain after implementation of MACT standards within 8 years of promulgation
  - Set additional standards if MACT does not protect public health with an "ample margin of safety"
  - Set additional standards if necessary to prevent adverse environmental effects
  - We have finalized residual risk standards for 16 source categories, proposed 10 more

- Section 112(d)(6) Technology Review
  - Review and revise MACT standard, as necessary, every 8 years
  - Evaluate developments in practices, processes, and control technologies

Residual Risk Decision Framework

Goals:

- Limit Maximum Individual Risk (MIR) for cancer to no higher than about 100-in-1 million (MIR is the person exposed to maximum lifetime HAP concentrations)
- Protect the greatest number of persons to less than 1-in-1 million lifetime cancer risk

<u>Step one</u> - Achieve "acceptable risk" of approximately 100-in-1 million or less considering all health information, including uncertainty and without consideration of costs

<u>Step two</u> - Set standard to provide "ample margin of safety" considering health information and other relevant factors (costs, feasibility)

What is the National Air Toxic Assessment (NATA)?

- **Characterization of air toxics across the nation** (US)
  - Nationwide assessment with _census tract[1]_ resolution for 180 Hazardous Air Pollutants (HAPs) plus Diesel Particulate Matter (DPM)
  - Emissions, modeled ambient concentrations and estimated _inhalation exposures_ from _outdoor sources_
  - _Cancer and noncancer_ risk estimates for the 123 HAPs with health data based on _chronic exposures_

- **Tool for EPA as well State/Local/Tribal Agencies to prioritize pollutants, emission sources and locations of interest; or it helps us focus our resources towards the pollutants, facilities, and locations with greatest risks.**

- **NATA serves as a scorecard for our air toxic program**

1 Census block data available for point sources

NATA History

- 1996 NATA
    - Based on 1996 National Toxic Inventory (NTI)
    - Release May 2002 (6 year lag)
    - **33 HAPs + DPM**

- 1999 NATA
    - Based on 1999 National Emissions Inventory (NEI)
    - Released Feb 2006 (7 year lag)
    - **177 HAPs + DPM**

- **2002 NATA**
    - **Based on 2002 NEI**
    - **Released in June 2009**
    - **180 HAPs + DPM**

- 2005 NATA/NAPA
    - Based on 2005 NEI
    - Expect Public release in 2010
    - Transitioning to National Air Pollutant Assessment (NAPA) approach

- 2008 NAPA
    - New modeling framework
    - Goal: Integrated assessment capability for criteria air pollutants and HAPs
    - Expected Release 2011

Who uses NATA?

- EPA
  - Office of Air Quality Planning and Standards (OAQPS)
    - USA Today school ranking – NATA 2002 was primary tool (in addition to Risk Screening Indicators Tool (RSEI) 2005 and Toxic Release Inventory (TRI) 2007) in determining which schools and pollutants to monitor
    - Risk and Technology Rulemakings (e.g., dry cleaning, chrome plating)
    - Allocation of state and local air toxics grant dollars to regions
    - Development of National Air Toxic Trend Sites (NATTS)

  - Office of Transportation and Air Quality (OTAQ)
    - Mobile Source Air Toxic Rule - used NATA for current and projected risk levels

  - Office of Research and Development (ORD)
    - Uses NATA to set research agenda
    - Comparing with field studies Detroit Exposure and Aerosol Research Study (DEARS)

