Designations for the 2006 PM2.5 Standards: Evaluating the Nine Factors in Setting Nonattainment Area Boundaries

Part 1 – Overview

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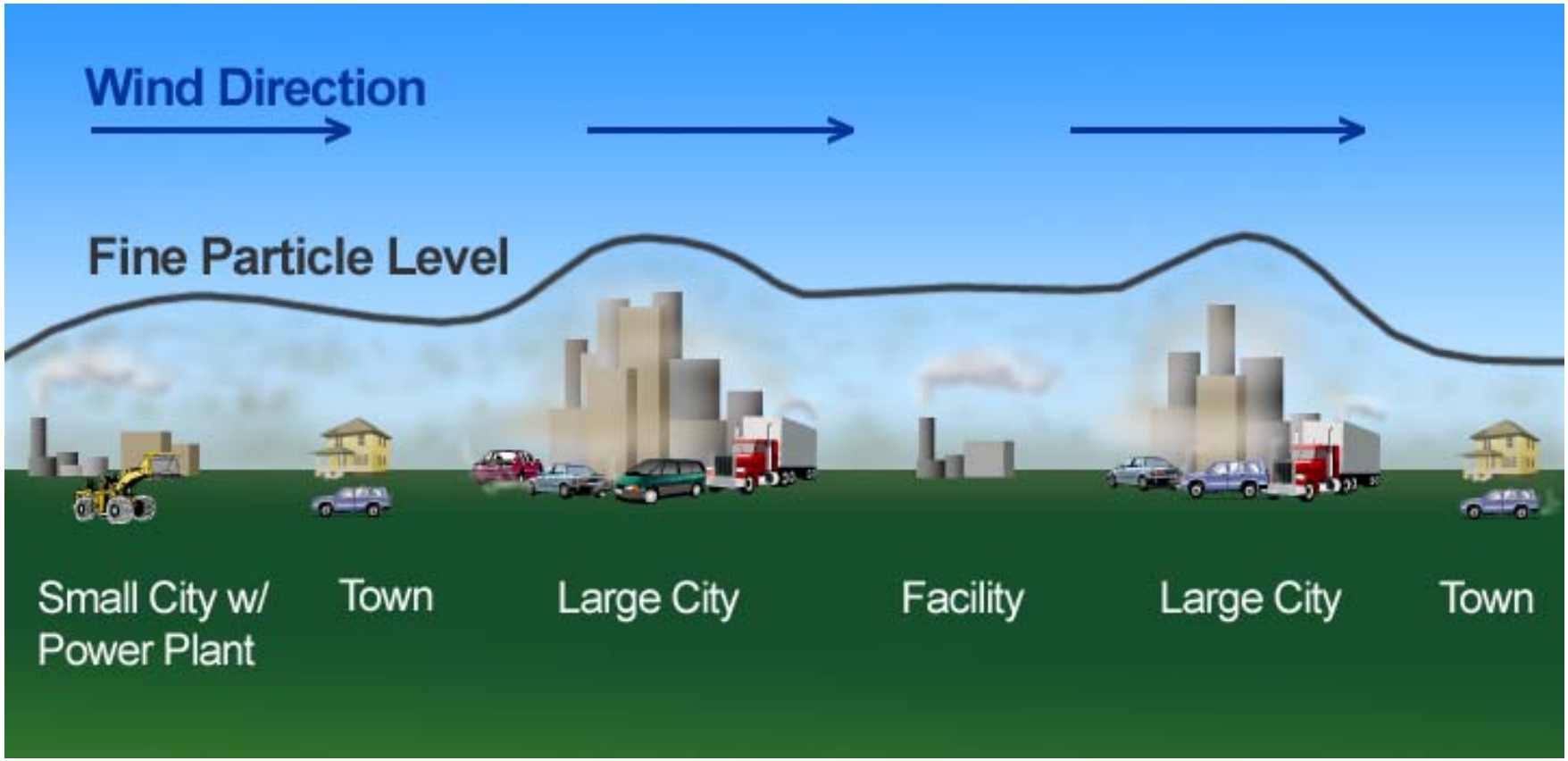
Statutory Requirement

- "Nonattainment area" is defined in section 107 of the Clean Air Act as:

"…any area that does not meet (<u>or that contributes</u> to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant."

Fine Particle Concentrations are Affected by Nearby Sources and Transported Emissions



Analytical Challenge in the Designations Process:

- ***Identifying the nearby areas and sources that contribute to PM2.5 violations***

The 9 Designation Factors

To Help Determine Nearby Area of Influence for 24-hr NAAQS Violations

Overall Approach

- All factors are taken into consideration in making nonattainment decisions
  - Decisions based on the weight of evidence of the nine technical factors.
- No bright lines are used for evaluating factors across all areas. Counties in a metro area are evaluated in relative terms, on a case-specific basis.
- Designations are to be based on best available current data for air quality, emissions, other factors
- In general, if a county in a metro area has a violating monitor, designate the full county.
  - Possible exceptions due to topography, size of county

Overall Approach (cont.)

- Nonattainment problems are caused by a combination of regional and local emissions
  - For purpose of designations, focus evaluation on counties within the metro area and counties adjacent to the metro area.
- Emissions: direct PM2.5 (carbon and crustal material), SO2, NOx, VOC, ammonia
- “Speciation monitoring” techniques can be used to help identify chemical components of PM2.5 mass as well as sources of emissions
- Goal is to maintain national consistency and fairness in decision making.

Sources of Information

- EPA Air Quality System - national PM2.5 monitoring network
  - Federal Reference Method monitors
  - Speciation Trends Network, IMPROVE
- 2002 National Emissions Inventory (version 3)
  - Direct carbon and crustal emissions are estimated from total PM2.5 emissions with the SMOKE emissions processor
- 2000 US Census population data and population growth data
- 2000 US Census, Journey to Work database
- Vehicle miles traveled
  - Estimates obtained from FHWA Highway Performance Modeling System
- NOAA weather and meteorological data
- NOAA HYSPLIT back trajectory model
- OMB 2003 metro area definitions
- USGS topographic information
- Satellite imagery – Google Earth

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Population / Degree of Urbanization

- What type of area is it?
  - Large metro area
  - Moderate-sized city
  - Small town / township
- How many counties make up the metro area?
  - Core Based Statistical Area (CBSA) and Consolidated Statistical Area (CSA)
- How do the counties in the area compare in terms of population density?
- Is the area affected by urban sprawl?

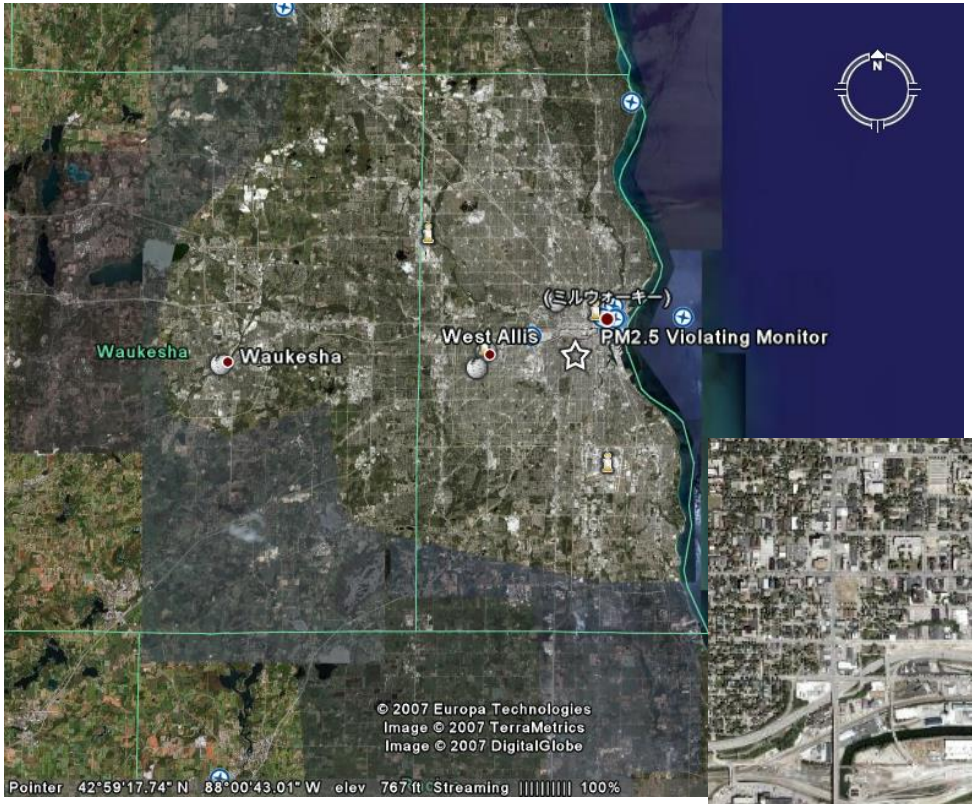
PM2.5 Monitoring Data 2003 - 2005: "New" Areas Violating 24-Hour Standard

