Overview of the 2011 National Air Toxics Assessment (NATA)

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Presentation Overview

- Background on NATA

- The 2011 NATA: Methods & Results

- Map App

- 2014 NATA Status

- Conclusions

NATA Background

- NATA is a screening-level characterization of air toxics across the nation
  - Nationwide assessment with _census tract_ resolution
  - Cancer and noncancer risk estimates for about 140 Clean Air Act hazardous air pollutants (HAP) with health data based on chronic exposures
  - Ambient concentration estimates for 180 HAP plus diesel particulate matter (DPM)

- NATA Uses
  - To help state, local agencies and tribes identify locations/sources of interest for further study
  - To prioritize pollutants and emission sources
  - To inform monitoring programs

- 2011 NATA is the 5th national-scale assessment (1996, 1999, 2002, 2005) and was released to the public Dec 17, 2015
  - Concentrations, exposures, and risks based on air quality modeling of emissions from the 2011 National Emissions Inventory (NEI)
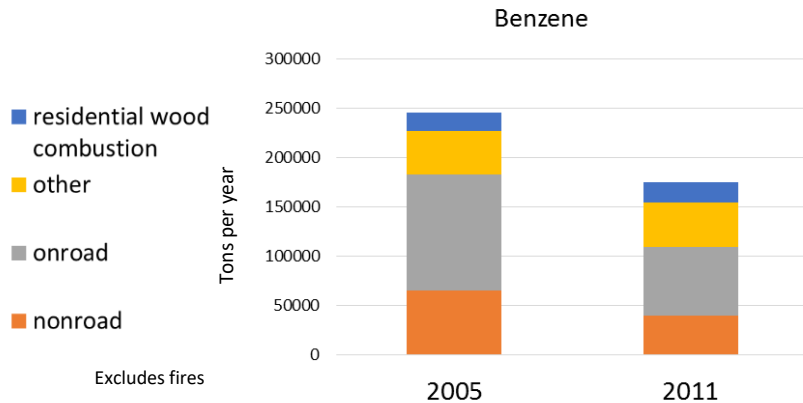
NATA Background (continued)

It's important to note that:

- Emissions, modeled ambient concentrations, and estimated inhalation exposures are only from sources of outdoor origin via the inhalation route of exposure

- Results are more uncertain at finer geographic scales
  - Surrogates used to allocate mobile and nonpoint source emissions
- Results should not be used to compare risks among different areas of the country
  - Underlying emissions data vary in level of detail from state to state

- 2011 NATA results should not be compared to previous NATAs
  - Changes in results are due to both actual emission changes and the use of different modeling and emissions processing techniques
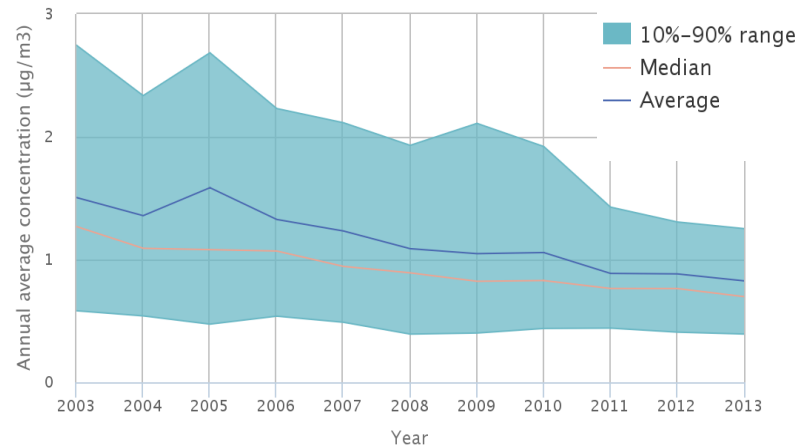
Air Toxic Trends

- Emissions and monitoring data indicate a marked reduction in air toxics over past decade.

- Emissions reductions due in large part to programs such as the federal mobile source programs.

2005 and 2011: National Trends in Emissions and Monitored Concentrations -- Benzene

Benzene Trend 2003-2013, EPA's Report on the Environment (ROE)

Benzene

residential wood combustion
other
onroad
nonroad

Tons per year

Excludes fires

Exhibit 3. Ambient benzene concentrations in the U.S., 2003–2013

Annual average concentration (μg/m3)

10%–90% range
Median
Average

Year

For Additional – monitoring trends– see Air Trends Report
https://www.epa.gov/air-trends

2011 NATA Methods

NATA Analytical Steps

| Compile National Emissions Inventory (2011 NEI) | Estimate ambient concentrations of air toxics across U.S. | Estimate population exposures | Characterize potential public health risks from inhalation |

2011 NEI includes stationary, mobile and natural sources (fires, biogenics).

NATA includes 180 HAPs and diesel particulate from mobile sources.