  - Office of Environmental Information (OEI)
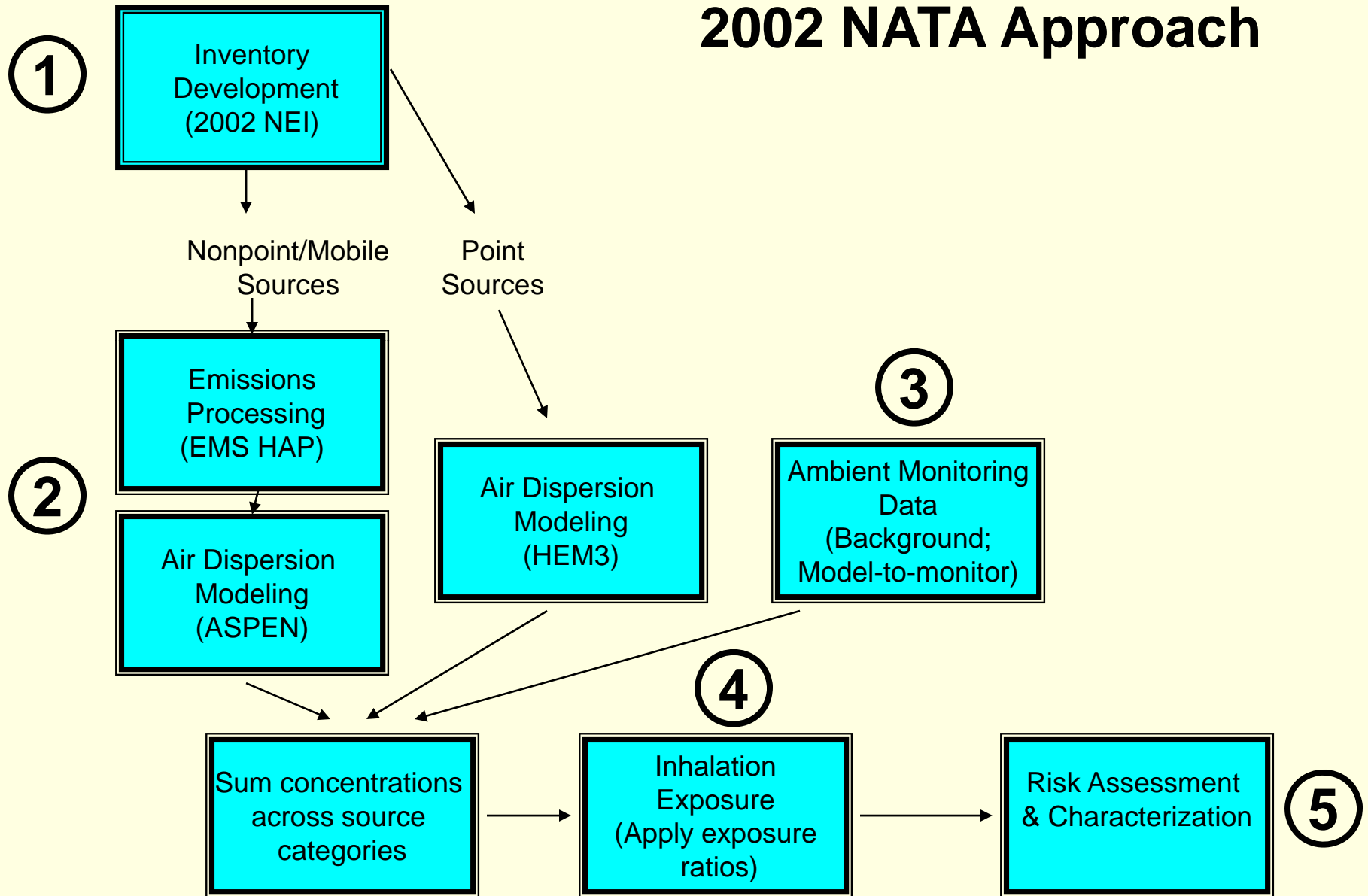   - Window to My Environment (WME) application – air toxic component

- States
  - Many State Air Toxic Programs set priorities using NATA (Oregon, New York)
  - Identify gaps in emissions inventories, encourage inventory improvements

- Academia
  - NATA referenced in 100's of papers/studies

2002 NATA Approach

① Inventory Development (2002 NEI)

Nonpoint/Mobile Sources

Point Sources

② Emissions Processing (EMS HAP)

Air Dispersion Modeling (ASPEN)

Air Dispersion Modeling (HEM3)

③ Ambient Monitoring Data (Background; Model-to-monitor)

Sum concentrations across source categories

④ Inhalation Exposure (Apply exposure ratios)

Risk Assessment & Characterization **⑤**

Overall Summary of 2002 NATA Results

- The **average cancer risk*** for 2002 is **36 in a million** (1 in 27,000) compared to 42 in a million (1 in 24,000) in 1999

    - The agency considers risks less than "1 in a million" as negligible
    - This represents the subset of total air toxics cancer risk which can be quantified
    - **Benzene** is most significant carcinogen
    - To put this in perspective:
        - radon presents a risk of 2,000 in a million (1 in 500)
        - it is estimated that one out of every three Americans will contract cancer during a lifetime, when all causes are taken into account.
            - Two thirds of this risk is due to smoking or lifestyle factors
    - Cancer risks range nationally (at census tract) from 2 to over 1,000 in a million

- The **average noncancer risk** for 2002 is a **hazard index 4.5** compared to 6.4 in 1999

    - Hazard Index (HI) is a measure used to show noncancer risks (e.g. respiratory toxicity)
    - The agency considers a HI of less than 1 as without appreciable risk
    - **Acrolein** a majority of this risk
    - Noncancer HI values range nationally (at census tract) from 0.05 to 130

