

# Overview of EPA-R5 network assessment conducted in 2000

Motria Caudill

R5 Air Monitoring & Analysis Section

# Participants & roles

- **USEPA-R5** – coordinated efforts, did data analysis
- **Lake Michigan Air Directors Consortium (LADCO)** – organized State input, drafted documents
- **Region 5 states** – evaluate local issues & priorities, review analyses and documents, suggest network changes
  - Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

# Monitoring strategy core principles

- State-by-state recommendations to improve (decrease, increase, relocate, revise) existing criteria pollutant networks based on consideration of:
  - public information
  - public health/compliance with NAAQS
  - strategy development (i.e., support modeling)
  - trends/strategy evaluation
  - multi-pollutant sites (supersites)
  - regional-scale (O<sub>3</sub>, PM<sub>2.5</sub>) v. local-scale (CO, SO<sub>2</sub>, Pb, PM<sub>10</sub>) pollution problems
  - over-monitoring (redundancy) and under-monitoring
  - low concentrations
  - state rules
  - population growth

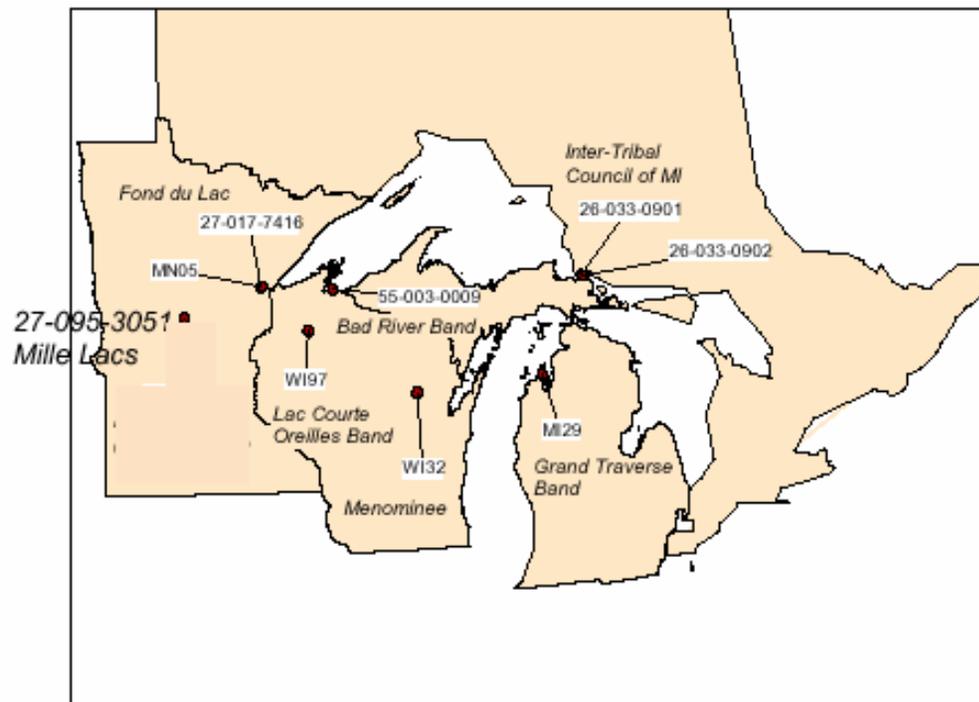
## Core principles, cont'd

- Not bound by Federal regs and policies; need to change NAMS/SLAMS regulations and nonattainment policies
- Evaluate new technology
- State/local flexibility (special needs – e.g., TSP in WI)
- Need to address administrative issues, incl. public outreach, reinvesting savings, preserve funding and jobs

# EPA's data analysis

- Focus on ozone and PM<sub>2.5</sub>
- Identify “high value” and “low value” monitors based on
  - Are concentrations near the NAAQS or well below?
  - Are results redundant, i.e. highly correlated with another site?
  - Does the site provide useful spatial coverage or is it near other sites?