EPA Reg	Site	State	County	County Pop	Core-Based Statistical Area (CBSA)	CBSA POP	24-Hour Avg	Annual Avg
10	530530029	Washington	Pierce	700,820	Seattle-Tacoma-Bellevue, WA	3,043,878	40	10.8
9	060731010	California	San Diego	2,813,833	San Diego-Carlsbad-San Marcos, CA	2,813,833	37	14.1
9	060670006	California	Sacramento	1,223,499	Sacramento--Arden-Arcade--Roseville, CA	1,796,857	45	11.8
9	060670010	California	Sacramento	1,223,499	Sacramento--Arden-Arcade--Roseville, CA	1,796,857	41	11.3
9	060674001	California	Sacramento	1,223,499	Sacramento--Arden-Arcade--Roseville, CA	1,796,857	38	10.5
9	060850005	California	Santa Clara	1,682,585	San Jose-Sunnyvale-Santa Clara, CA	1,735,819	39	11.7
9	060852003	California	Santa Clara	1,682,585	San Jose-Sunnyvale-Santa Clara, CA	1,735,819	36	10.3
5	550790010	Wisconsin	Milwaukee	940,164	Milwaukee-Waukesha-West Allis, WI	1,500,741	37	13.0
5	550790043	Wisconsin	Milwaukee	940,164	Milwaukee-Waukesha-West Allis, WI	1,500,741	39	13.2
5	550790099	Wisconsin	Milwaukee	940,164	Milwaukee-Waukesha-West Allis, WI	1,500,741	37	12.8
5	551330027	Wisconsin	Waukesha	360,767	Milwaukee-Waukesha-West Allis, WI	1,500,741	36	13.5
2	360290005	New York	Erie	950,265	Buffalo-Niagra Falls, NY Metropolitan Sta	1,170,111	37	13.8
8	490350003	Utah	Salt Lake	898,387	Salt Lake City, UT	968,858	47	11.9
8	490350012	Utah	Salt Lake	898,387	Salt Lake City, UT	968,858	49	14.7
8	490351001	Utah	Salt Lake	898,387	Salt Lake City, UT	968,858	41	9.8
8	490353006	Utah	Salt Lake	898,387	Salt Lake City, UT	968,858	47	11.6
8	490353007	Utah	Salt Lake	898,387	Salt Lake City, UT	968,858	48	12.2
5	260810020	Michigan	Kent	574,335	Grand Rapids-Wyoming, MI	740,482	37	13.1
3	420770004	Pennsylvania	Lehigh	312,090	Allentown-Bethlehem-Easton, PA-NJ	740,395	36	14.5
3	420950025	Pennsylvania	Northampton	267,066	Allentown-Bethlehem-Easton, PA-NJ	740,395	36	14.1
5	390950024	Ohio	Lucas	455,054	Toledo, OH	659,188	39	14.7
5	390950025	Ohio	Lucas	455,054	Toledo, OH	659,188	37	14.4
5	390950026	Ohio	Lucas	455,054	Toledo, OH	659,188	37	14.3
3	420850100	Pennsylvania	Mercer	120,293	Youngstown-Warren-Boardman, OH-PA	602,964	36	13.7
5	390990005	Ohio	Mahoning	257,555	Youngstown-Warren-Boardman, OH-PA	602,964	36	15.0
5	390990014	Ohio	Mahoning	257,555	Youngstown-Warren-Boardman, OH-PA	602,964	38	15.5
5	391550007	Ohio	Trumbull	225,116	Youngstown-Warren-Boardman, OH-PA	602,964	38	14.7

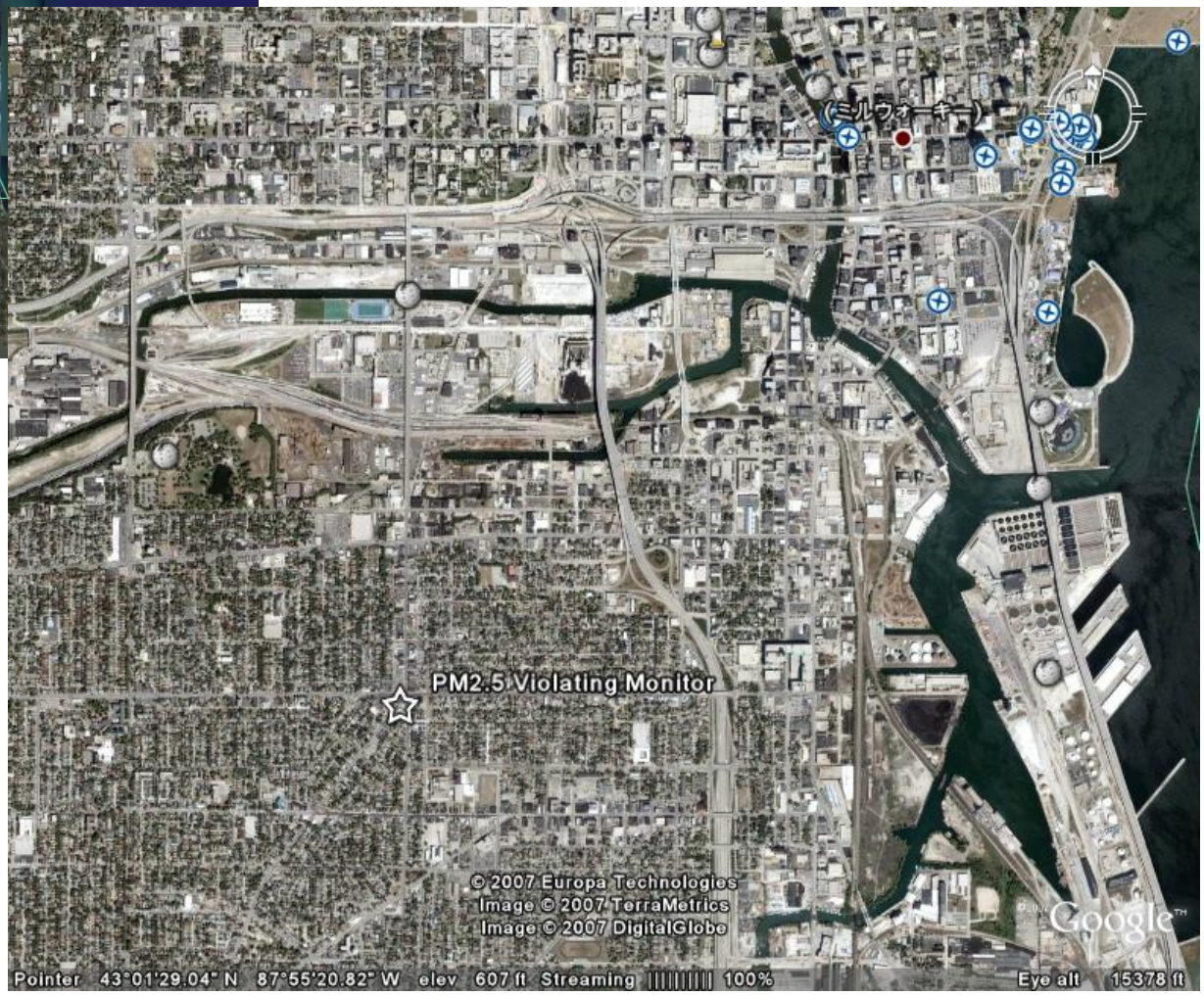
EPA Reg	Site	State	County	County Pop	Core-Based Statistical Area (CBSA)	CBSA POP	24-Hour Avg	Annual Avg
8	490110004	Utah	Davis	238,994	Ogden-Clearfield, UT	442,656	40	11.0
8	490570002	Utah	Weber	196,533	Ogden-Clearfield, UT	442,656	40	11.5
8	490571003	Utah	Weber	196,533	Ogden-Clearfield, UT	442,656	36	9.5
8	490490002	Utah	Utah	368,536	Provo-Orem, UT	376,774	39	10.0
8	490494001	Utah	Utah	368,536	Provo-Orem, UT	376,774	43	10.5
8	490495010	Utah	Utah	368,536	Provo-Orem, UT	376,774	36	8.7
10	410392013	Oregon	Lane	322,959	Eugene-Springfield, OR	322,959	53	12.4
5	550090005	Wisconsin	Brown	226,778	Green Bay, WI	282,599	36	11.0
4	011130001	Alabama	Russell	49,756	Columbus, GA-AL	281,768	37	15.7
4	132150008	Georgia	Muscogee	186,291	Columbus, GA-AL	281,768	38	15.5
9	060070002	California	Butte	203,171	Chico, CA	203,171	47	12.6
5	180390003	Indiana	Elkhart	182,791	Elkhart-Goshen, IN	182,791	36	14.6
5	181570008	Indiana	Tippecanoe	148,955	Lafayette, IN	178,541	37	14.1
6	350130017	New Mexico	Dona Ana	174,682	Las Cruces, NM	174,682	36	10.4
5	181670023	Indiana	Vigo	105,848	Terre Haute, IN	170,943	36	13.6
5	261210040	Michigan	Muskegon	170,200	Muskegon-Norton Shores, MI	170,200	37	11.7
9	060250005	California	Imperial	142,361	El Centro, CA	142,361	39	12.7
9	061010003	California	Sutter	78,930	Yuba City, CA Metropolitan Statistical	139,149	36	9.6
3	420270100	Pennsylvania	Centre	135,758	State College, PA	135,758	38	13.4
3	540610003	West Virginia	Monongalia	81,866	Morgantown, WV	111,200	36	14.5
8	490050004	Utah	Cache	91,391	Logan, UT-ID	102,720	65	12.1
8	300630031	Montana	Missoula	95,802	Missoula, MT	95,802	41	10.5
3	420010001	Pennsylvania	Adams	91,292	Gettysburg, PA	91,292	36	13.6
10	020900010	Alaska	Fairbanks North Star	82,840	Fairbanks, AK	82,840	40	11.9
10	410350004	Oregon	Klamath	63,775	Klamath Falls, OR	63,775	41	11.0
7	191390015	Iowa	Muscatine	41,722	Muscatine, IA	53,905	38	13.0
7	190450021	Iowa	Clinton	50,149	Clinton, IA	50,149	36	12.6
5	180830004	Indiana	Knox	39,256	Vincennes, IN	39,256	36	14.1
8	300810001	Montana	Ravalli	36,070			37	7.8
10	160090010	Idaho	Benewah	9,171			43	10.3
10	160590004	Idaho	Lemhi	7,806			37	10.7
10	160790017	Idaho	Shoshone	13,771			39	12.1