Uses CMAQ and AERMOD to predict census tract ambient concentrations nationwide.

Includes an exposure model (HAPEM7) to account for human activity data, commuting patterns, and near roadway exposures.

Census tract level cancer and noncancer risks nationwide.

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Emission Inventory For NATA is the NEI

- NEI Hazardous Air Pollutants are voluntarily submitted by State/local tribal agencies and supplemented by EPA

- 2011 NATA went through a series of reviews with data submitters –resulted in a better inventory
  - In the review process for the 2014 NATA

- Updates to models (MOVES), emission tools, and better spatial allocation

2011 NEI Point Source Voluntary HAP Counts by State

Legend:
- 1 - 20
- 20 - 61
- 61 - 98
- 98 - 117
- 117 - 134
- 134 - 173
- 173 - 209
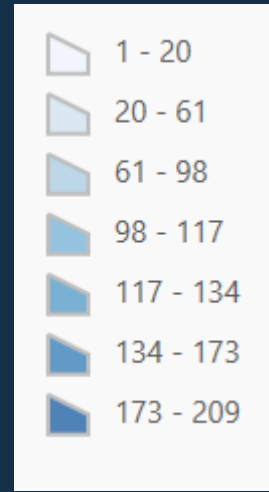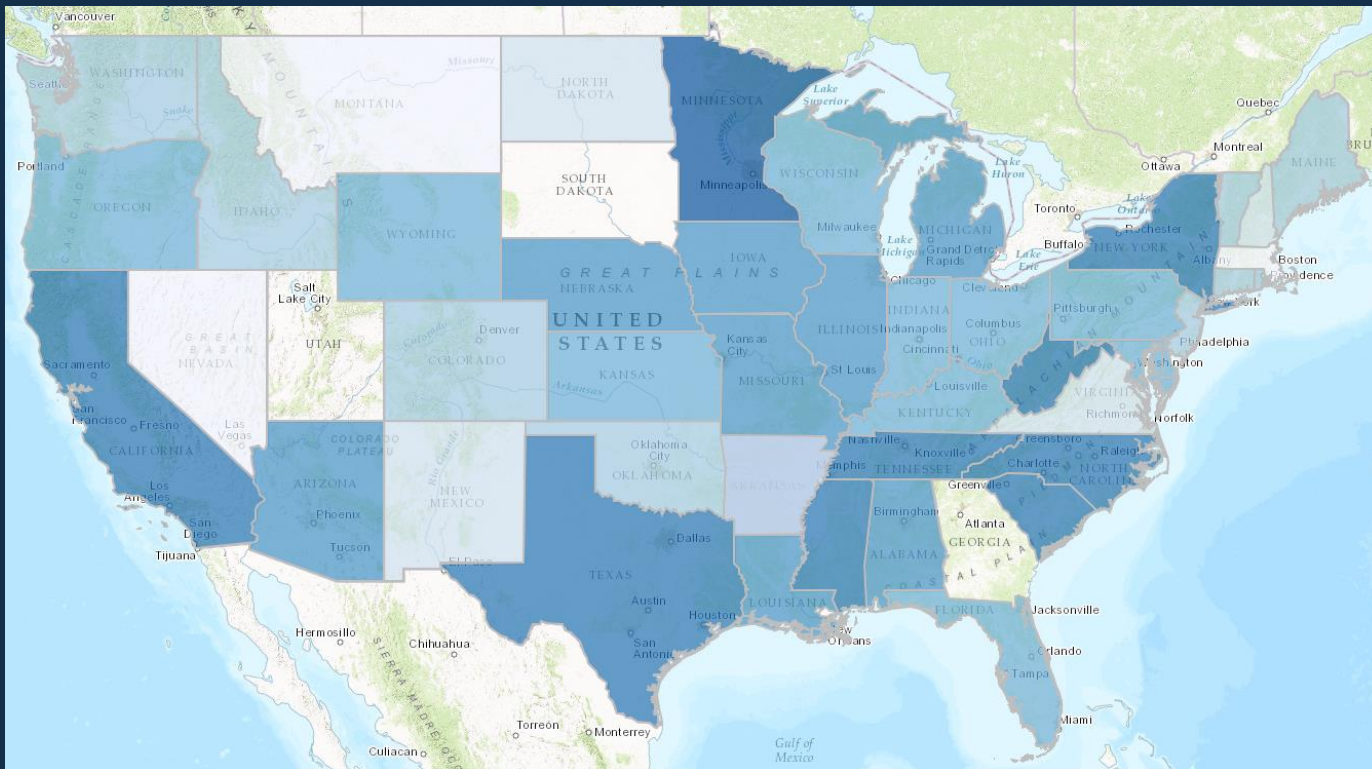
AK, HI and Puerto Rico are in the 1-20 bin

