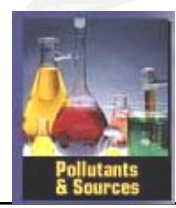
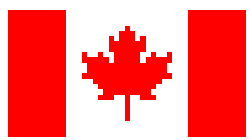
Analysis of Air Toxics Emission Inventories for Area Sources in the Great Lakes Region




N
Ontario
Minnesota
Wisconsin
Michigan
New York
Pennsylvania
Illinois
Indiana
Ohio

Introduction

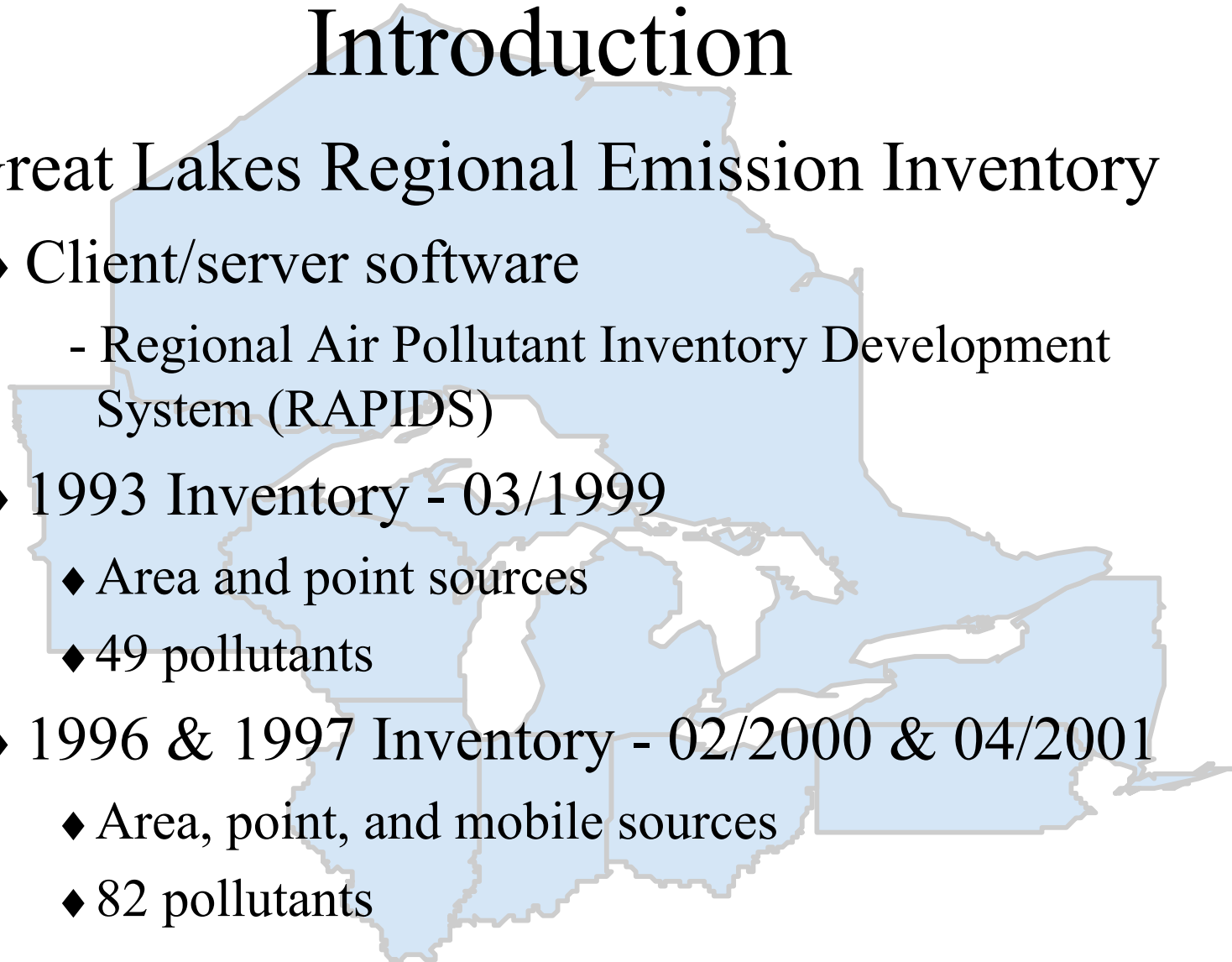
- Great Lakes Regional Emission Inventory
  - Initiated in 1986
    - To foster cooperation among the Great Lakes states in quantifying the loading of toxic substances
    - Funded by