San Jose – Sunnyvale-Santa Clara Metro Area
Population 1.7 million

Shoshone County, Idaho – City of Pinehurst
Population 13,000



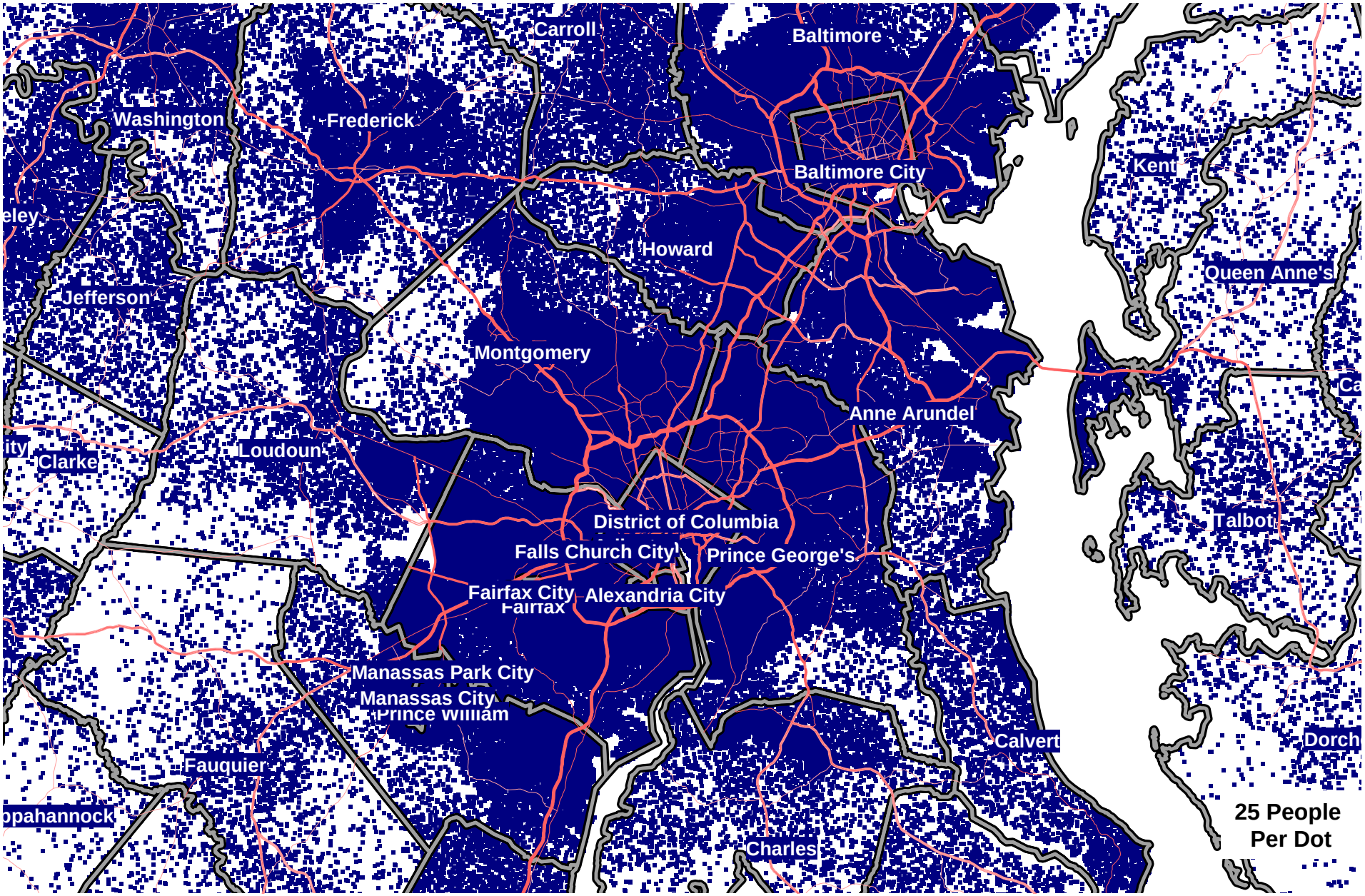
Milwaukee, Wisconsin
Population 1.5 million
39 ug/m3



Satellite imagery can help illustrate the degree of urbanization and can help identify important emissions sources in the vicinity of the violating monitor(s)