# Tribal sites considered



**Figure 3. Tribal Monitoring Locations**

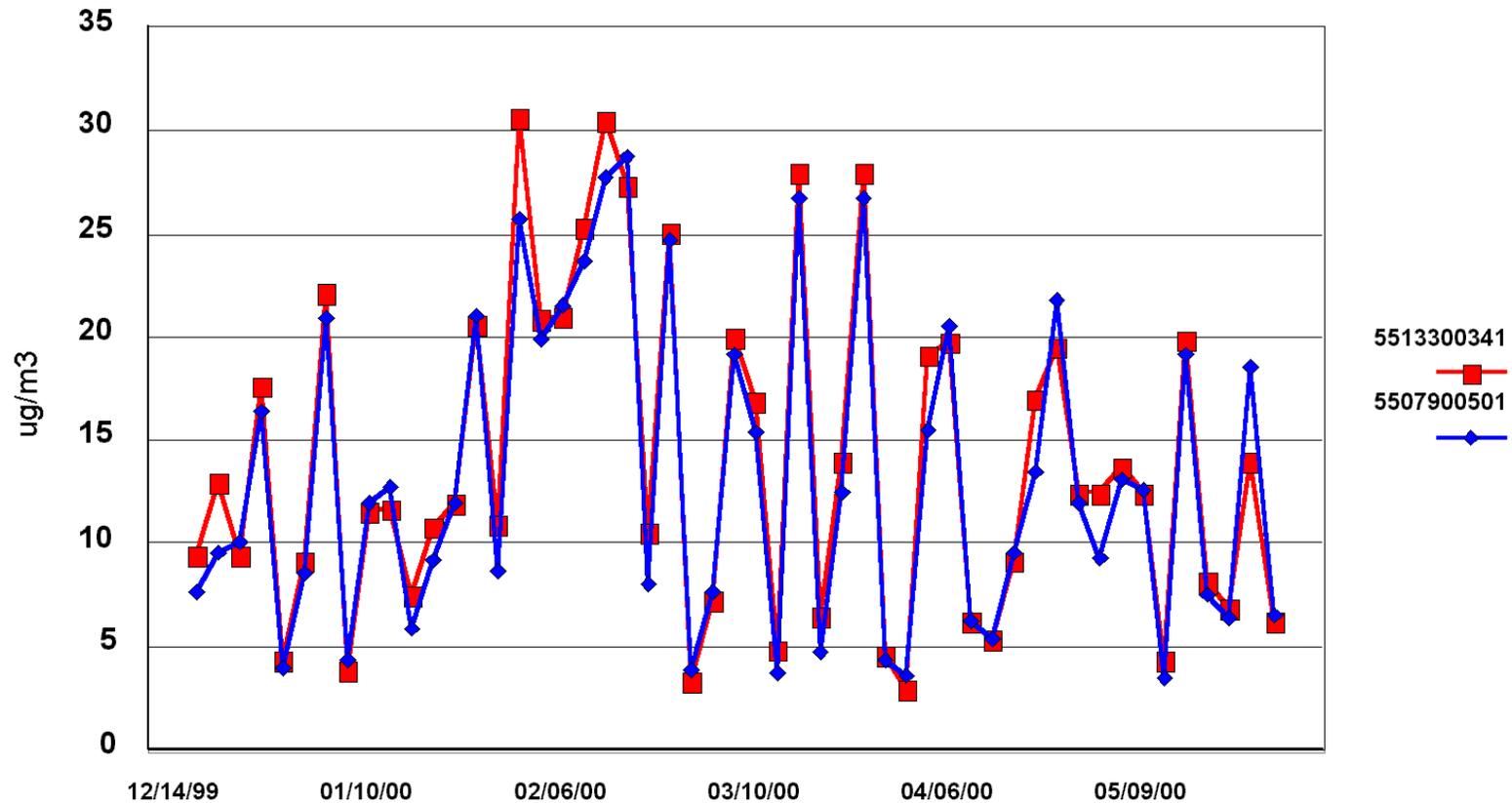
- Several Tribes operate PM<sub>2.5</sub> and ozone sites
- Valuable spatial coverage for modeling and AQI

# PM<sub>2.5</sub> assessment

- ~200 sites in the Region
- Wrote SAS program to determine correlation (R) between each pair of monitors
  - “R” describes the degree of association between groups of variables
  - Example: if R<sup>2</sup> is 0.90, then 90% of variability in site A can be explained by variability in site B
- Other metrics
  - Distance (km) to nearest monitor
  - Average PM<sub>2.5</sub> concentration
  - County population change