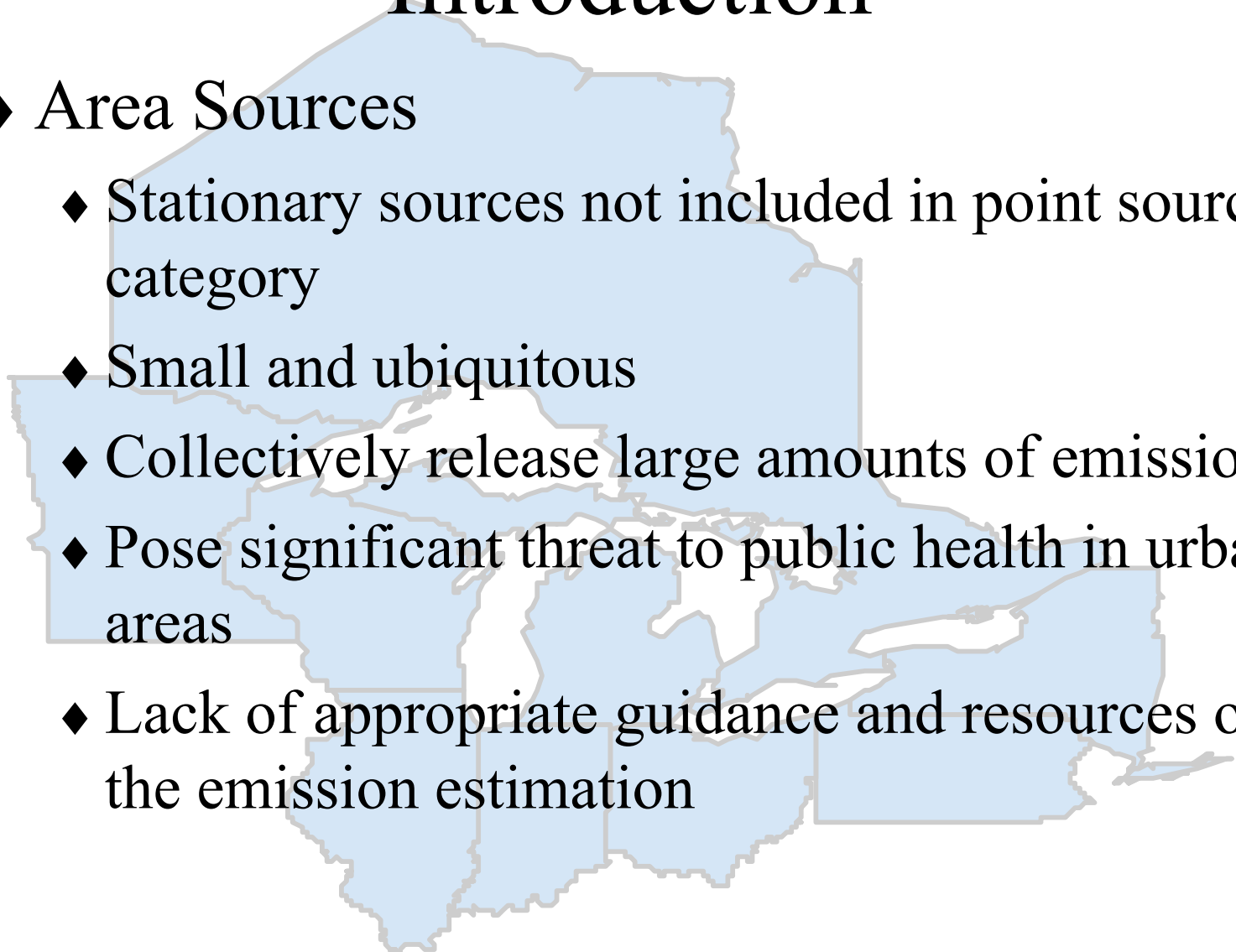
Environment Canada

Introduction

- Great Lakes Regional Emission Inventory
  - Client/server software
    - Regional Air Pollutant Inventory Development System (RAPIDS)
  - 1993 Inventory - 03/1999
    - Area and point sources
    - 49 pollutants
  - 1996 & 1997 Inventory - 02/2000 & 04/2001
    - Area, point, and mobile sources
    - 82 pollutants



Introduction



- Area Sources
  - Stationary sources not included in point source category
  - Small and ubiquitous
  - Collectively release large amounts of emissions
  - Pose significant threat to public health in urban areas
  - Lack of appropriate guidance and resources on the emission estimation

Methodology

- Regional Effort
  - High level of coordination - consistency
    - Information collection
    - Methodology
    - Data management
    - Others
  - Great Lakes Commission - project management
  - Technical Steering Committee