* Note: This is an estimate of the average American's chance of contracting cancer from breathing the air toxics analyzed here, if they were exposed to 2002 emissions levels for 70 years. This assessment does not include indoor air, diesel emissions, non inhalation exposure pathways. Risks from PM and other criteria pollutants are not included in this assessment.
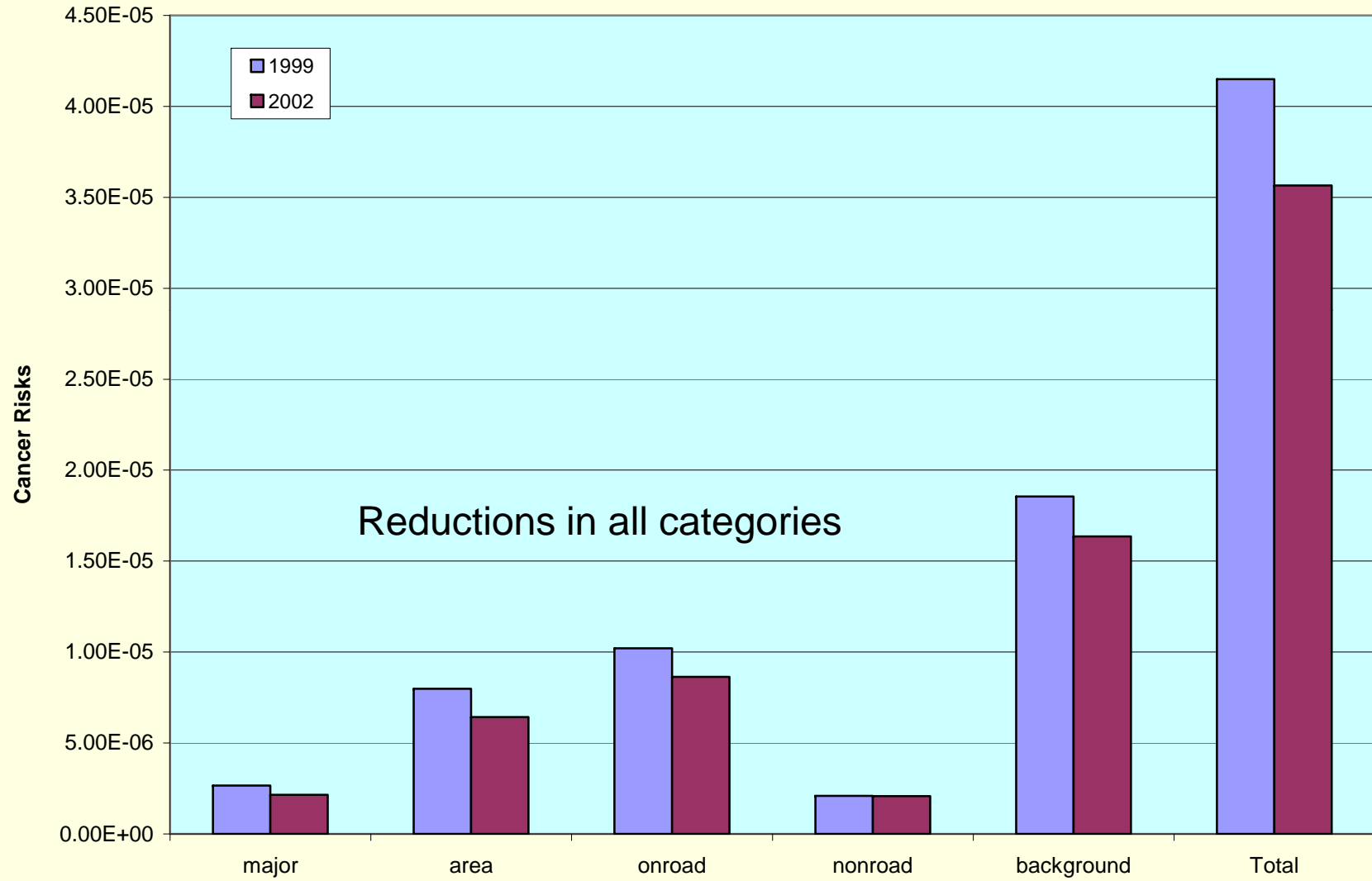
Why are the risks lower in 2002?