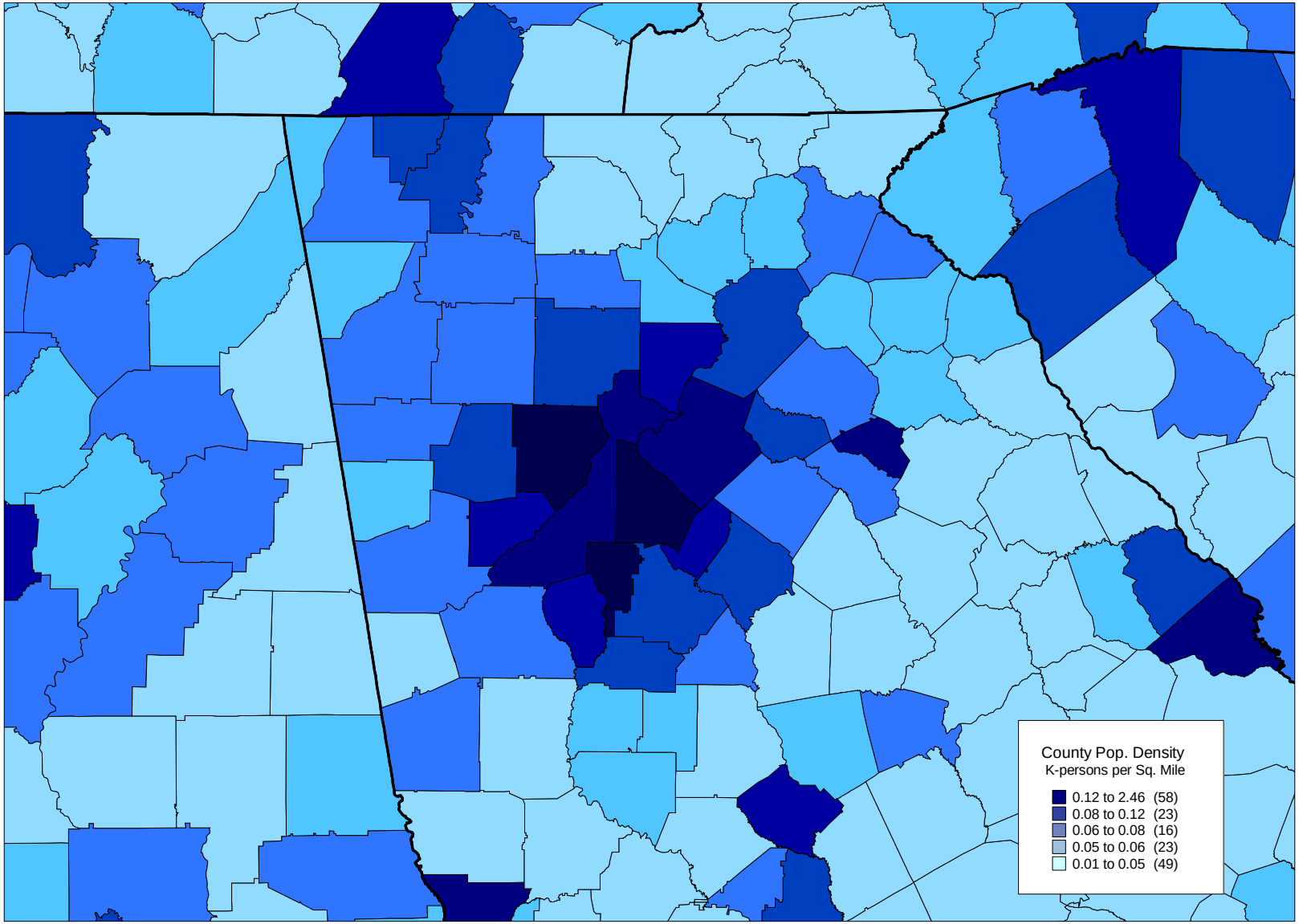
Population Density

Washington, DC



Population Density

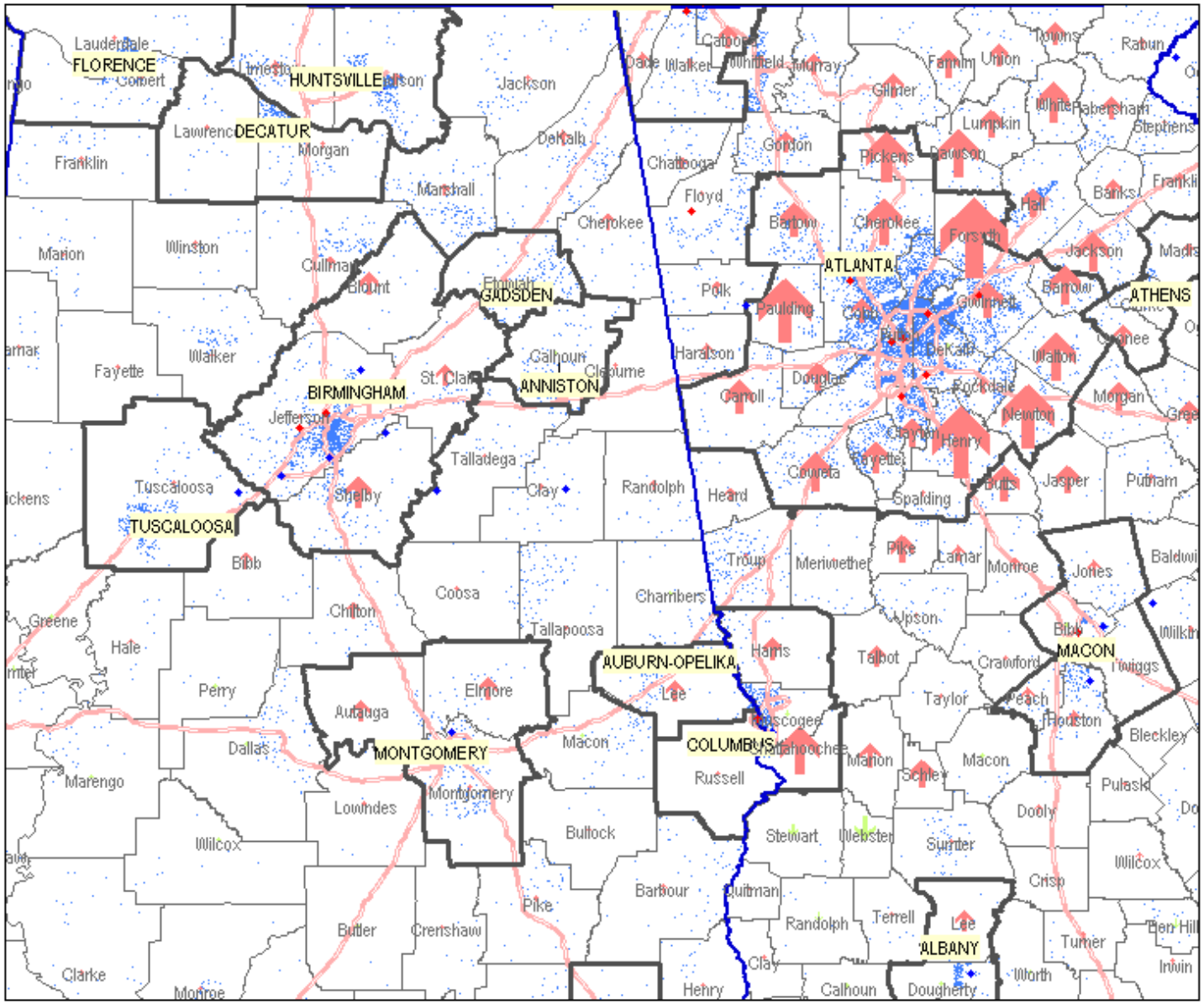
Atlanta, GA



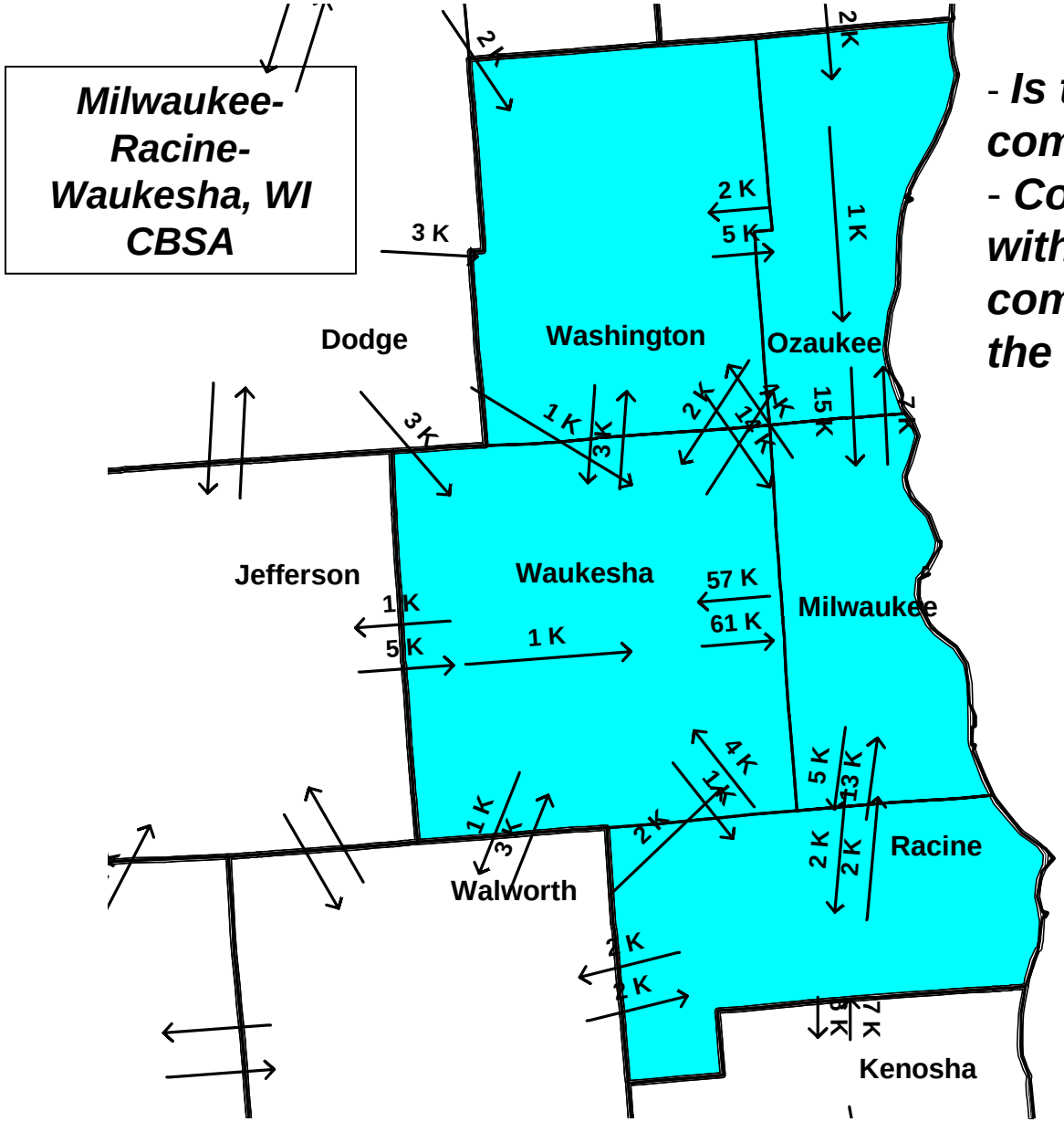
Growth Rates

- What has been the population growth rate in the area in recent years?
- Which counties have the highest rates?
  - The counties with highest population density may differ from those with the highest growth rates.
- Is growth expected to continue?

Population Growth Rates



Traffic and Commuting Patterns



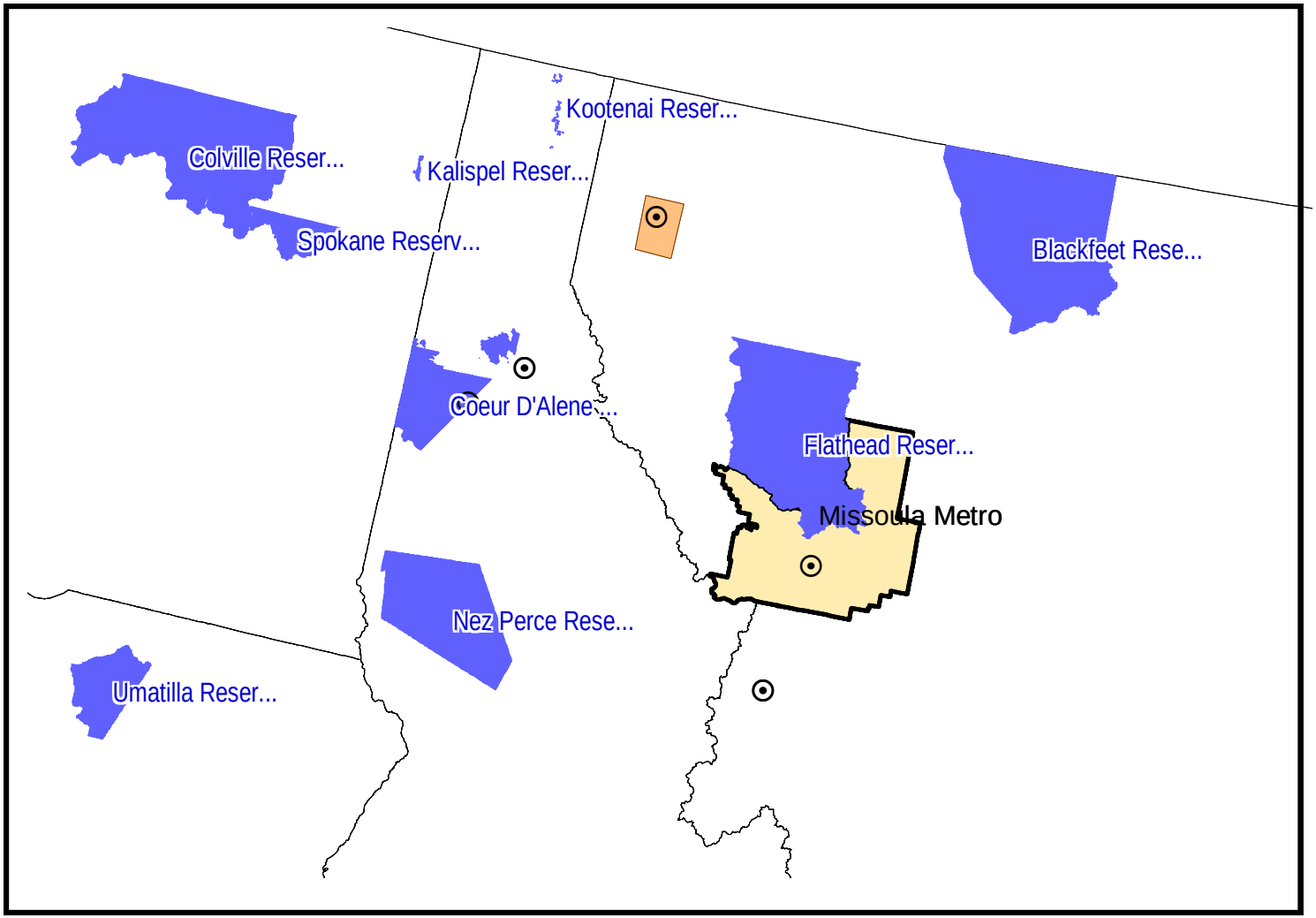
- ***Is there a high degree of commuting in the metro area?***
- ***Consider inclusion of counties with significant level of commuting to counties within the city or metro area***