3 tribes reported HAPs (1-20 and 20-61) bins

2011 NATA Spatial Allocation Approach

Category	Inventory Resolution	Spatial Approach for AERMOD	Spatial approach for CMAQ
Point (non Airports)	Point	Point – vertical stack and fugitive	
Airports	Point	Point – runways & 10mX10m areas	
Locomotives	Point (railyards) and County/Shape	Nonpoint - Tracts Point - Point Fugitives	12 km by 12 grid cells
Commercial Marine Vessels	County/Shape	Shapes	
Onroad, Nonroad Equipment and other nonpoint	County	Tracts	
Fires (prescribed and wild)	Point	Not Modeled	

2011 NATA Estimated Total Cancer Risk
(in-1 million)

**12 Urbanized Areas with Risks
Greater than 100-in-1 million**

0 - 25	
25 - 50	
50 - 75	
75 - 100	
> 100	
Zero Population Tracts	
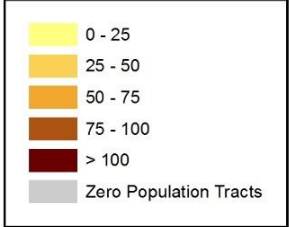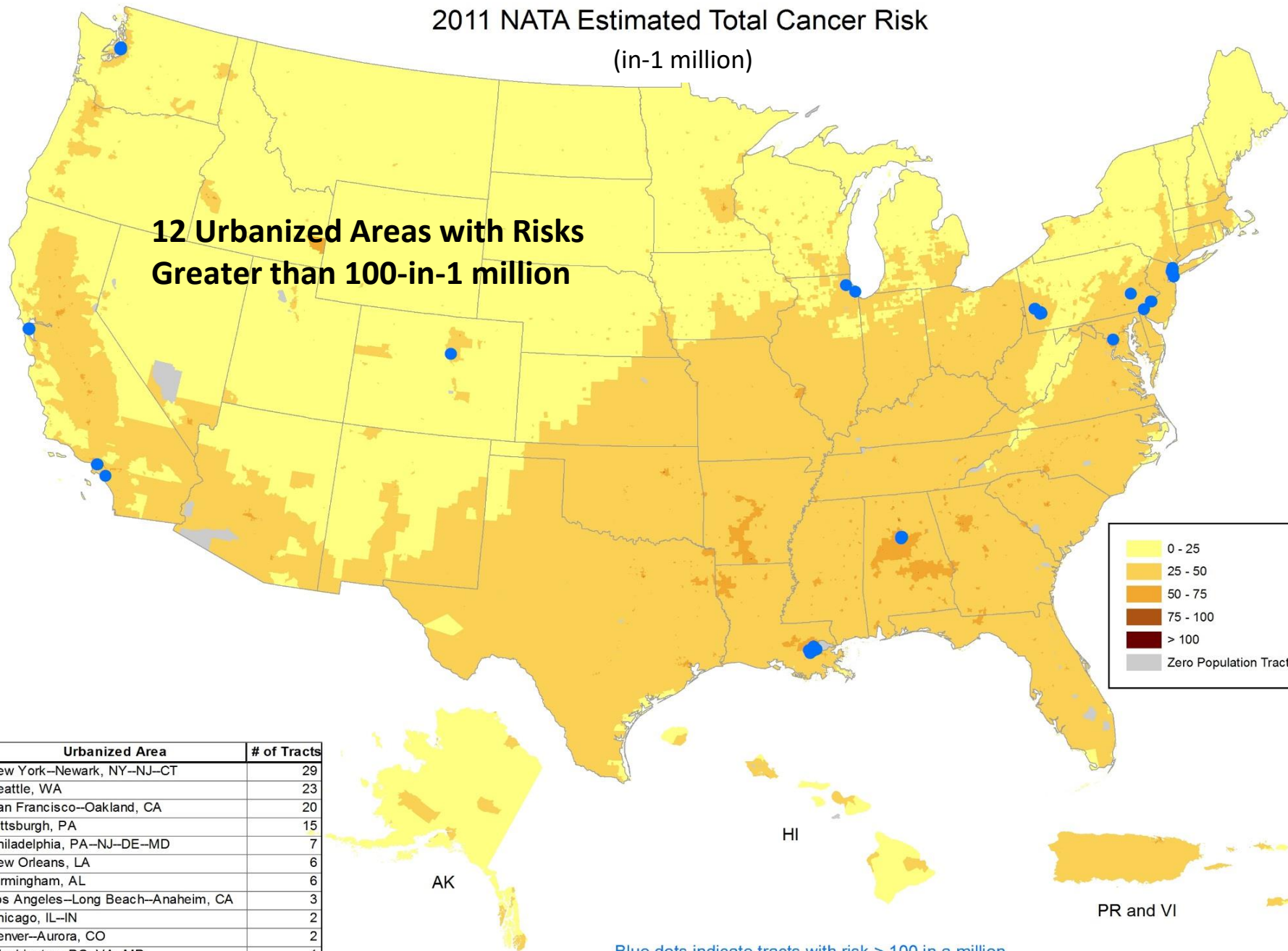
Urbanized Area	# of Tracts
New York--Newark, NY--NJ--CT	29
Seattle, WA	23
San Francisco--Oakland, CA	20
Pittsburgh, PA	15
Philadelphia, PA--NJ--DE--MD	7
New Orleans, LA	6
Birmingham, AL	6
Los Angeles--Long Beach--Anaheim, CA	3
Chicago, IL--IN	2
Denver--Aurora, CO	2
Washington, DC--VA--MD	1
Reading, PA	1