- Emissions Changes
  - from 1999 to 2002 the NEI shows a reduction of over 500,000 tons/year or an overall drop of about 10%
    - Major source emissions fell by 30%
    - Onroad source emissions fell by 17%

  - 21 Maximum Achievable Control Technology (MACT) standards with compliance dates between 1999 and 2002
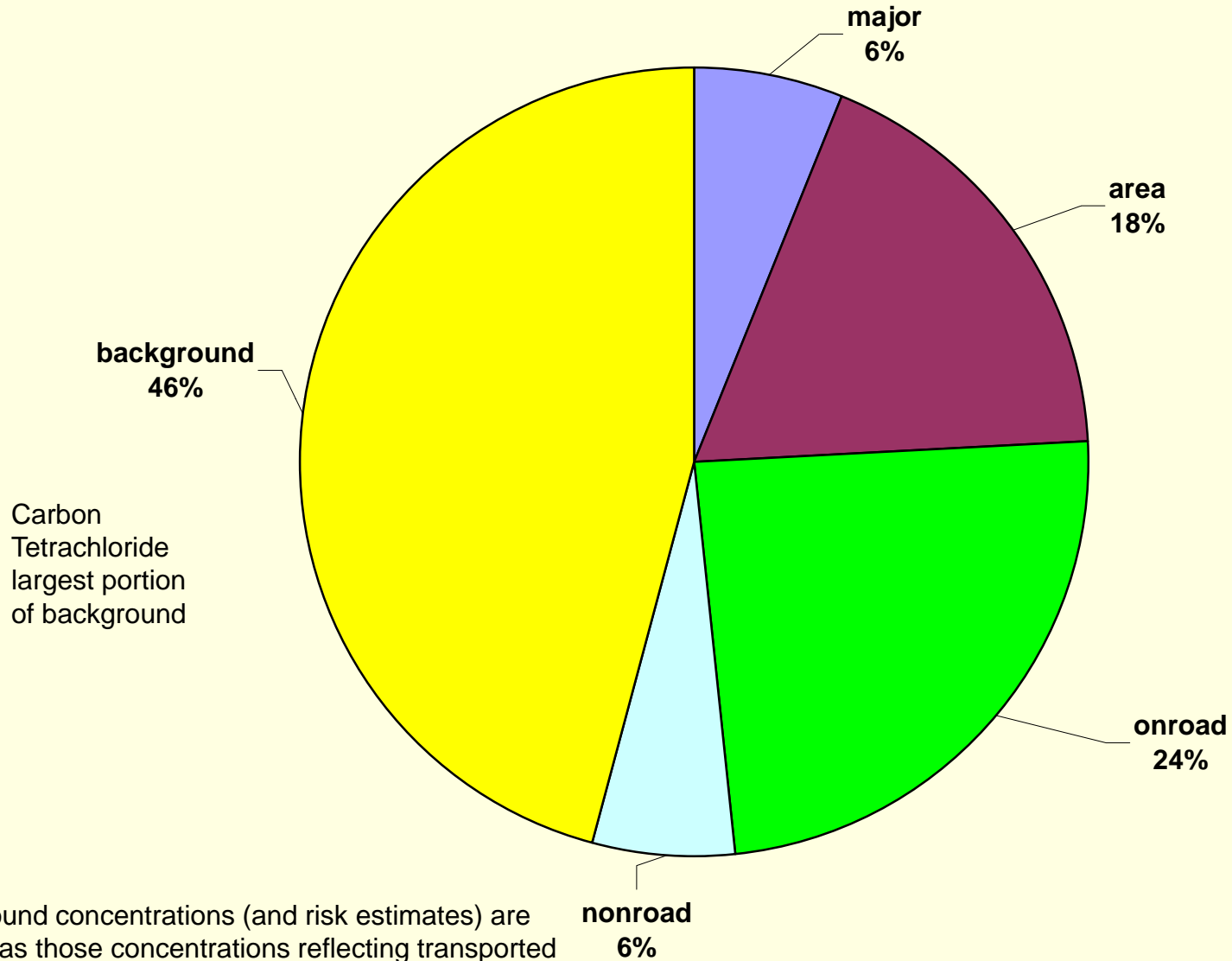
- Methodology Changes
  - Improved background
  - Inventory improvements (i.e., Chrome speciation)
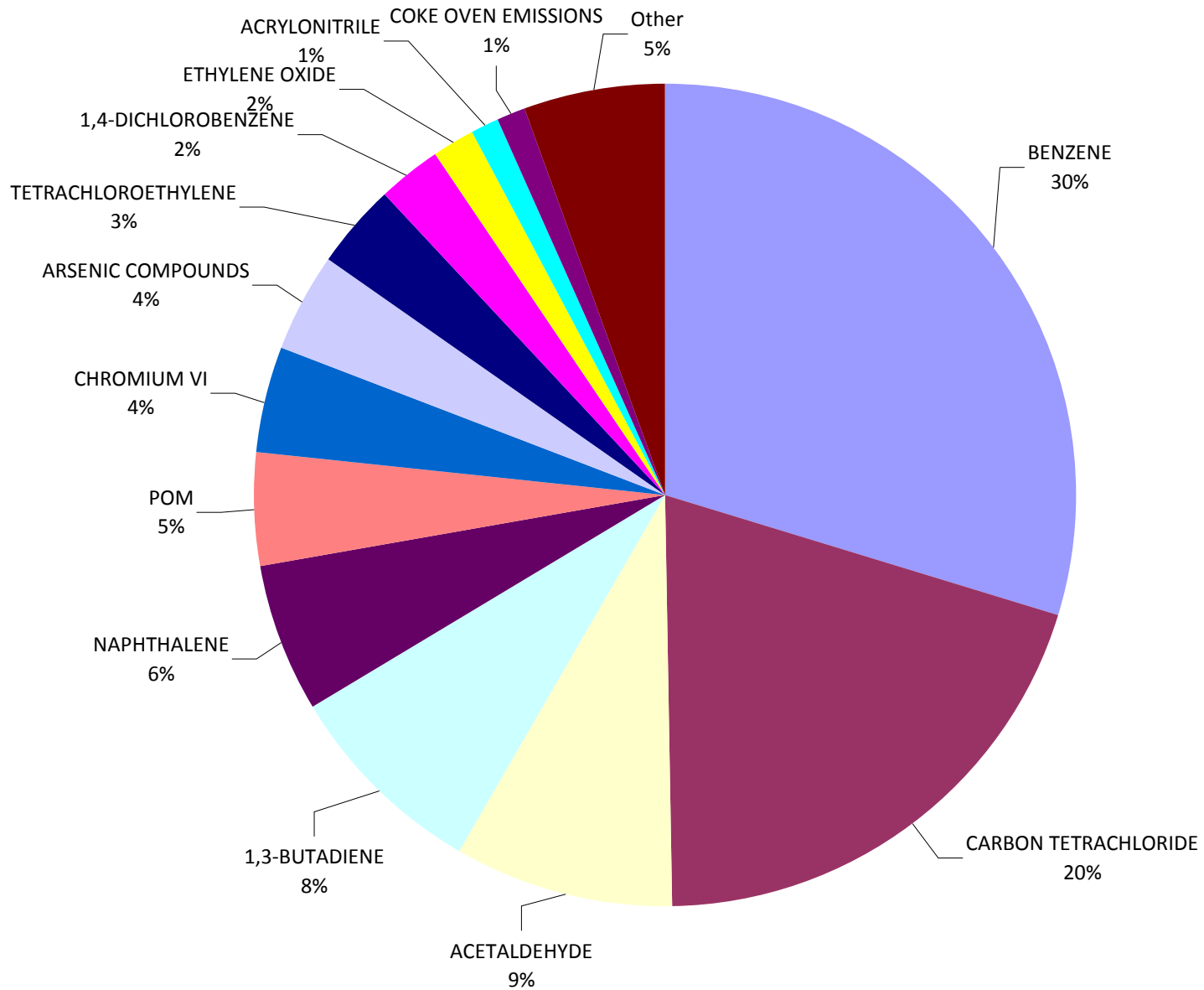
1999-2002 NATA Comparison