Percentage of workers who commute to other counties in the metro area

Source: 2000 US Census, Journey to Work data

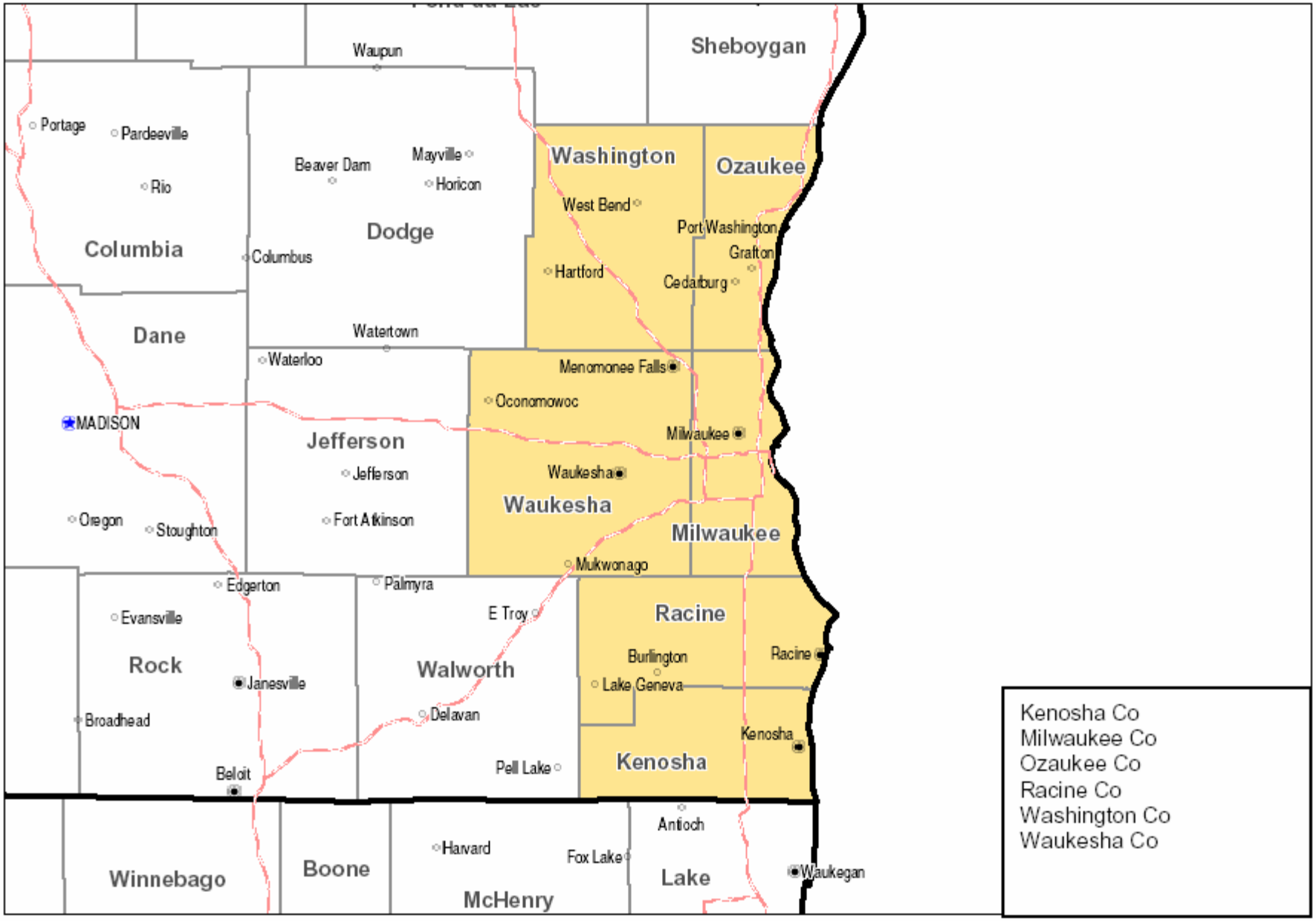
Jurisdictional and Other Boundaries

- County and metropolitan area boundaries
  - Including multi-state areas
- Metropolitan planning organizations
- Existing nonattainment area boundaries
- Air pollution control districts
- Tribal lands