HI

AK

PR and VI

Blue dots indicate tracts with risk > 100 in a million
121 tracts nationwide (12 Urbanized Areas)

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2011 NATA Cancer Risks
Entire US - Pollutant Contributions (40-in-1 million)

- CHROMIUM VI 1%
- ARSENIC COMPOUNDS 1%
- ETHYLBENZENE 2%
- PAHPOM 1%
- Other 2%
- NAPHTHALENE 3%
- 1,3-BUTADIENE 5%
- CARBON TETRACHLORIDE 8%
- ACETALDEHYDE 11%
- FORMALDEHYDE 53%
- BENZENE 13%

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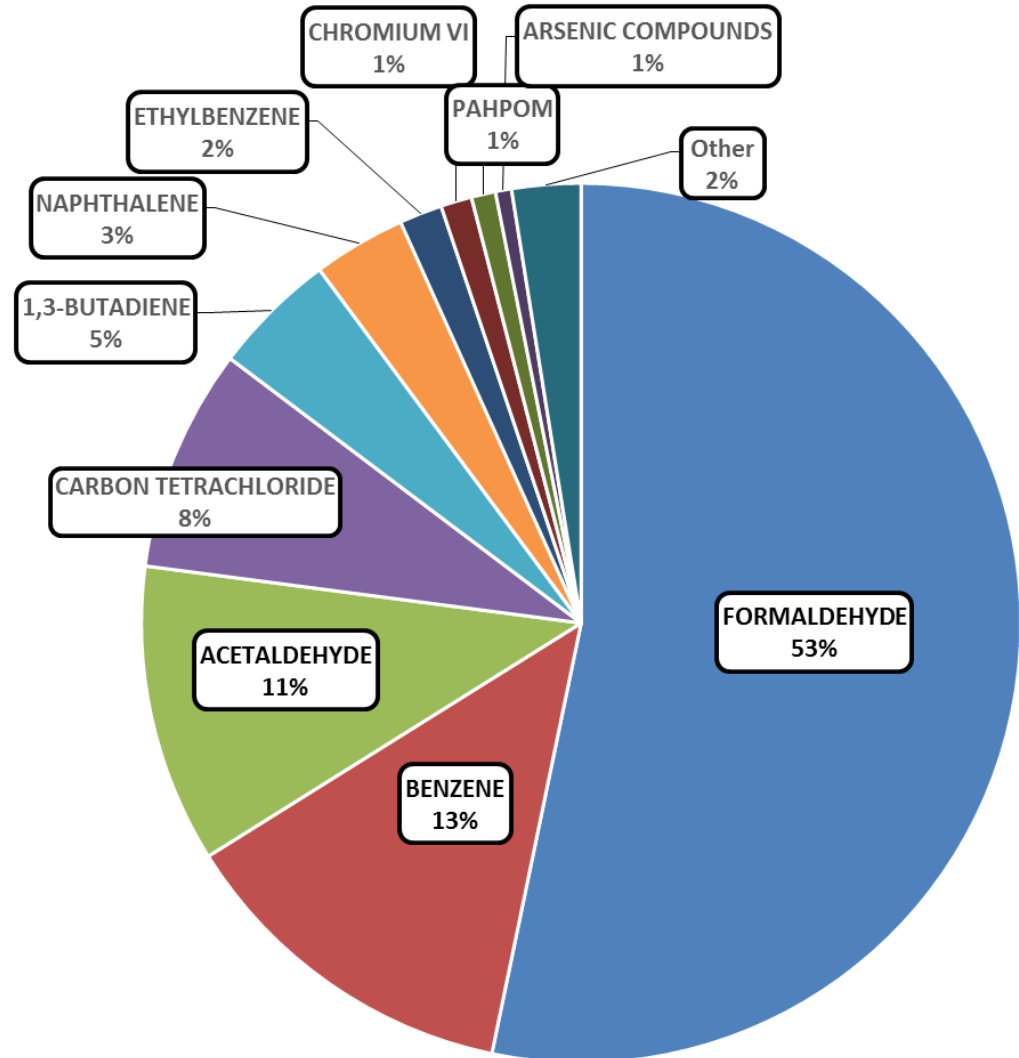
2011 NATA Cancer Risks
Entire US – Source Category Contributions (40-in-1 million)