Methodology

- Select Potential Source Categories
  - Emission Inventory Improvement Program (EIIP)
  - Factor Information Retrieval (FIRE) Data System
  - 1996 National Toxics Inventory (NTI)
  - Previous regional/state inventories
  - Others
- Examine the Feasibility and Develop Protocols
  - Each state or province - one or two categories
  - 16 categories - inventoried for 1996 & 1997

Methodology

- Compile the Inventory
  - Each jurisdiction - respective portion
  - Guidance of protocols
    - Identification and location of emission sources
    - Identification of possible pollutants
    - Recommendation of suggested and alternative methods
    - Activity data collection
    - Recommendation on emission factors
    - References
- Quality Assurance and Quality Control
  - State-level and regional level


http://www.glc.org/air/1996/1996.html
http:// www.glc.org/air/air3.html

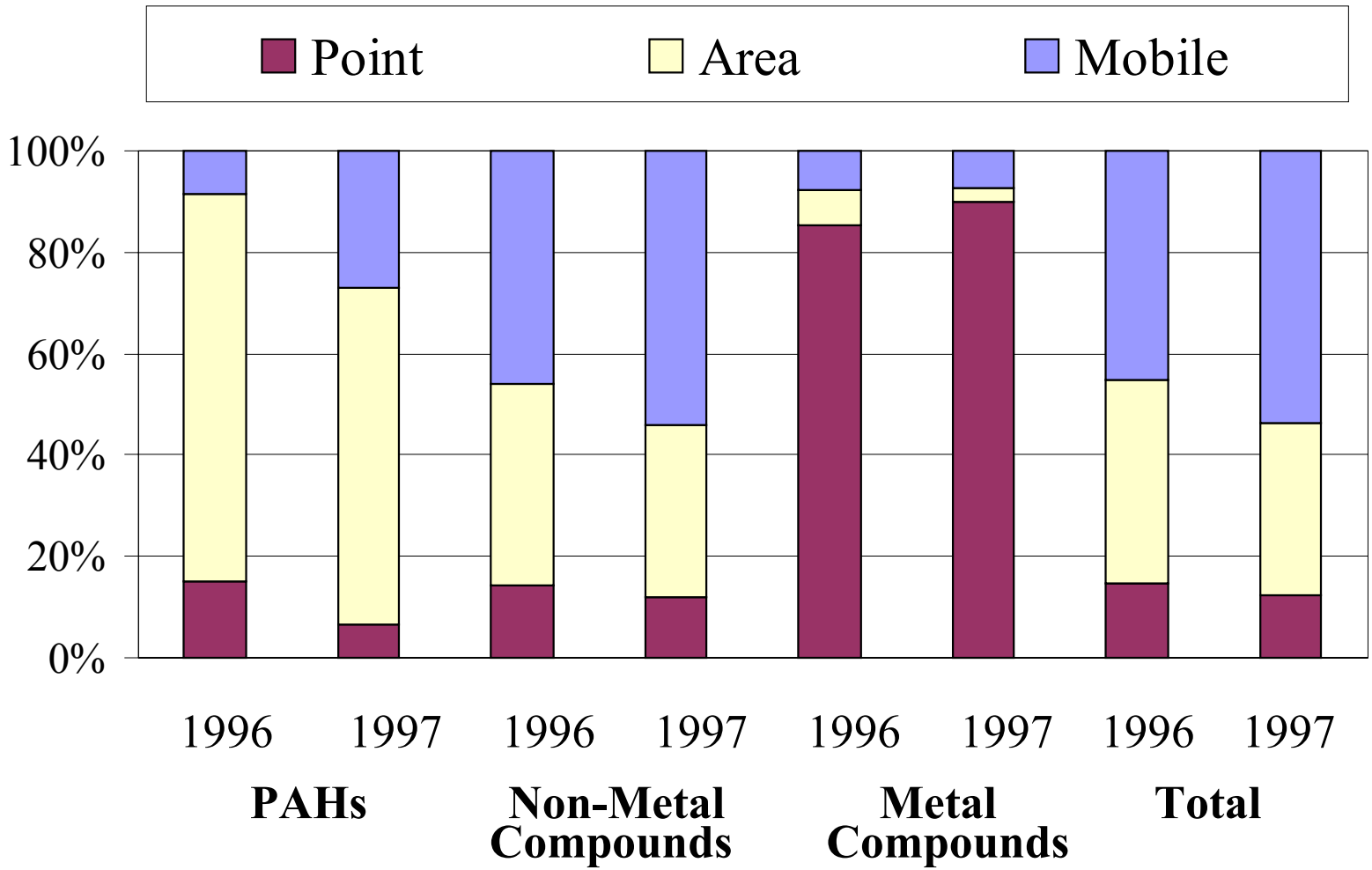
Results and Discussions

- Overall

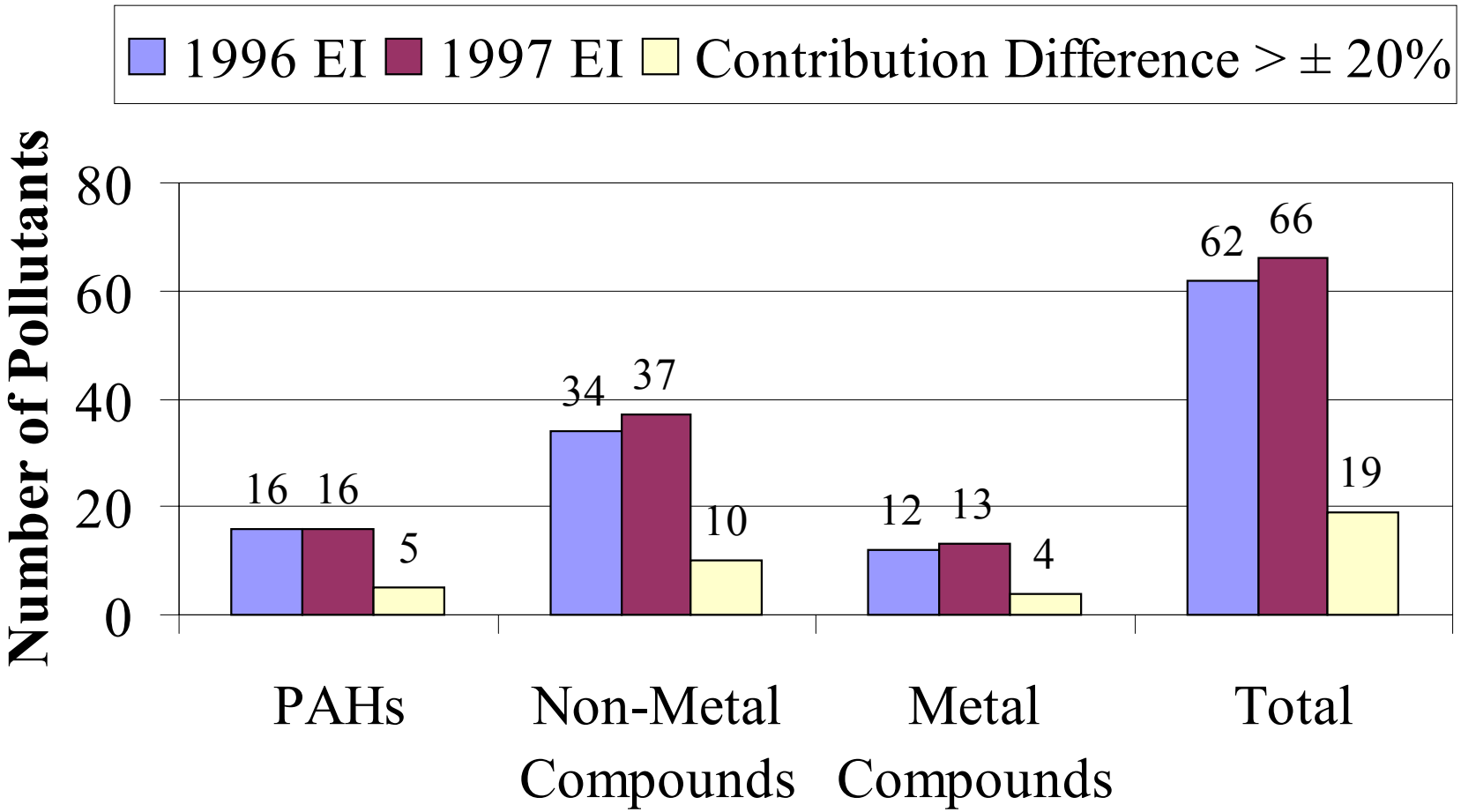
Number of pollutants in inventories

Pollutants Category	Targeted Number	Estimated Number In 1996	Estimated Number In 1997
PAHs	16	16	16
Non-Metal Compounds	53	49	47
Metal Compounds	13	12	12
Total	**82**	**77**	**75**