2002 NATA National Cancer Risks (36 in a million)

major
6%

area
18%

onroad
24%

nonroad
6%

background
46%
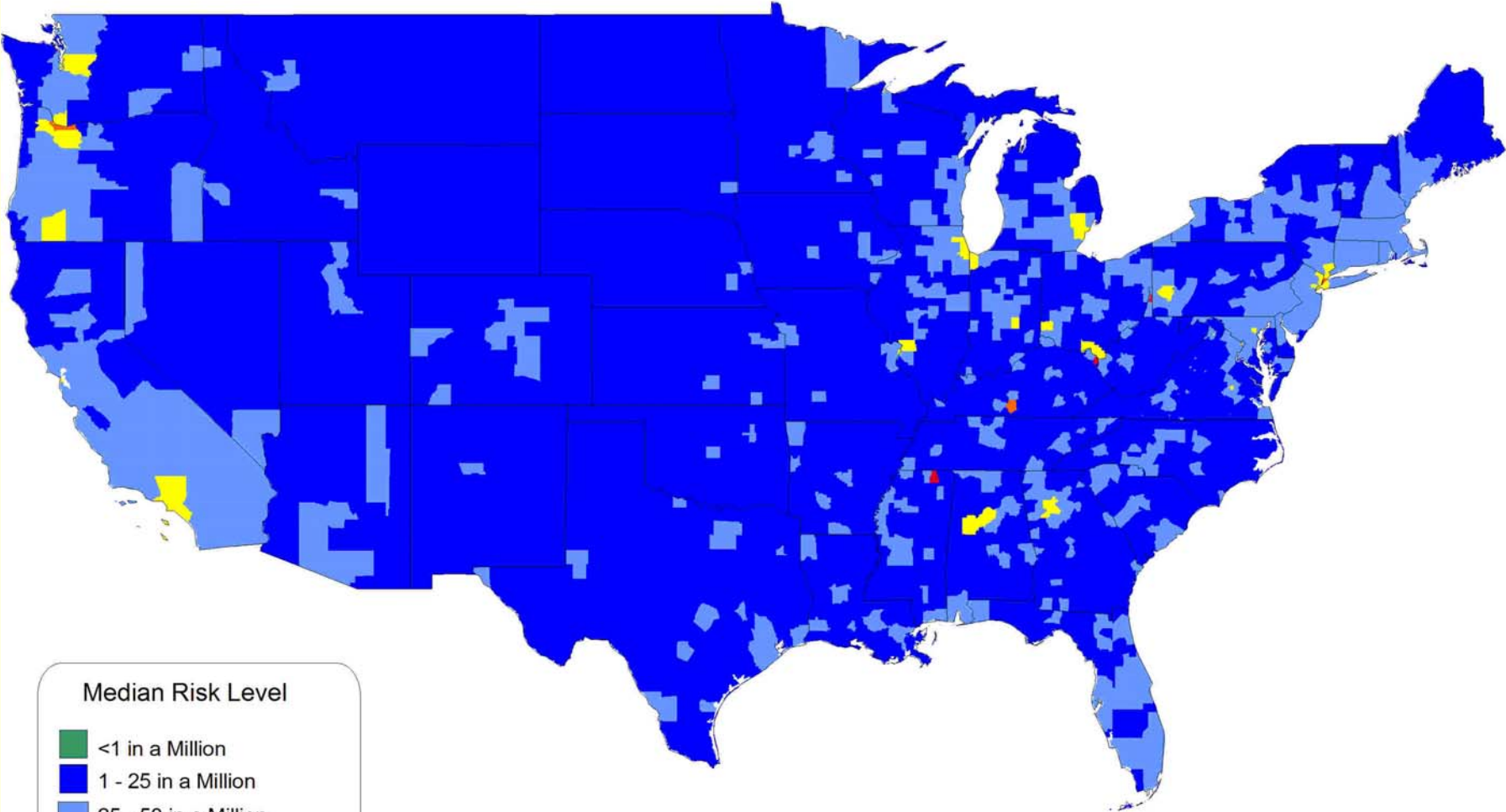
Carbon
Tetrachloride
largest portion
of background

Background concentrations (and risk estimates) are
defined as those concentrations reflecting transported
contributions from farther than 50 km away, unidentified
emissions sources, persistent pollutants, and natural
emissions sources