# Example of highly correlated sites in SE WI

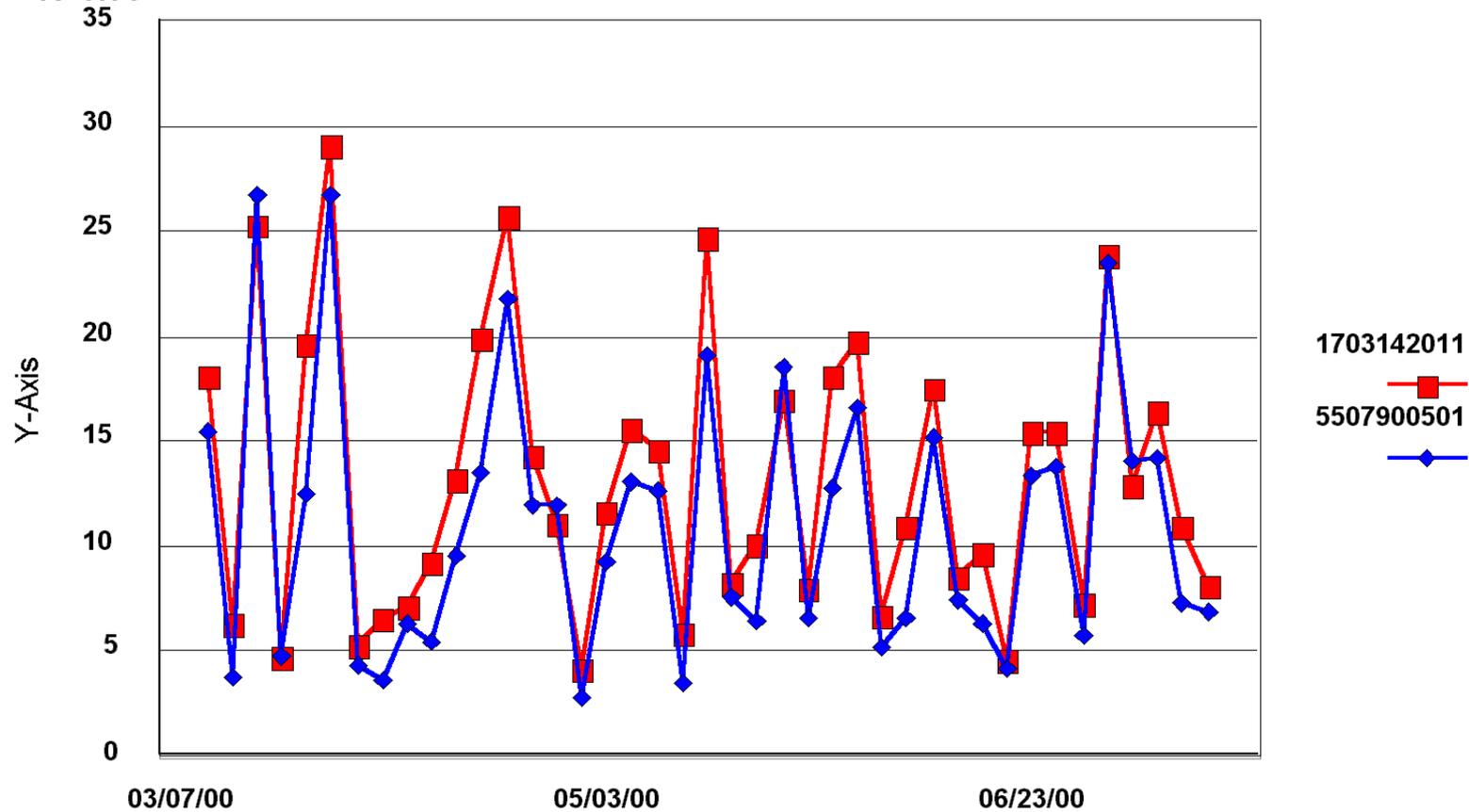
Sites in Milwaukee and Waukesha, WI (21 km apart);  
 $R=0.980$