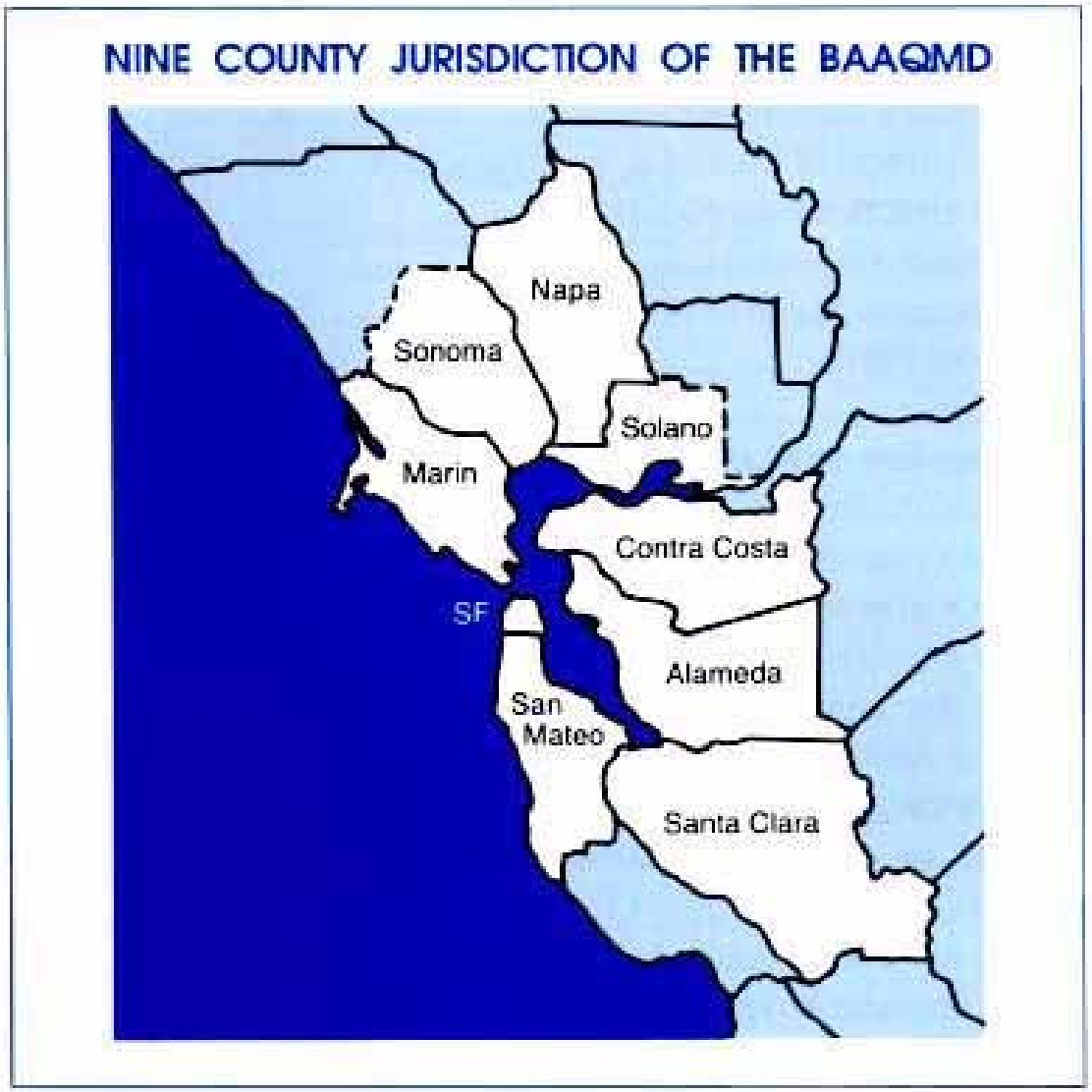
Consideration of Tribal Lands

Milwaukee-Racine, WI 8-hour Ozone Nonattainment Area

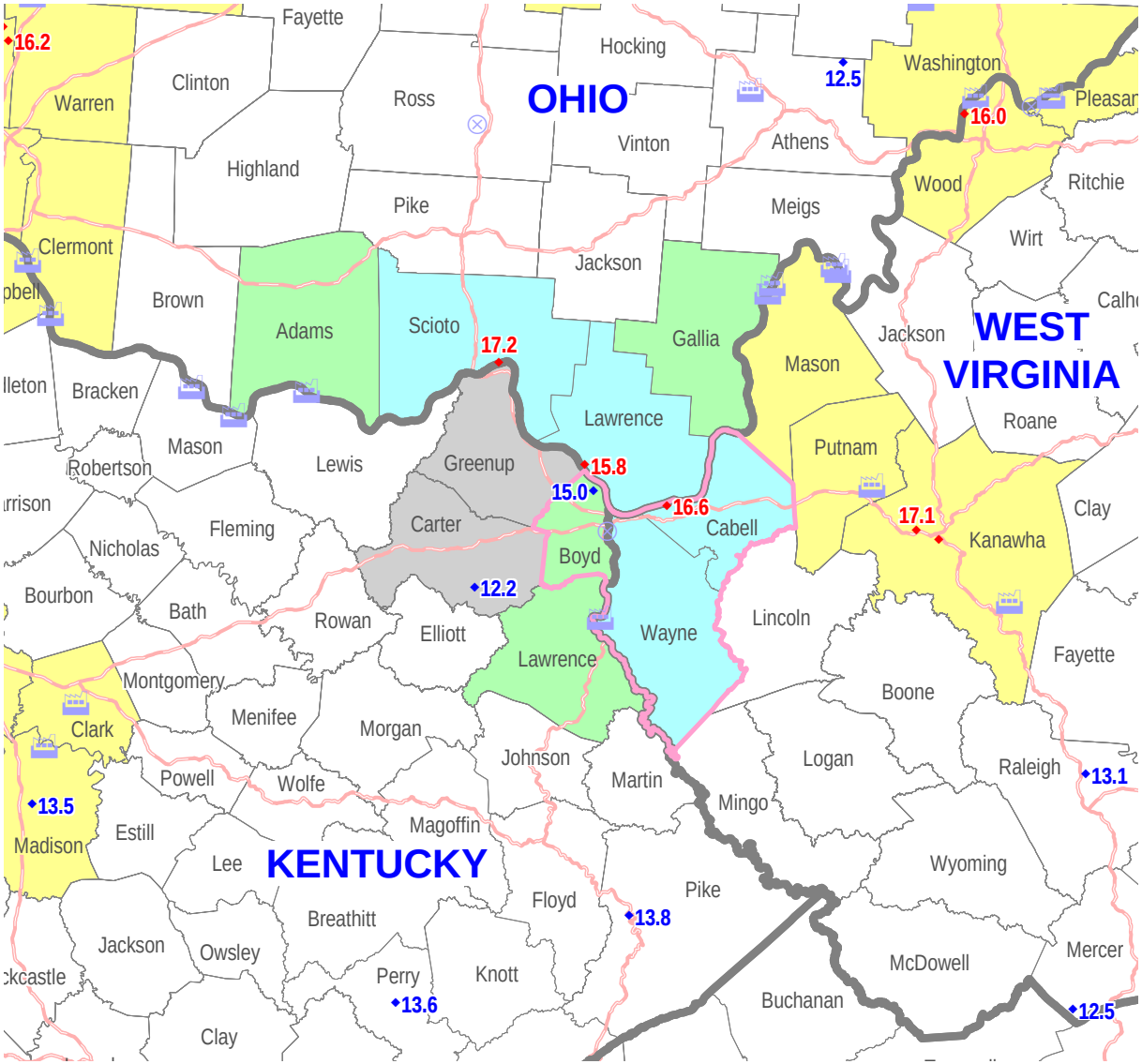


Boundaries and locations are for illustrative purposes only. This is not a regulatory document.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

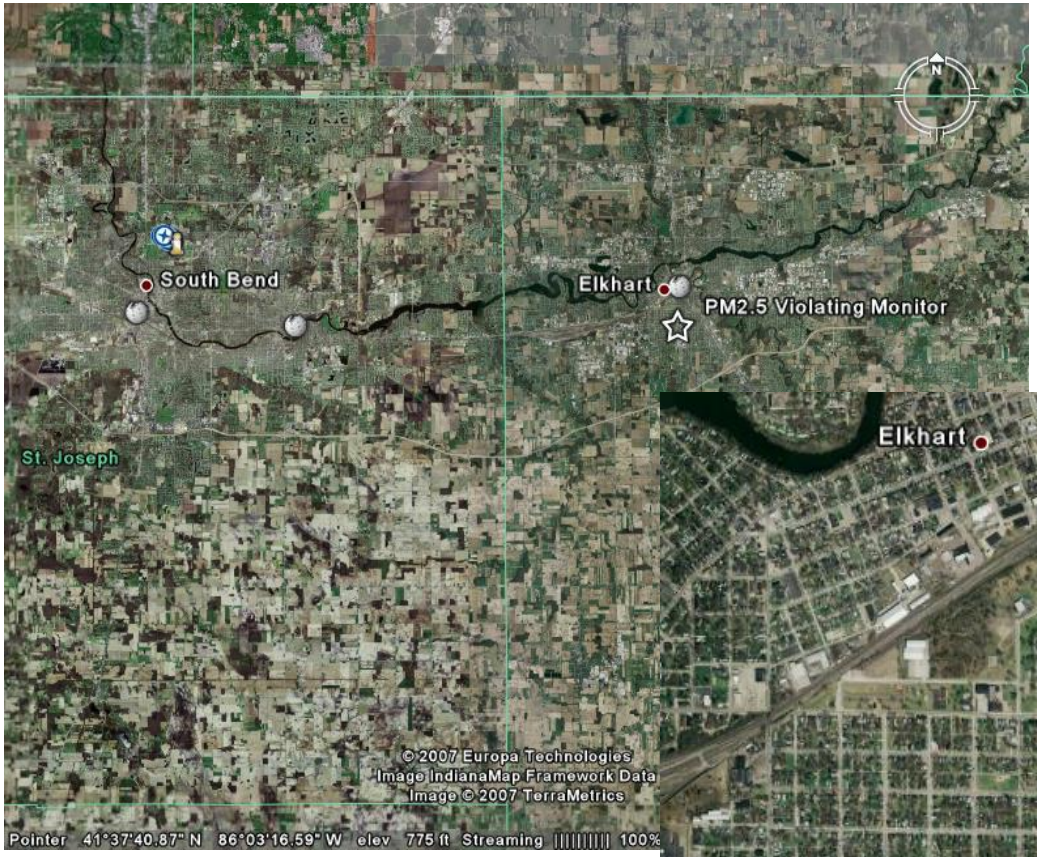


Huntington-Ashland Multi-State Area

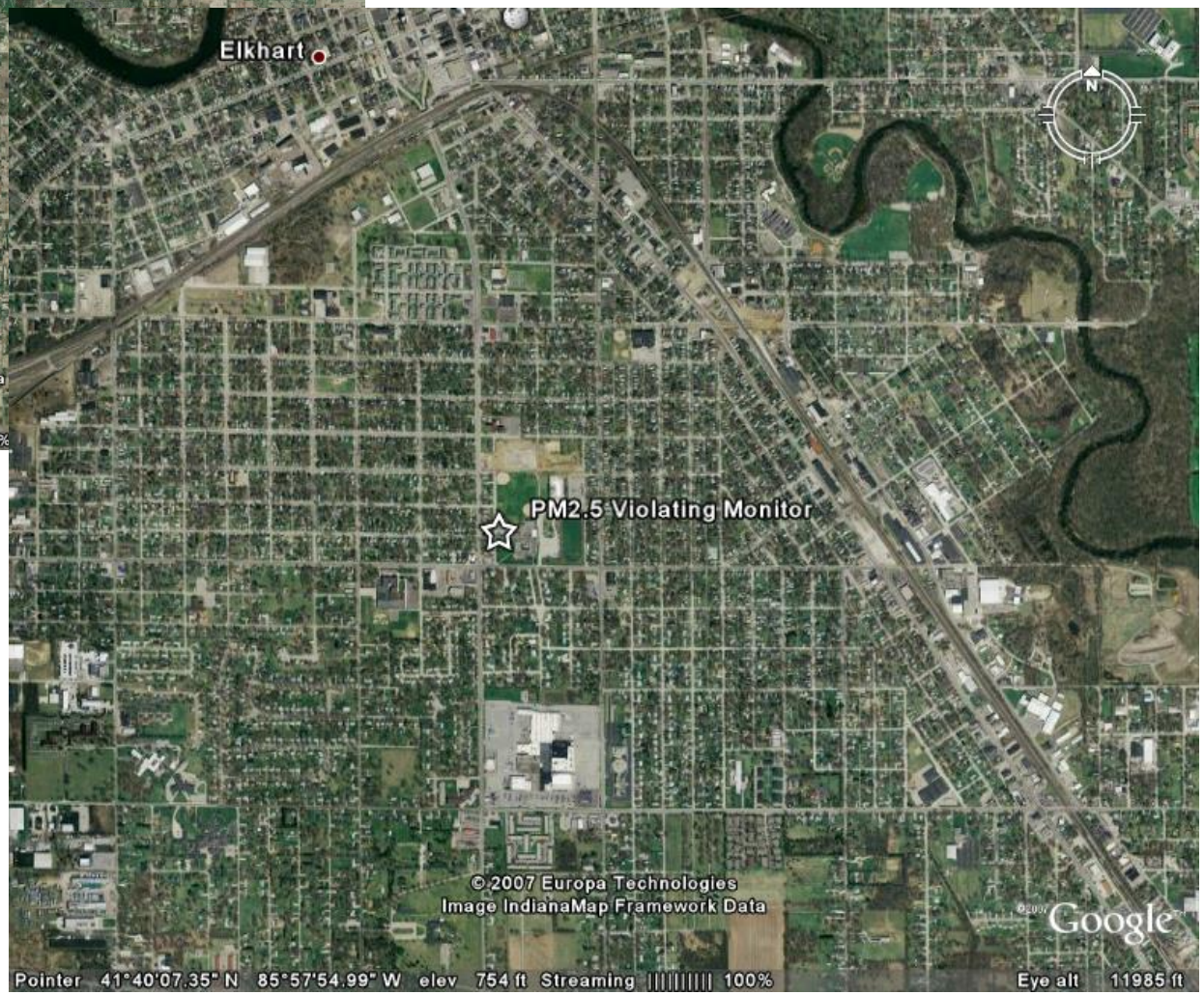


Topography / Geography

- Are there topographic features that defines or affects the contributing source region?
  - Examples: high mountains, narrow valley
- Primarily a western issue