2002 NATA Pollutant Drivers

ACRYLONITRILE
1%

COKE OVEN EMISSIONS
1%

Other
5%

ETHYLENE OXIDE
2%

1,4-DICHLOROBENZENE
2%

TETRACHLOROETHYLENE
3%

ARSENIC COMPOUNDS
4%

CHROMIUM VI
4%

POM
5%

NAPHTHALENE
6%

1,3-BUTADIENE
8%

ACETALDEHYDE
9%

BENZENE
30%

CARBON TETRACHLORIDE
20%

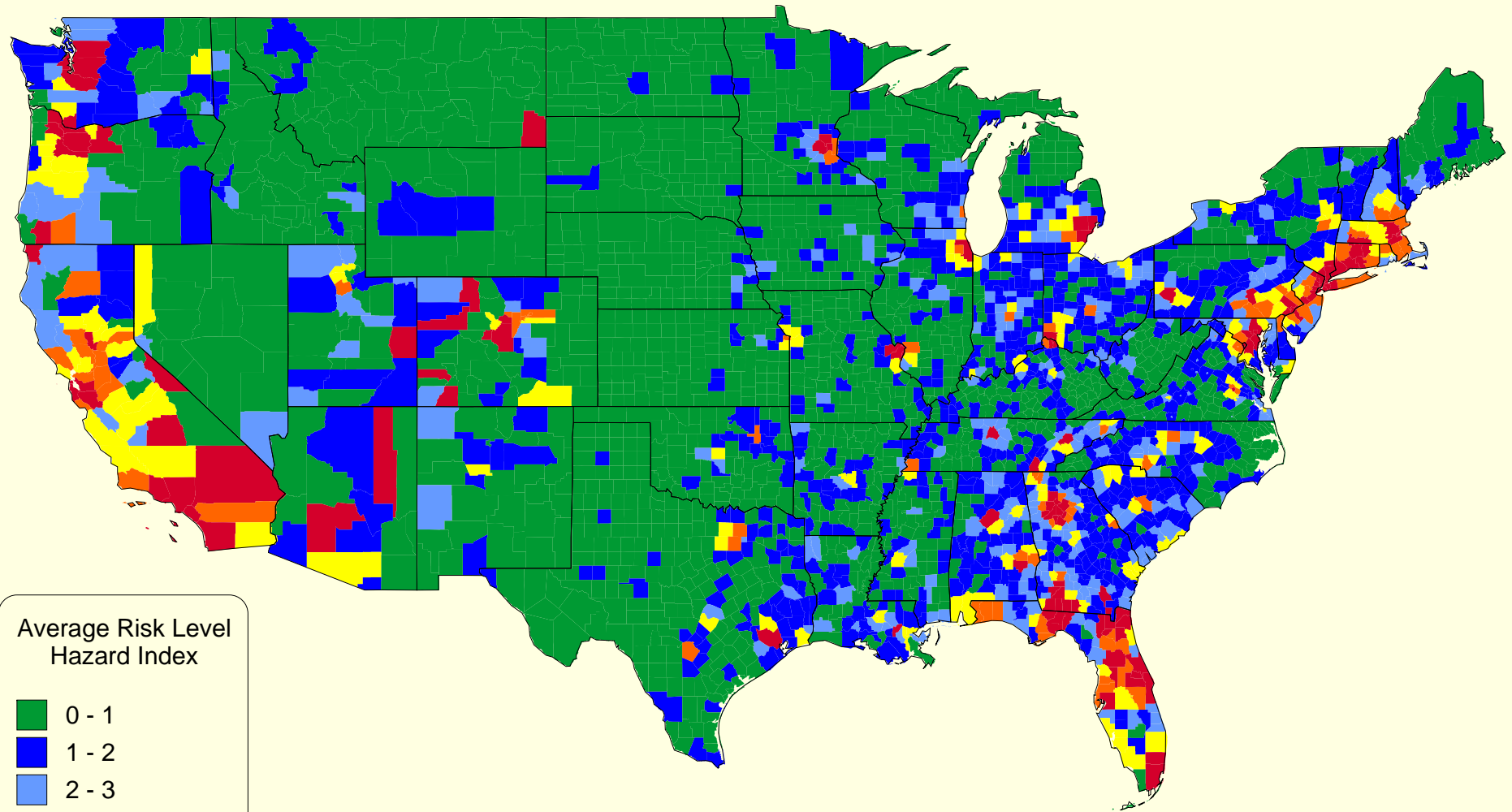2002 NATA - National Scale Assessment
Predicted County Level Carcinogenic Risk

Median Risk Level

<1 in a Million
1 - 25 in a Million
25 - 50 in a Million
50 - 75 in a Million
75 - 100 in a Million
>100 in a Million