# Two sites further apart

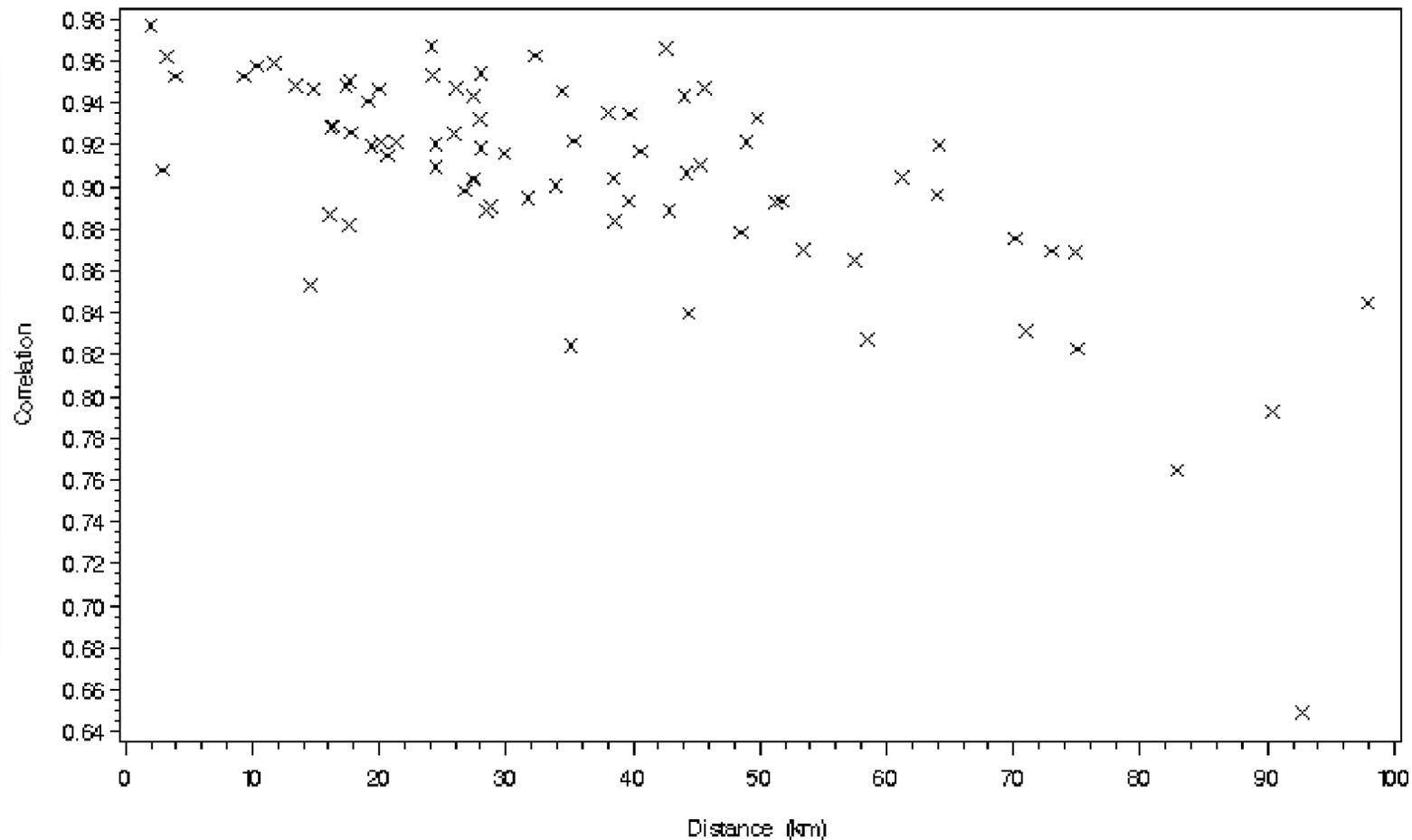
PM2.5 Sites in Chicago, IL and Milwaukee, WI (108 km);