Emissions by principal source category



Comparison of Area Source Emissions between Calendar Year 1996 and 1997



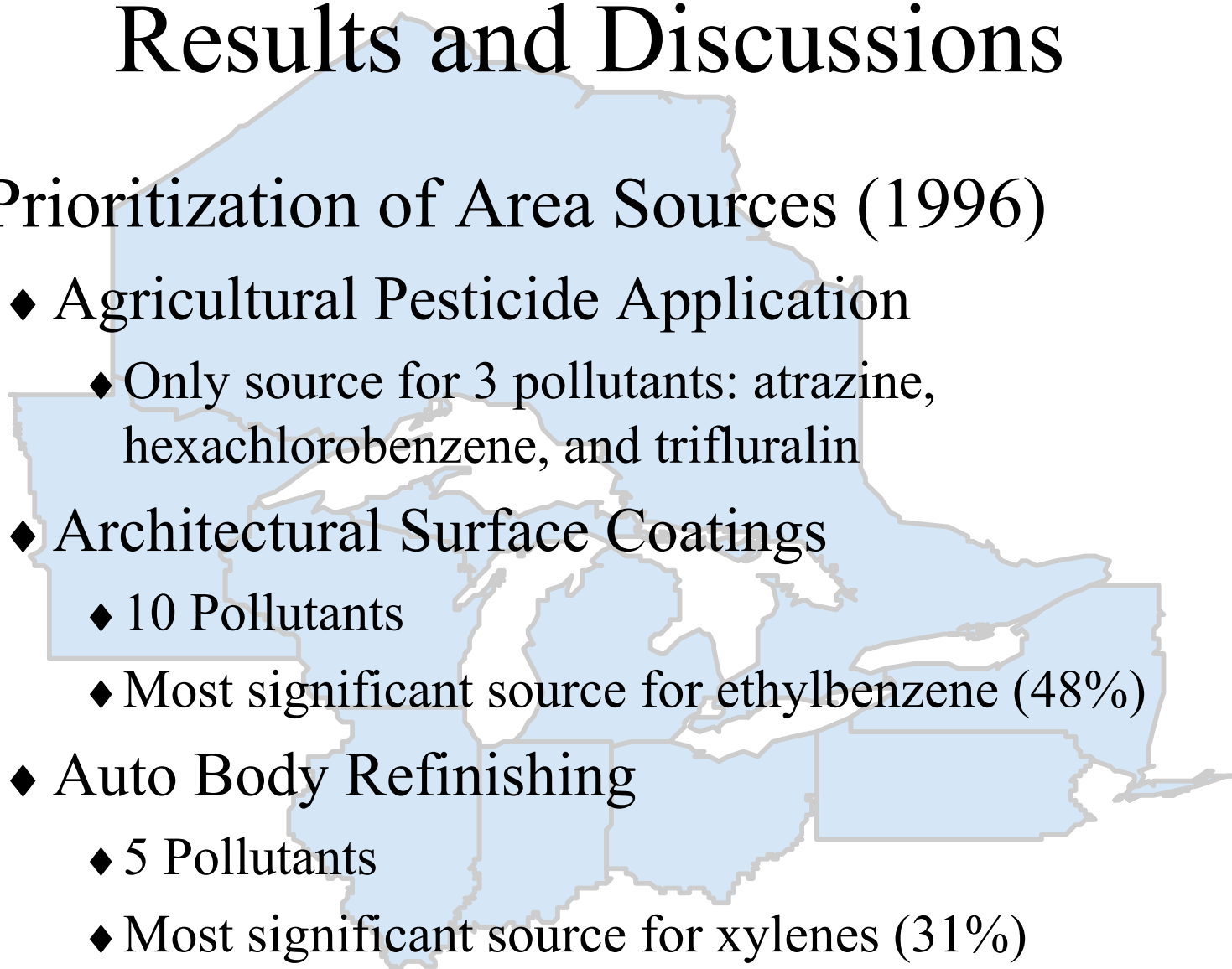
1996 Emissions by principal source category for individual pollutants

Pollutants Category	Estimated Number	> 2/3 Emissions		
		Point	Area	Mobile
PAHs	16	1	15	0
Non-Metal Compounds	49	27	7	7
Metal Compounds	12	10	1	0
Total	**77**	**38**	**23**	**7**