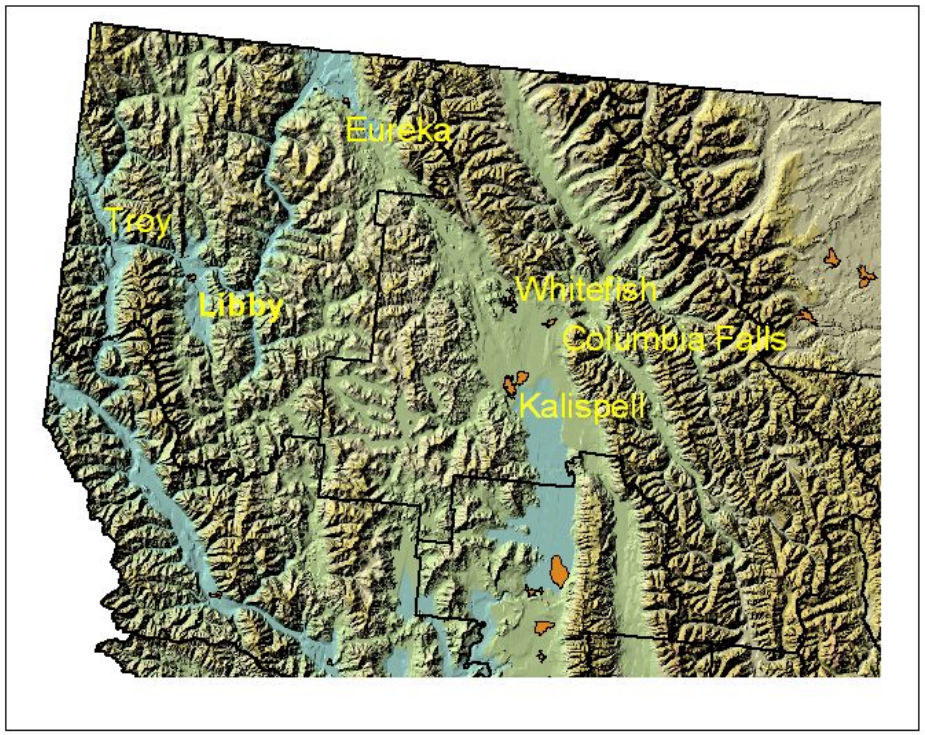


Elkhart, Indiana
Population 183,000
36 ug/m3



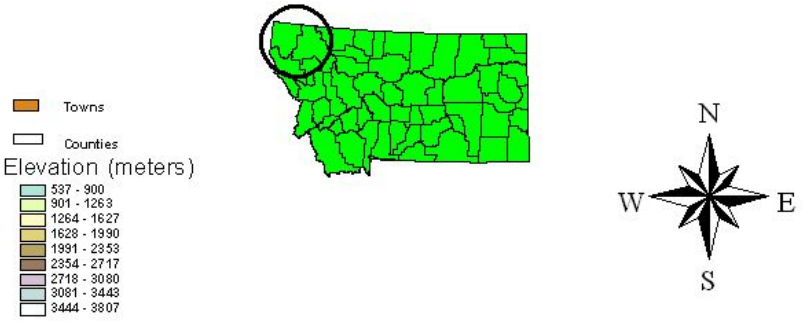
Kinda flat …
Topography is not much of an issue here.

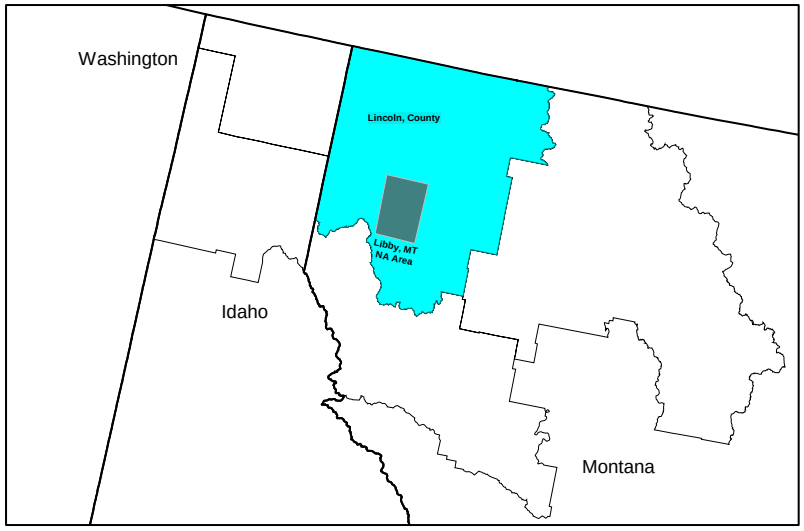
Libby, MT
PM 2.5 Nonattainment Designation