R=0.96



# PM<sub>2.5</sub> correlogram

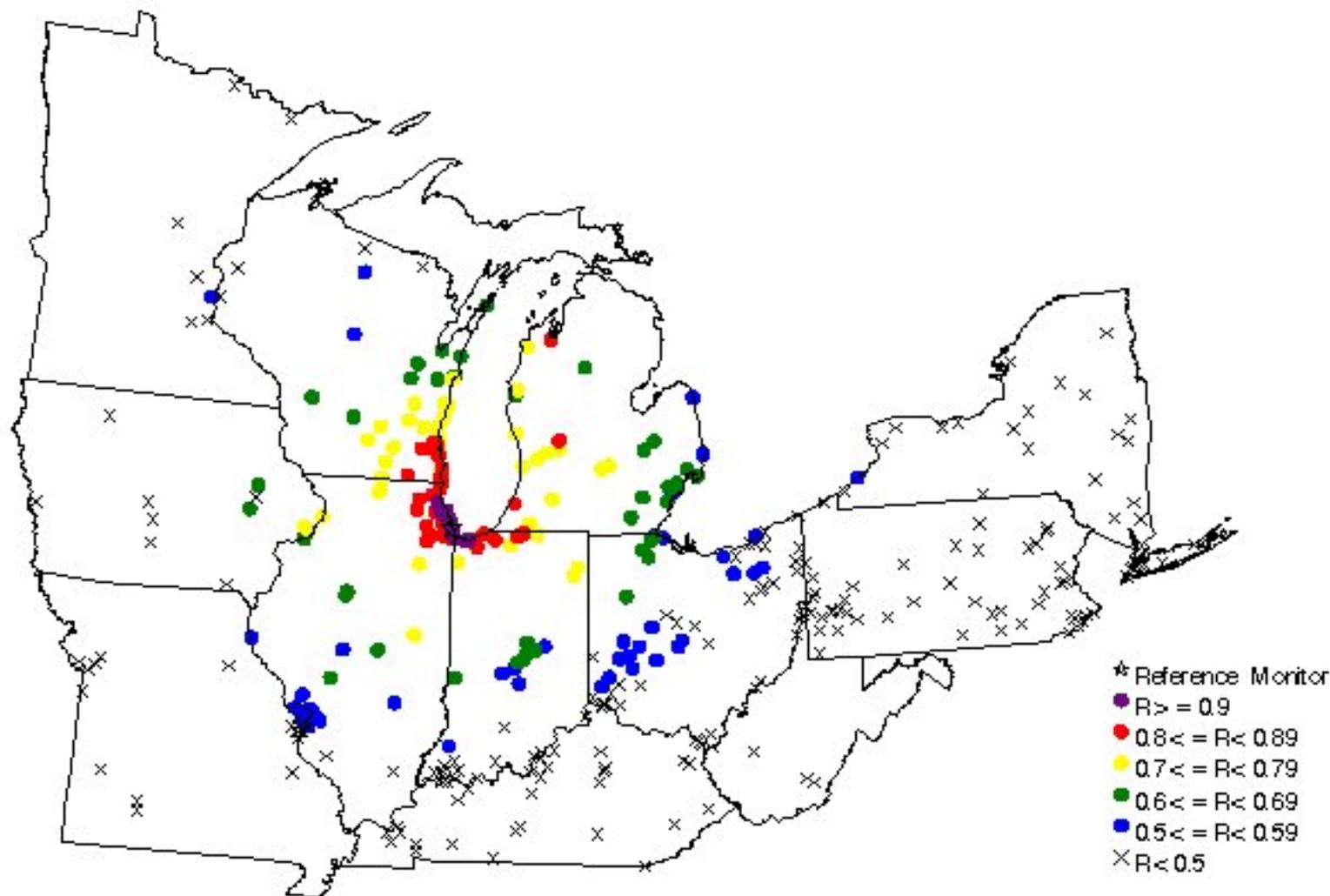
Correlogram for CHICAGO, IL



Data taken from AIRS: July 12, 2000

# Ozone Correlation Map for a Monitor in METROPOLITAN CHICAGO

Site ID= 170310064442011



## Results provided to States

- Spreadsheets with data outputs
- GIS maps to display concentration, correlation, and site proximity
- States weighed these purely technical findings against real-world considerations, e.g. some monitors grow “roots” in the community and cannot be moved