The 1996 highest and the lowest emissions in the Great Lakes Region

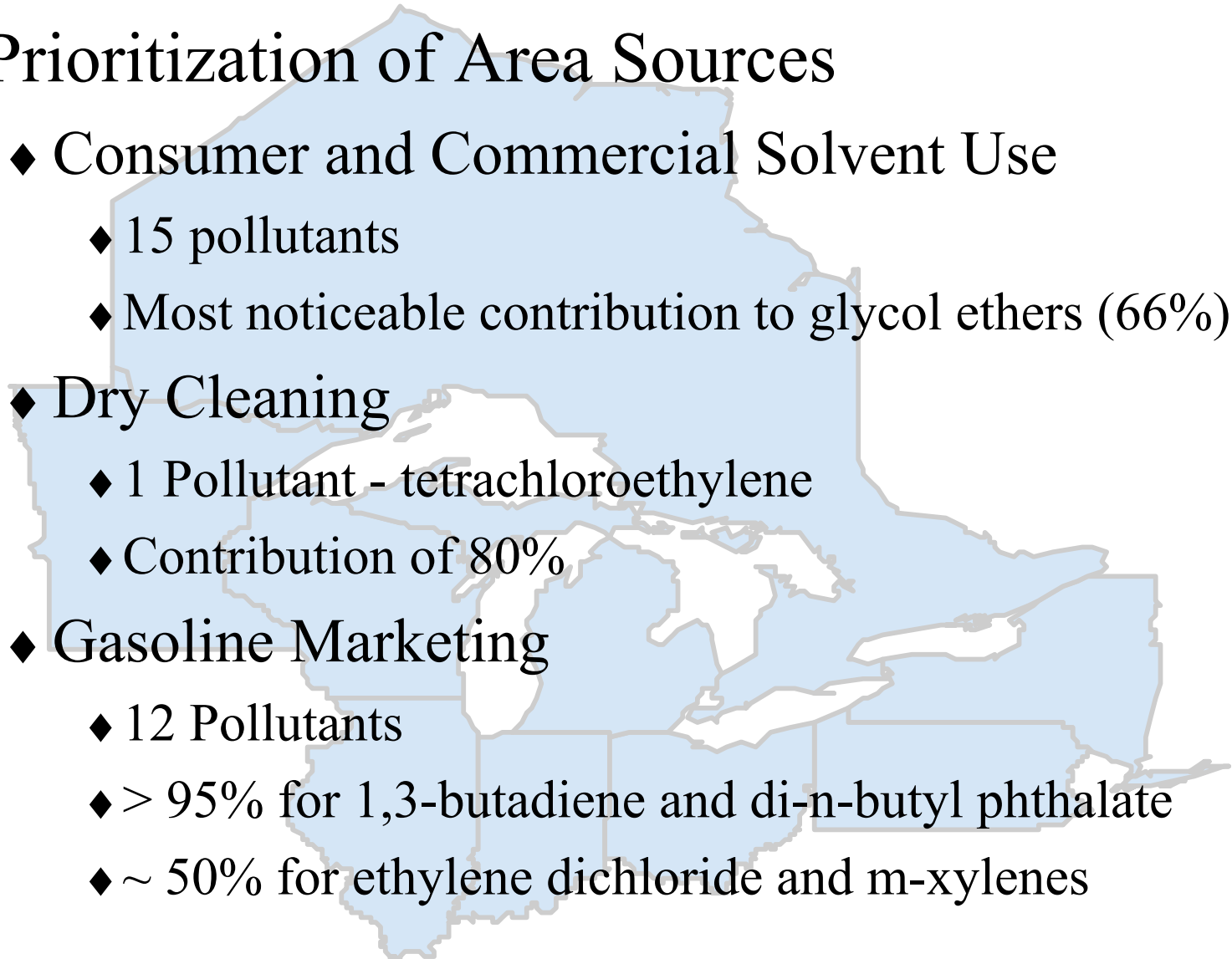
Pollutant	Emissions (lbs)	Ranking By Emissions
Toluene	545,821,726	1
2,4,5-Trichlorophenol	0.02	77