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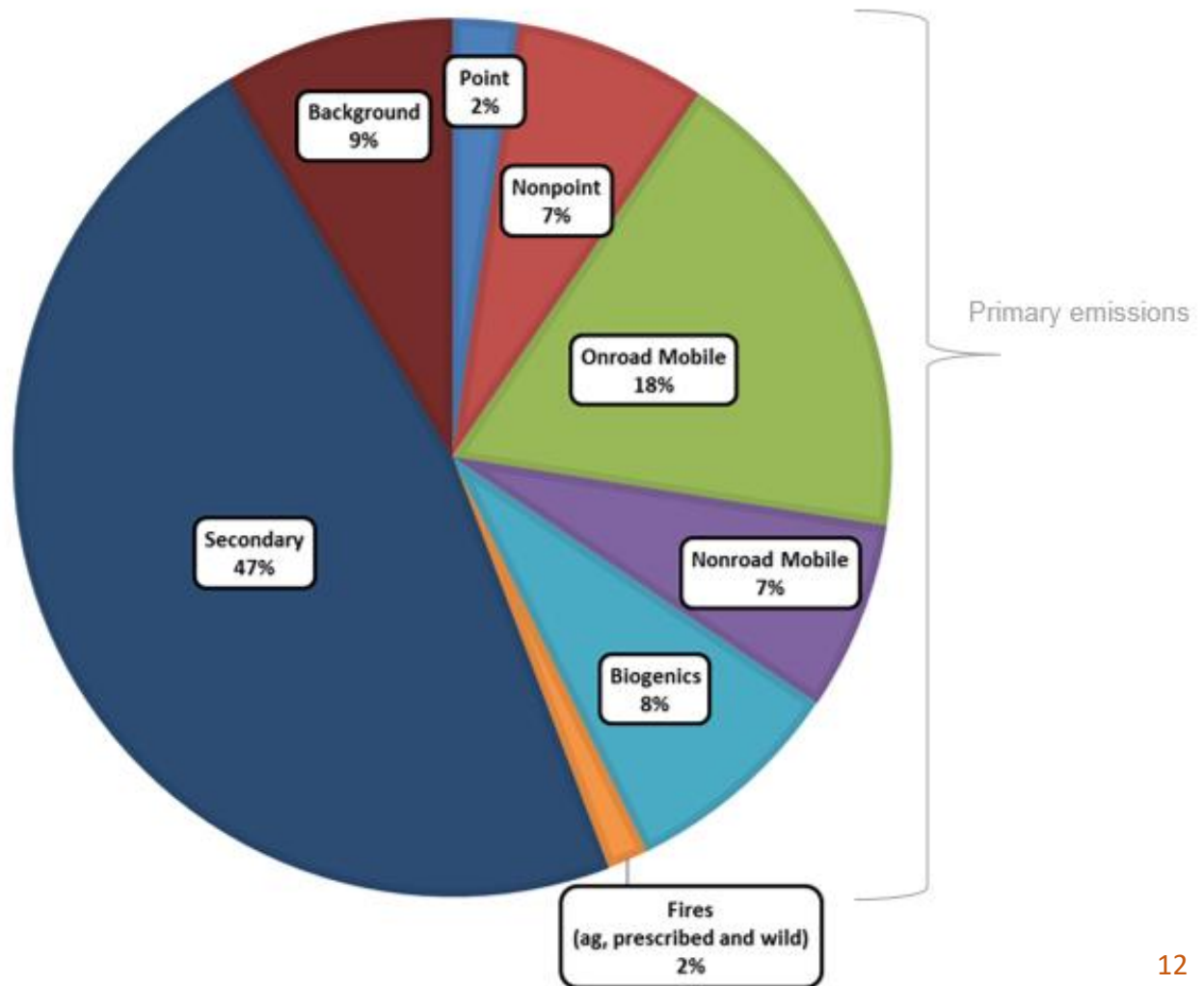
2011 NATA Noncancer Respiratory Risks
Entire US – Pollutant Contributions (HI=2)