Topography / Geography

- Example: Libby, Montana

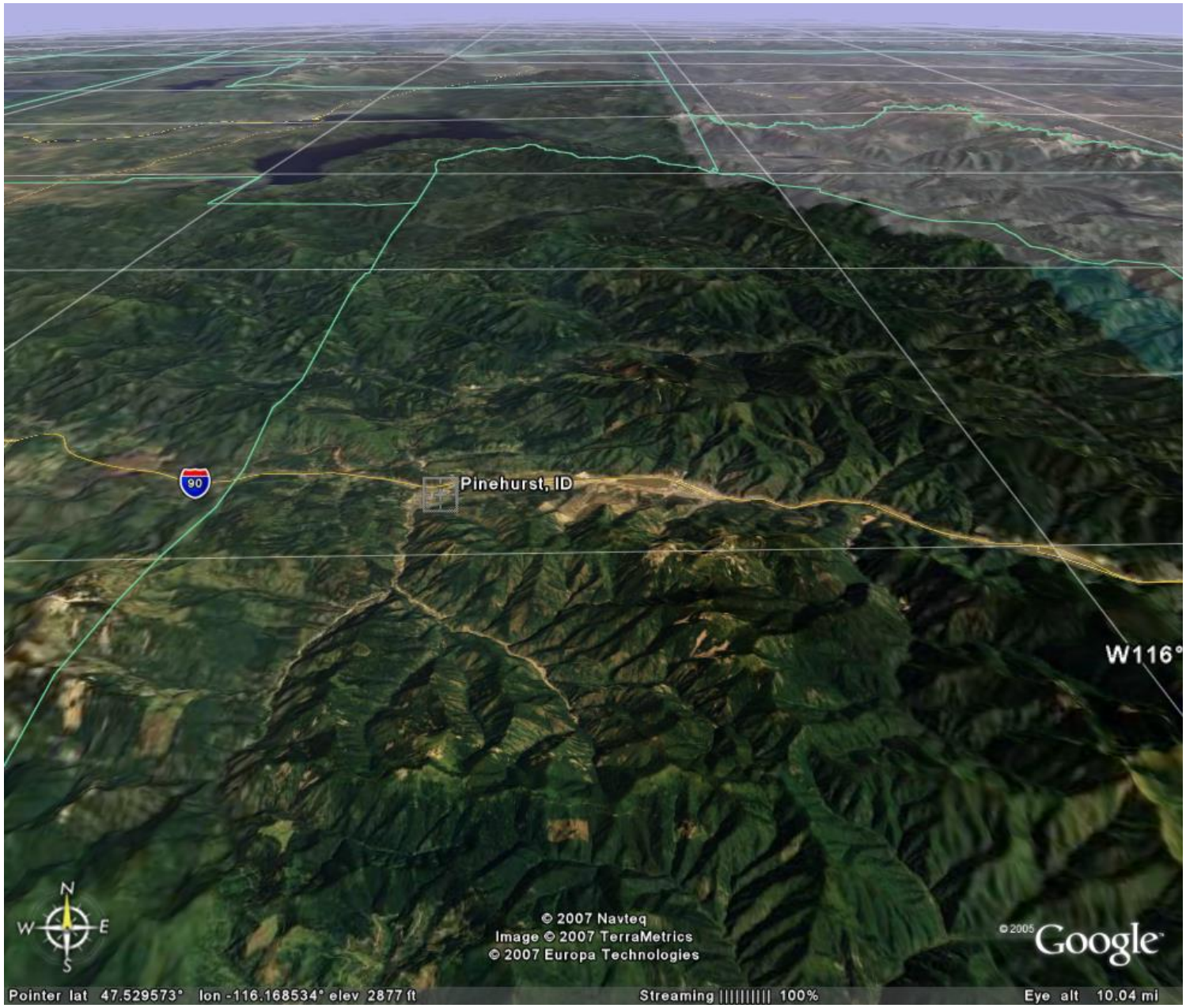


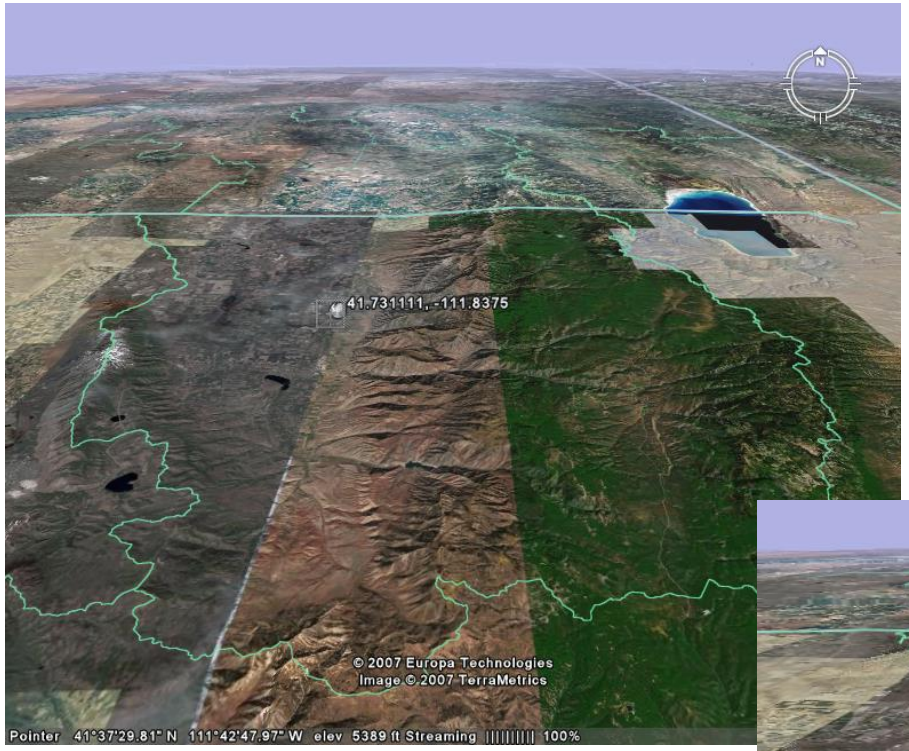


Shoshone County, Idaho – City of Pinehurst

Small town
in large county

Shoshone County, Idaho – City of Pinehurst

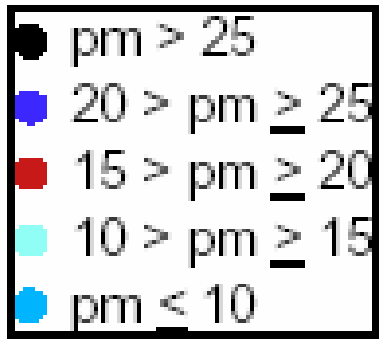


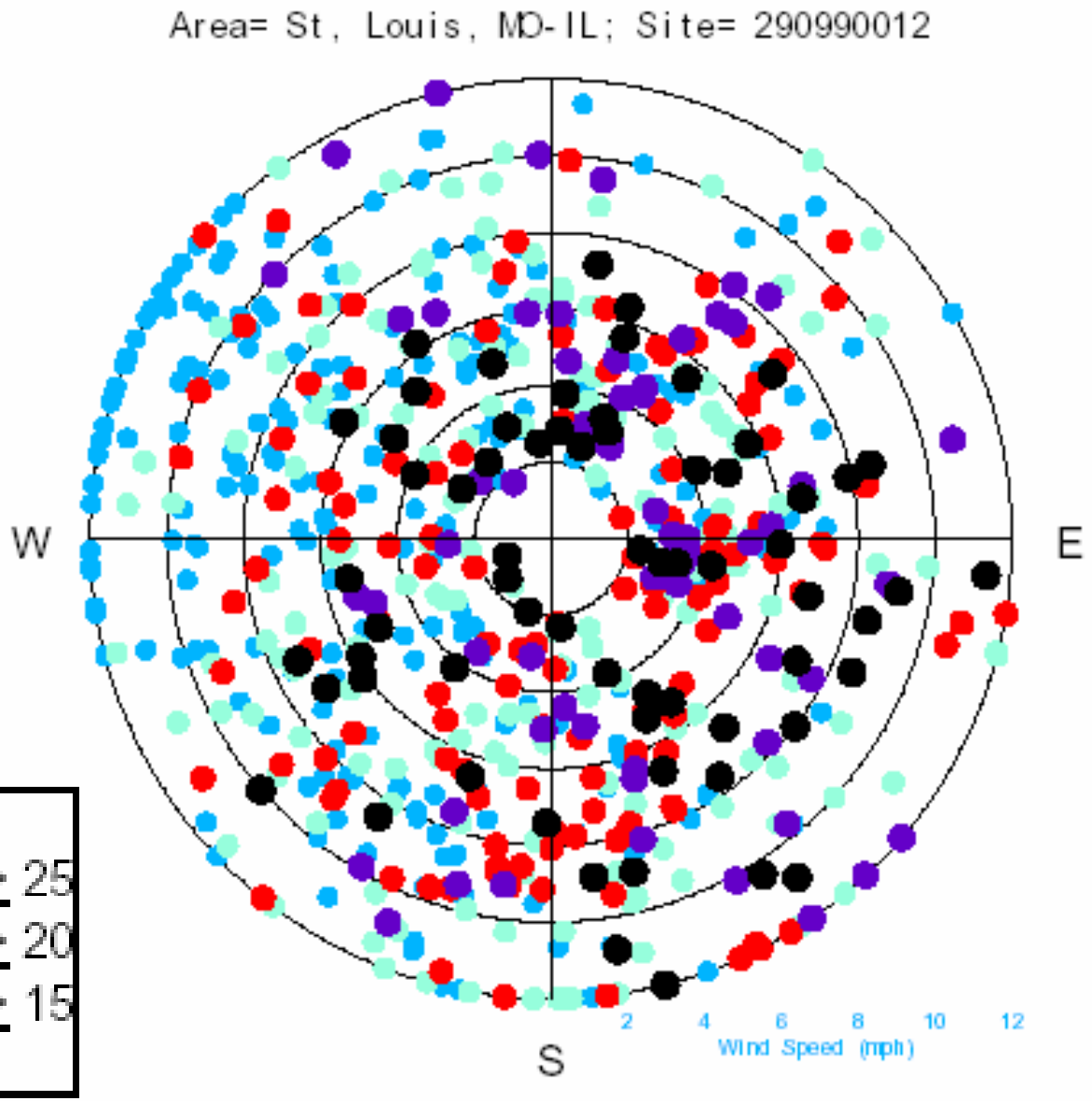


Logan, Utah
Population 103,000
65 ug/m3

Meteorology

Possible tools:
- Pollution roses based on hourly wind direction data and 24-hour PM2.5 data
- Back trajectories for analysis of high days

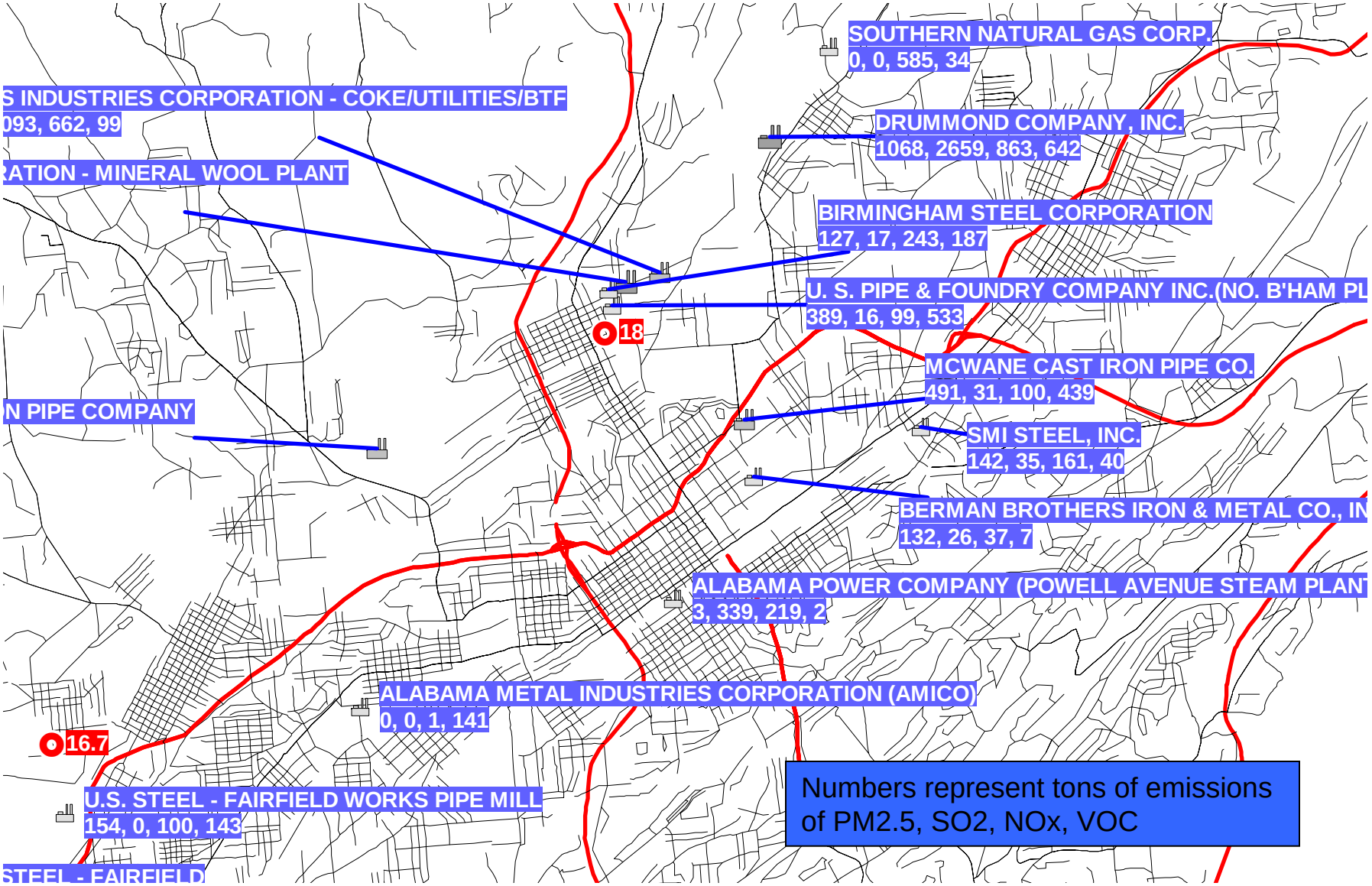




Emissions Data

- Where are important nearby emissions sources located?
- What are emissions of PM2.5 and precursors by county?
- Are certain sources key contributors during specific seasons?
  - Speciation data provides important information
  - High nitrate and carbon in winter, sulfate in summer

Birmingham, AL Local Emissions Sources



Birmingham, AL – 2001 Emissions

		PM	SO2	NOX	VOC	Amm	Carbon	Crustal
Birmingham,AL	**Jefferson**	**12,772**	**56,703**	**69,364**	**44,782**	**1,198**	**3,574**	**7,061**
Birmingham,AL	**Shelby**	**8,780**	**126,125**	**42,095**	**9,650**	**386**	**2,329**	**5,100**
Birmingham,AL	Walker	3,916	59,256	23,982	4,750	1,491	1,080	2,332

Next:

- Conceptual model for PM2.5 24-hour concentrations

-Analyses of PM2.5 Mass and Speciation Data for high days

-Analyses combining air quality, meteorology, and emissions