Based on County Averages

2002 NATA - National Scale Assessment
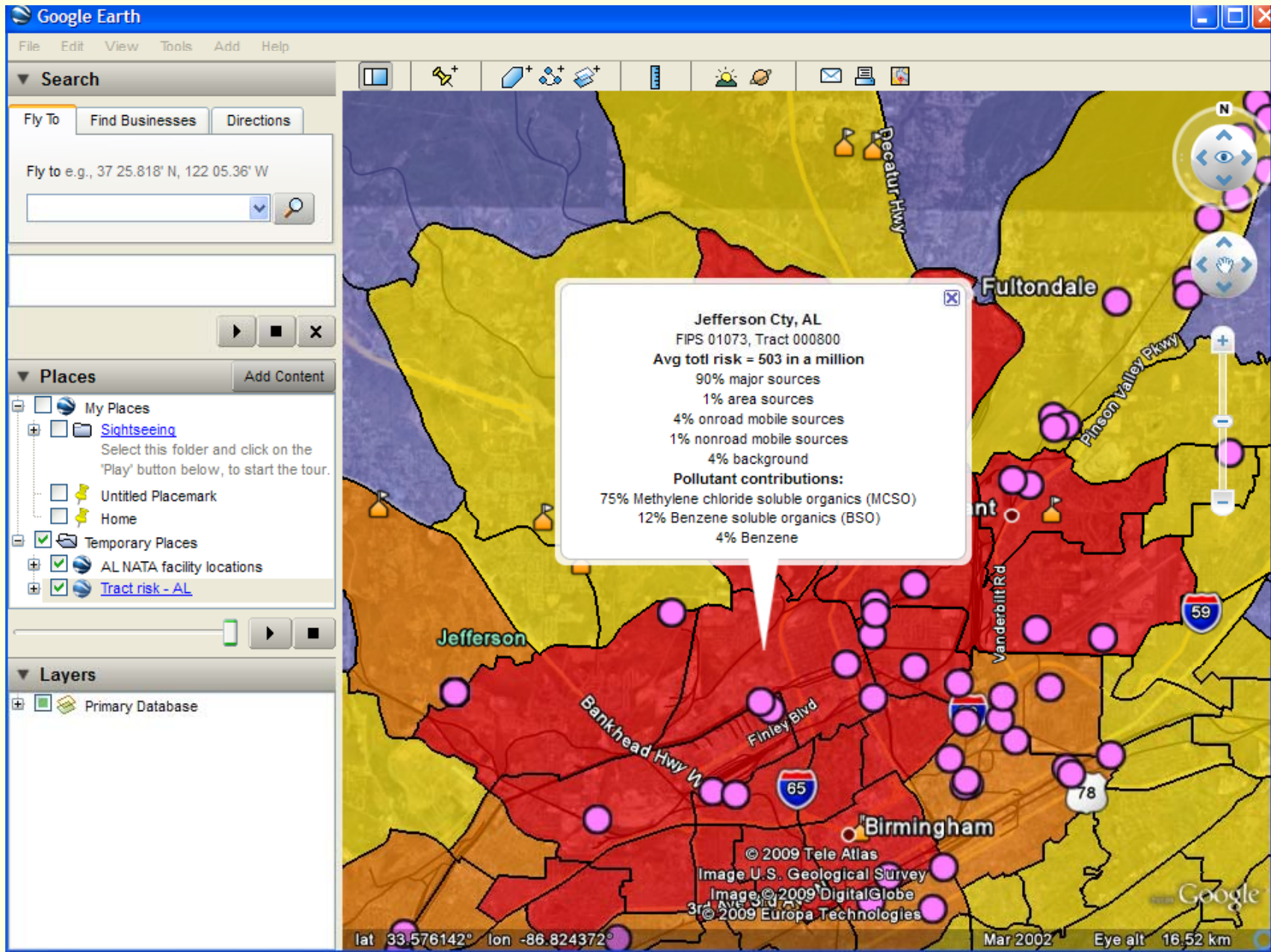## Predicted County Level Noncancer (Respiratory) Risk

Average Risk Level
Hazard Index

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 30

Based on County Averages

NATA Google Earth Maps with Tract-Level Risk and Source Locations

What do the NATA Results Mean?

- Risk results highly variable from location to location
  - Generally higher in urban areas, near major emitters

- Higher risks levels highlight areas for further investigation (e.g., schools monitoring program site selection, local-scale modeling assessments, emission inventory improvements, ambient or personal exposure monitoring)

- Like any assessment of this magnitude, the results have their limitations
  - Model-to-monitor results generally show good agreement for volatile pollutants and underprediction for metals
  - Limitations: inhalation, chronic exposures only – does not include indoor sources, ingestion exposures, or acute impacts
  - Results only as good as inventory

Air Toxic Websites

- Air Toxic Regulations
  - MACT Standards - http://www.epa.gov/ttn/atw/mactfnlalph.html
  - Area Sources - http://www.epa.gov/ttn/atw/area/arearules.html
  - Residual Risks - http://www.epa.gov/ttn/atw/rrisk/rtrpg.html

- NATA - http://www.epa.gov/ttn/atw/nata2002/index.html
  - Technical Info on Analysis
    - Methods
    - Limitations
    - Technical studies (model-to-monitoring comparison; background concentration derivations)
  - Frequently Asked Questions
  - Results
    - By geographic area (national, county, state, tract)
    - By pollutant
    - Access & Excel files
    - Census tract Google earth maps