Results and Discussions

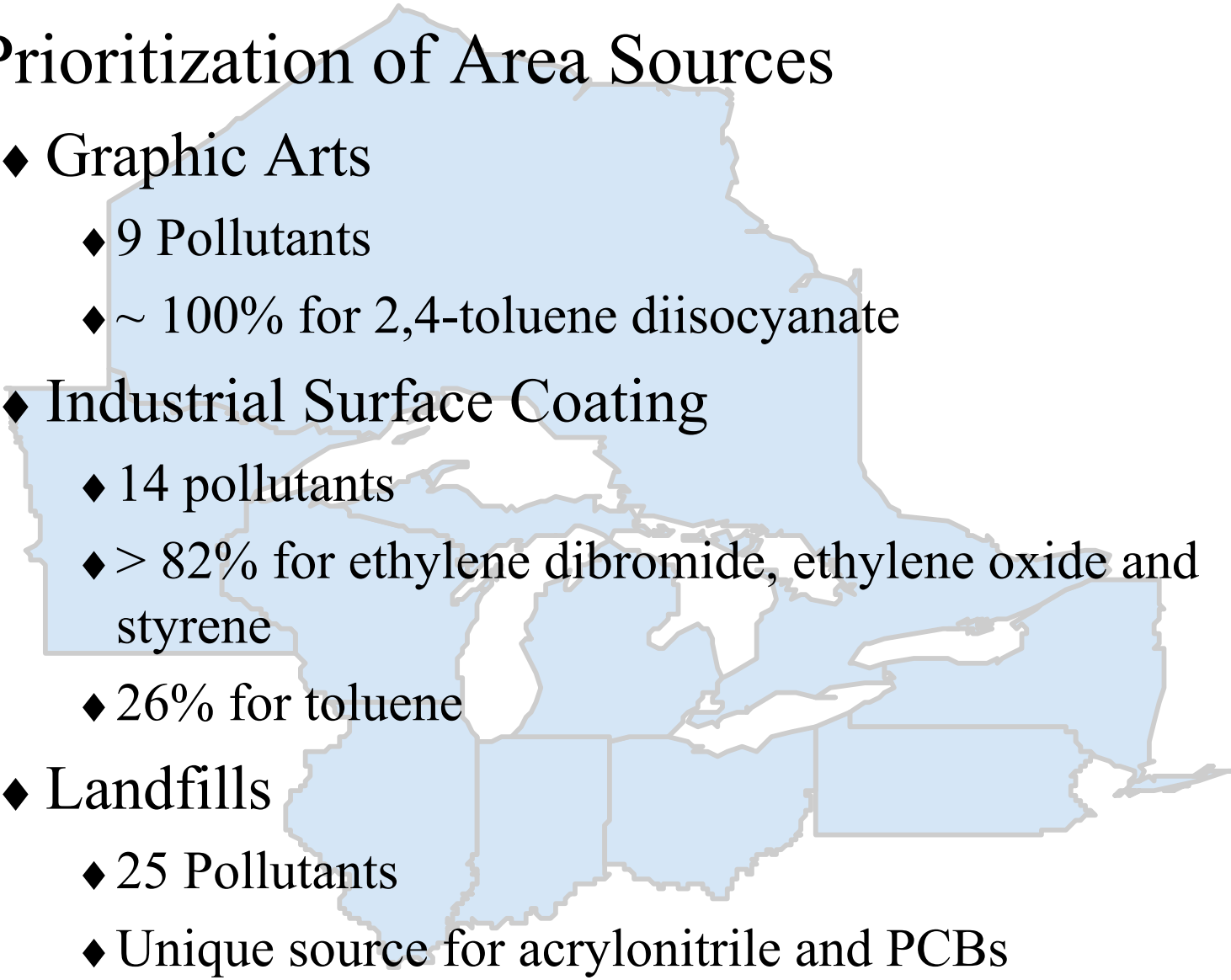


- Prioritization of Area Sources (1996)
  - Agricultural Pesticide Application
    - Only source for 3 pollutants: atrazine, hexachlorobenzene, and trifluralin
  - Architectural Surface Coatings
    - 10 Pollutants
    - Most significant source for ethylbenzene (48%)
  - Auto Body Refinishing
    - 5 Pollutants
    - Most significant source for xylenes (31%)