NAPHTHALENE 1%
CHLORINE 1%
Other 1%
DIESEL PM 5%
FORMALDEHYDE 9%
ACETALDEHYDE 12%
ACROLEIN 71%

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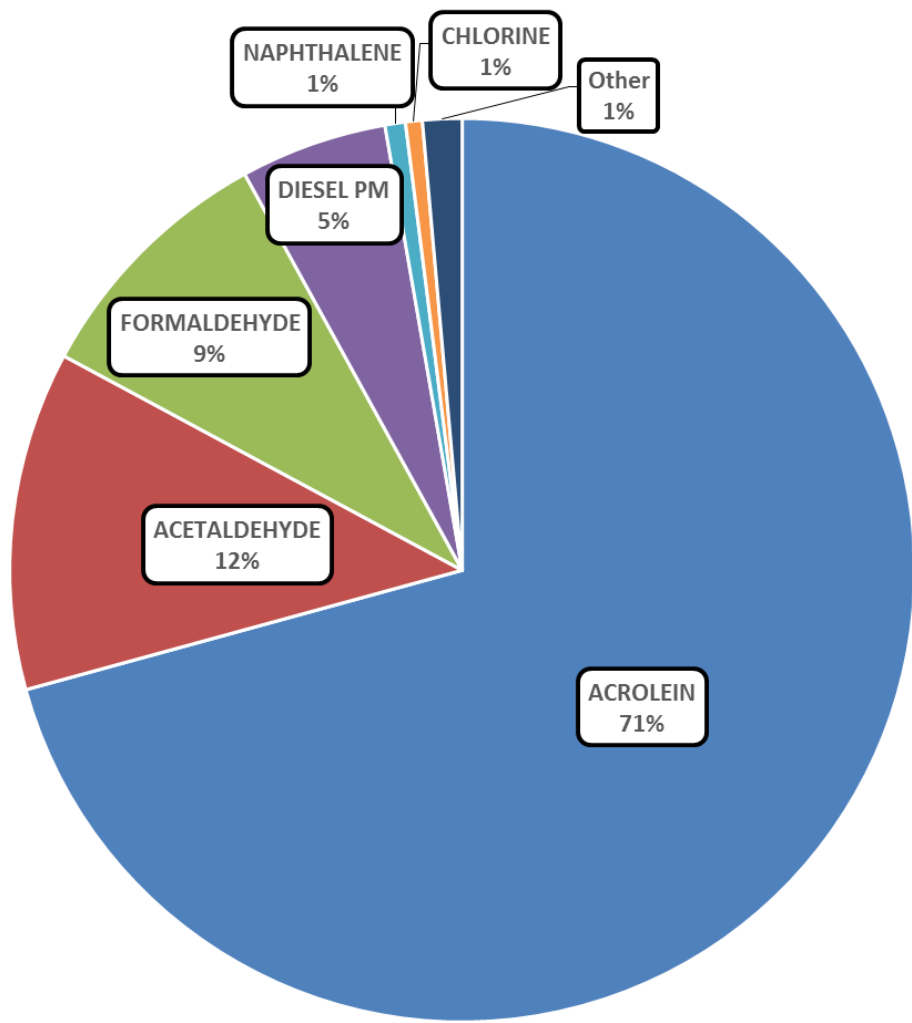
2011 NATA Respiratory Risks
Entire US - Source Sector Contributions (HI=2)
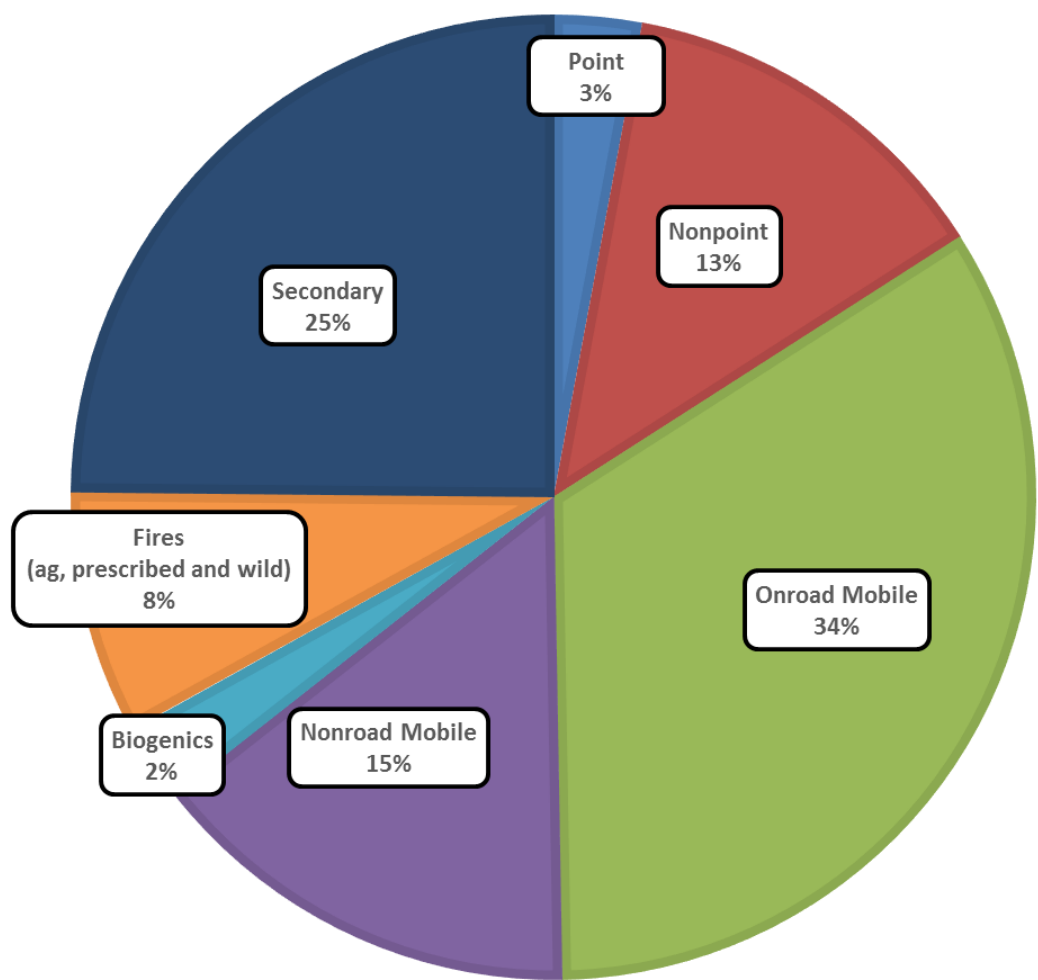
NATA Web App