# High-value sites in RED

Microsoft Excel - pm25states.XLS

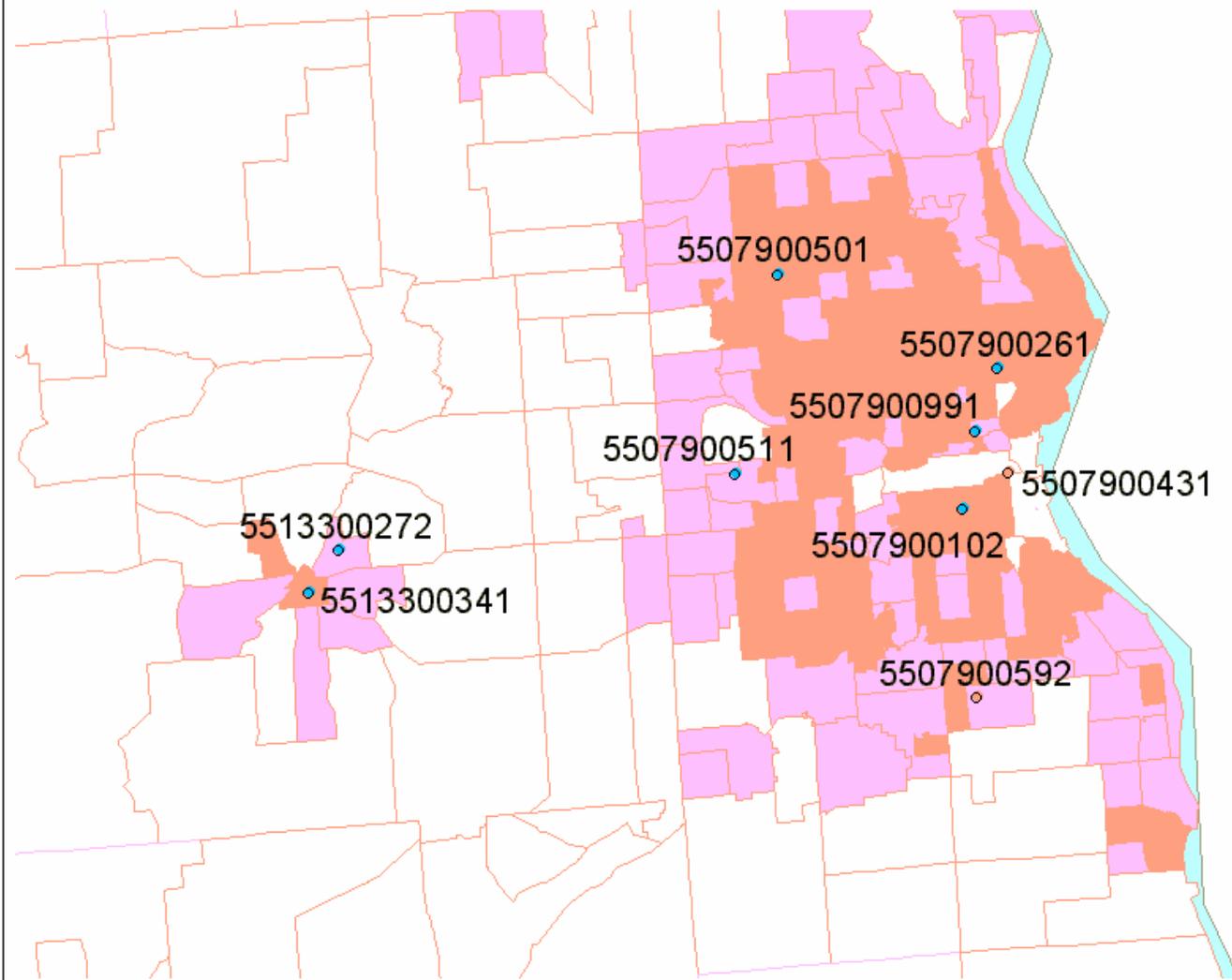
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	A	B	C	D	E	G	H	I
1	State	County	Metropolitan Statistical Area (MSA)	AIRS ID	Mean (ug/m3)	Distance to Next Site (km)	Correlation, Highest (R)	County Population Growth, Percent
2								
3	IL	Adams	Not in an MSA	1700100061	NA	60.3	NA	0 to 5 %
4	IL	Champaign	Champaign-Urbana, IL	1701900041	NA	14.6	NA	-15 to 0 %
5	IL	Champaign	Champaign-Urbana, IL	1701910011	14.54	14.6	0.926	-15 to 0 %
6	IL	Cook	Chicago, IL	1703100141	16.60	11.1	0.953	0 to 5 %
7	IL	Cook	Chicago, IL	1703100221	17.76	2.7	0.940	0 to 5 %
8	IL	Cook	Chicago, IL	1703100501	17.03	3.3	0.966	0 to 5 %
9	IL	Cook	Chicago, IL	1703100521	18.36	6.0	0.943	0 to 5 %
10	IL	Cook	Chicago, IL	1703100571	17.32	6.0	0.966	0 to 5 %
11	IL	Cook	Chicago, IL	1703100761	16.57	8.2	0.968	0 to 5 %
12	IL	Cook	Chicago, IL	1703110161	20.82	2.0	0.943	0 to 5 %
13	IL	Cook	Chicago, IL	1703117011	NA	2.0	NA	0 to 5 %
14	IL	Cook	Chicago, IL	1703120011	17.01	10.5	0.968	0 to 5 %
15	IL	Cook	Chicago, IL	1703133011	17.08	3.1	0.962	0 to 5 %
16	IL	Cook	Chicago, IL	1703140061	15.25	14.8	0.881	0 to 5 %
17	IL	Cook	Chicago, IL	1703142011	14.47	15.4	0.957	0 to 5 %
18	IL	Cook	Chicago, IL	1703160051	16.43	6.0	0.962	0 to 5 %
19	IL	Du Page	Chicago, IL	1704340021	15.27	26.5	0.961	5 to 15 %
20	IL	Kane	Chicago, IL	1708900031	14.51	19.3	0.959	15 to 30 %
21	IL	Lake	Chicago, IL	1709710071	12.21	4.2	0.978	15 to 30 %
22	IL	La Salle	Not in an MSA	1709900071	15.25	72.2	0.937	0 to 5 %
23	IL	Mc Henry	Chicago, IL	1711100011	14.76	19.4	0.959	30 - 60 %
24	IL	Mc Lean	Bloomington-Normal, IL	1711320021	NA	53.6	NA	5 to 15 %
25	IL	Macon	Decatur, IL	1711500131	15.48	51.2	0.926	-15 to 0 %