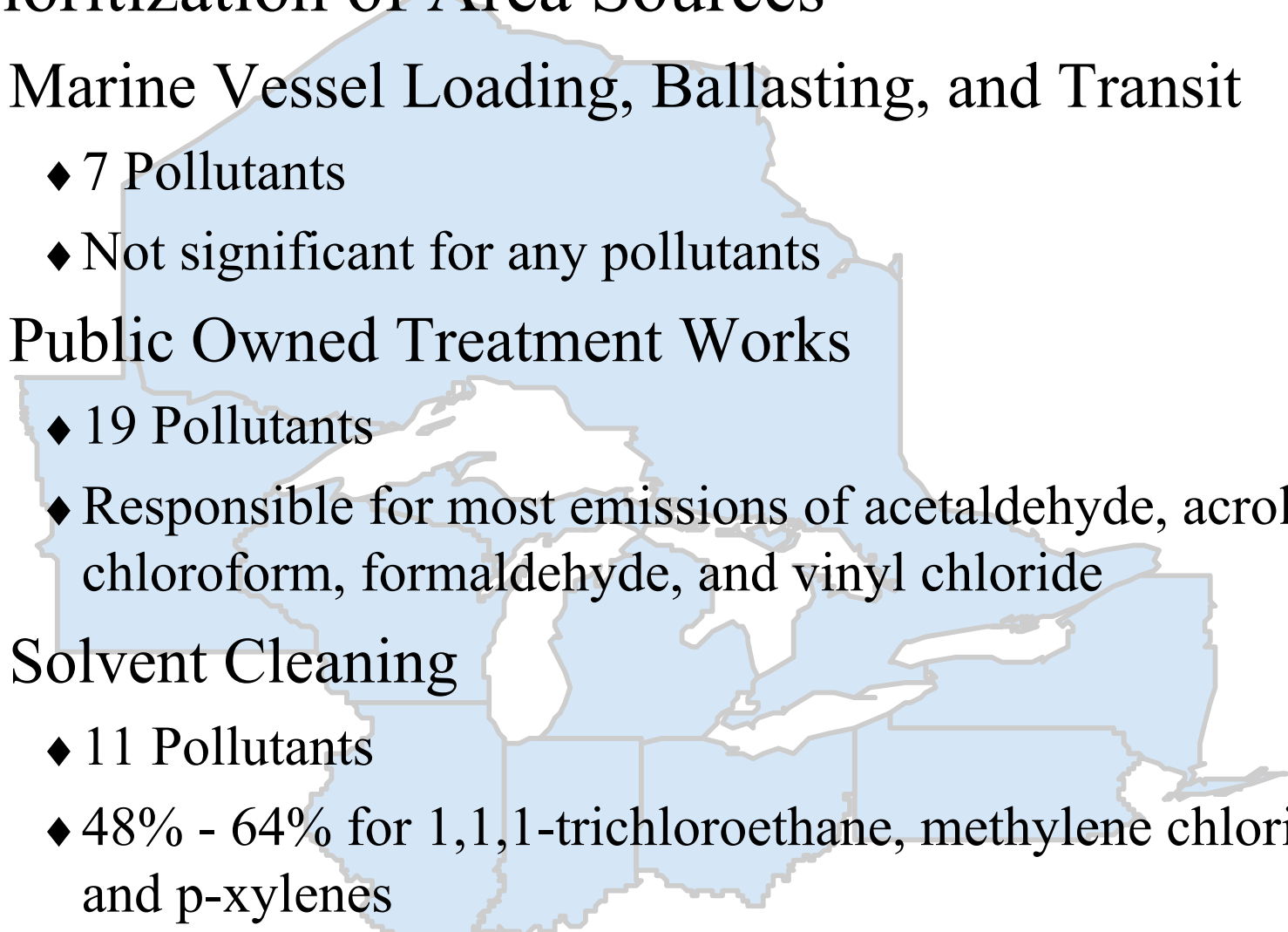
- Prioritization of Area Sources
  - Consumer and Commercial Solvent Use
    - 15 pollutants
    - Most noticeable contribution to glycol ethers (66%)
  - Dry Cleaning
    - 1 Pollutant - tetrachloroethylene
    - Contribution of 80%
  - Gasoline Marketing
    - 12 Pollutants
    - > 95% for 1,3-butadiene and di-n-butyl phthalate
    - ~ 50% for ethylene dichloride and m-xylenes



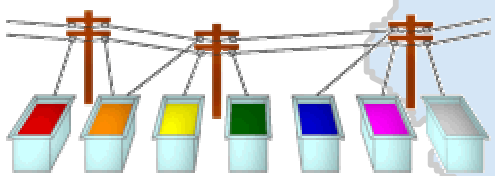
- Prioritization of Area Sources
  - Graphic Arts
    - 9 Pollutants
    - ~ 100% for 2,4-toluene diisocyanate
  - Industrial Surface Coating
    - 14 pollutants
    - > 82% for ethylene dibromide, ethylene oxide and styrene
    - 26% for toluene
  - Landfills
    - 25 Pollutants
    - Unique source for acrylonitrile and PCBs



- Prioritization of Area Sources
  - Marine Vessel Loading, Ballasting, and Transit
    - 7 Pollutants
    - Not significant for any pollutants
  - Public Owned Treatment Works
    - 19 Pollutants
    - Responsible for most emissions of acetaldehyde, acrolein, chloroform, formaldehyde, and vinyl chloride
  - Solvent Cleaning
    - 11 Pollutants
    - 48% - 64% for 1,1,1-trichloroethane, methylene chloride, and p-xylenes
    - 98% for trichloroethylene



- Prioritization of Area Sources
  - Chromium Electroplating
    - 2 Pollutants
    - Only source for chromium (6)
  - Residential Fuel Combustion
    - 35 Pollutants
    - Primary source for all metals from area sources except for chromium (6)



- Prioritization of Area Sources
  - Residential Wood Combustion
    - 30 Pollutants
    - Dominates area source emissions for all PAHs, benzene, phenol, TCDD, TCDF, PCDDs, PCDFs, and o-xylenes
  - Traffic Marking
    - 8 Pollutants
    - Significant to carbon tetrachloride emissions (48%)

Lesson Learned

- Regional coordination is an effective way
- Barriers and obstacles exist

Lesson Learned

- Definitions - Not Consistent
  - Dependent on data collection methods
  - Difficult to compare emissions among states
- Guidance - Not Consistent and Not Comprehensive
  - Inadequate for all area source categories
  - Hard to judge appropriate emission factors
- Emission Trends - Not Representative

Conclusions

- Area sources are significant contributors to the Great Lakes regional emissions of certain toxics
- Further improvement is needed for a more comprehensive and accurate inventory