Enhanced GIS-Based NATA Web App

- Shows estimated risks at the census tract level and displays risks, emissions sources, and monitoring data on a map -- generates pie charts and tabular results

- The NATA web map can help users identify the sources and pollutants that contribute to potential risks in their community

- Users can compare the NATA modeling results to local ambient monitors

- The NATA web app is also available on tablets and smartphones

NATA Web App

The next slide drills down on this area to show risk.

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NATA Web App – Tract Risk Breakdown
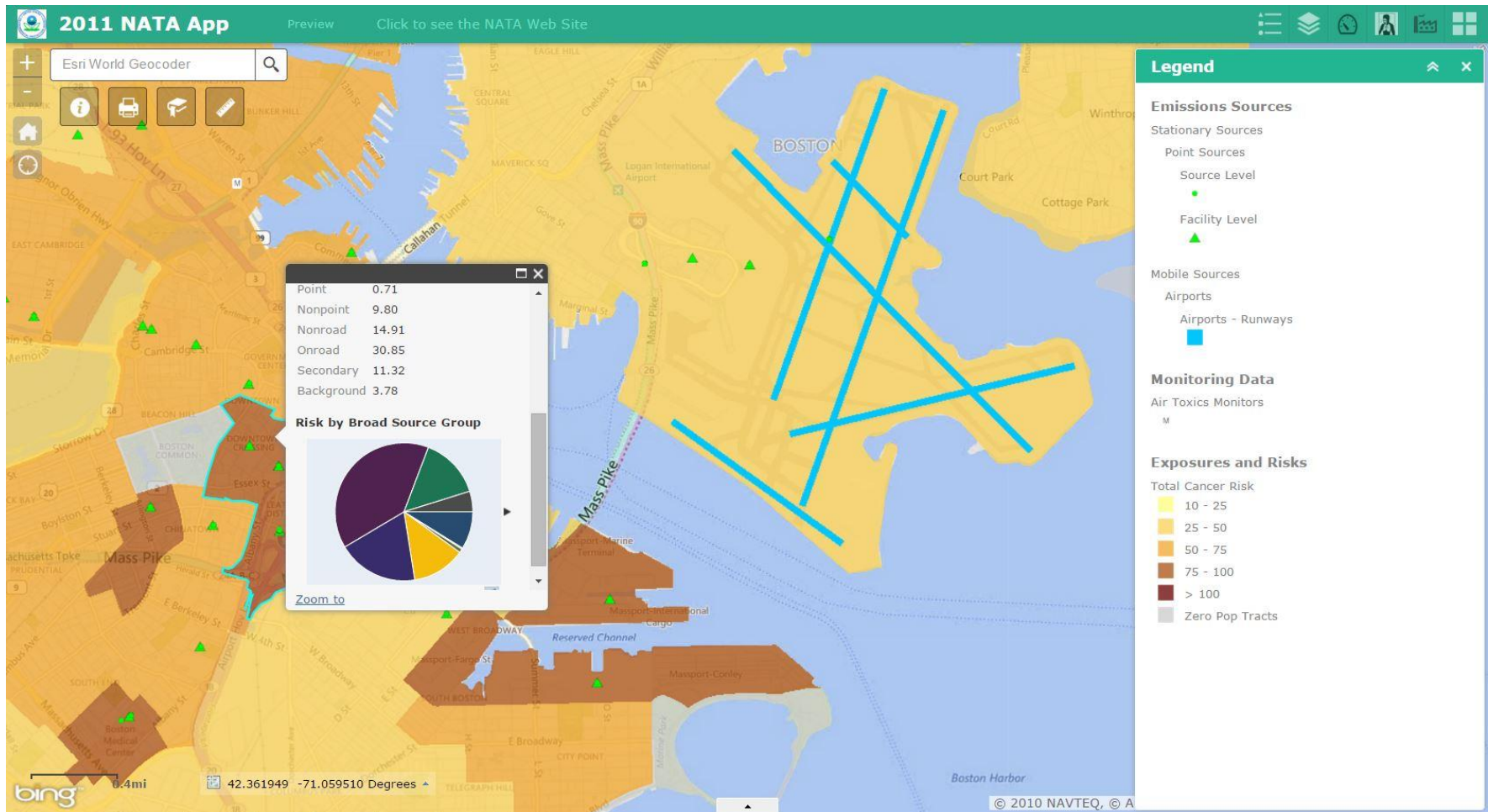
This slide shows the census tract risk by broad source group (e.g., point, nonpoint).

NATA Web App - Detailed Source Information

Green dots are individual emission points.

2014 NATA Update

- Will be based on 2014 NEI Version 2

- Will use the most recently released version of MOVES (2014a) to generate both onroad and nonroad emissions

- Will include emissions allocations to 4- and 12-km grids instead of allocating emissions to census tracts for nonpoint and mobile source emissions

- Update to unit risk estimate of ethylene oxide

- Will include updates to the Map App

- Targeting completion in 2018

Conclusions

- NEI is critical input to NATA - HAPs and CAPs are used

- HAPs are Voluntarily submitted and gap-filled as necessary

- Continuing need for improving the data
  - Use of available source test data for emission inventories
  - Update emission factors and speciation profiles
  - Update and develop new inventory tools
  - Improve source test methods and detection levels

Resources **http://www.epa.gov/nata**

- "Hybrid" approach citation:

Hybrid Modeling Approach to Estimate Exposures of Hazardous Air Pollutants (HAPs) for the National Air Toxics Assessment (NATA)

Richard D. Scheffe, Madeleine Strum, Sharon B. Phillips, James Thurman, Alison Eyth, Steve Fudge, Mark Morris, Ted Palma, and Richard Cook. *Environmental Science & Technology* **2016** *50* (22), 12356-12364. DOI: 10.1021/acs.est.6b04752