### PM2.5 Mean, Milwaukee, WI

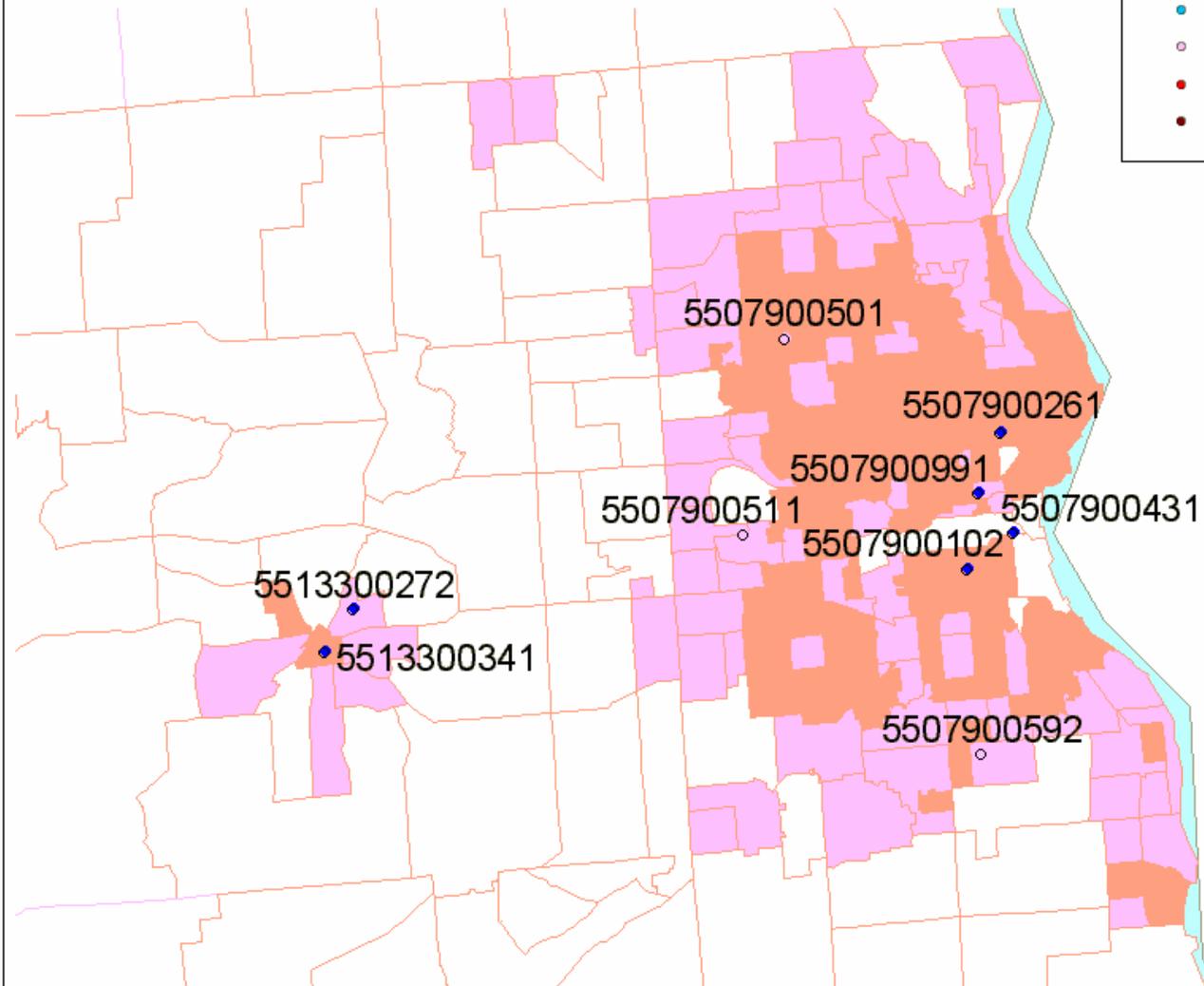
- Mean PM2.5,  
Quintiles (ug/m<sup>3</sup>)
- 7 - 12
  - 12 - 14
  - 14 - 15
  - 15 - 17
  - 17 - 21



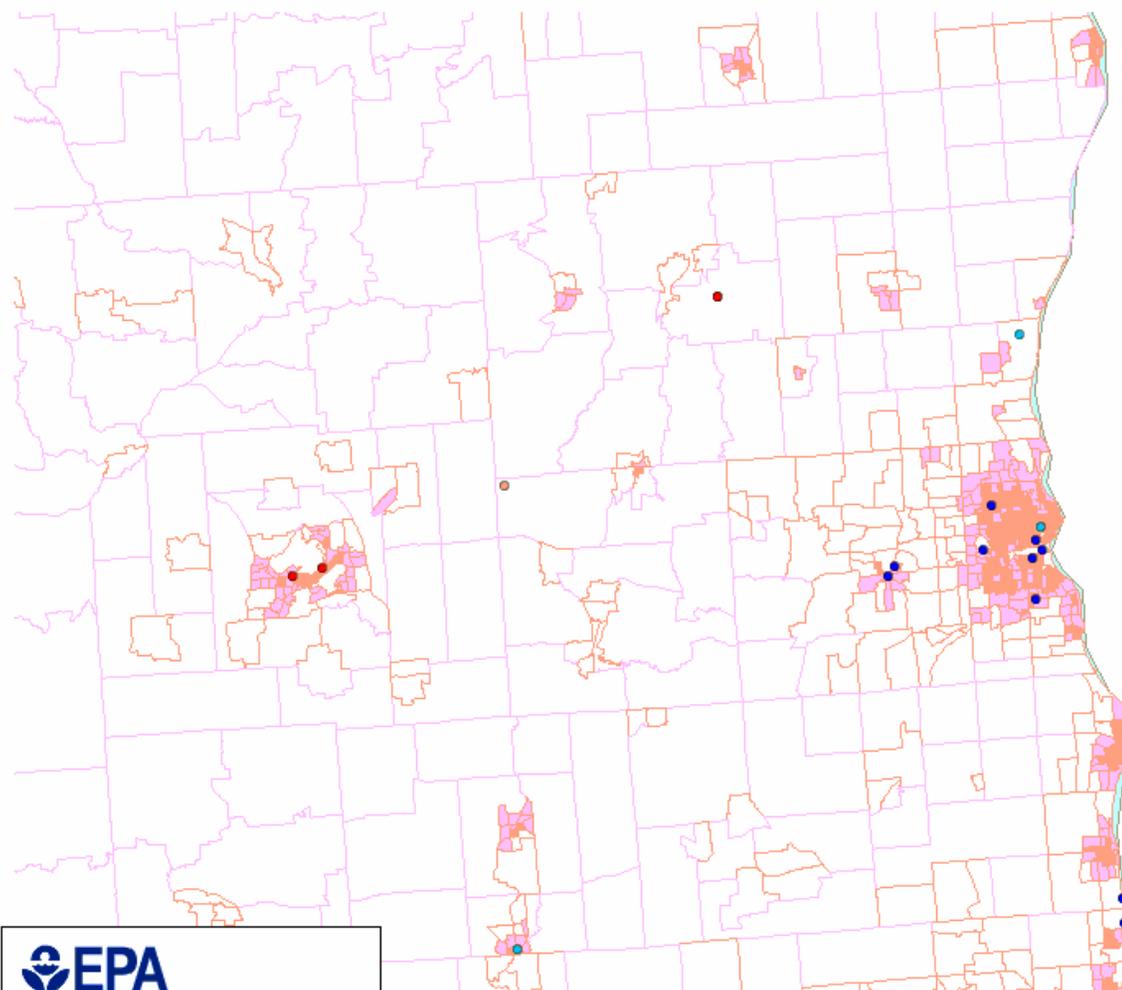
## Monitor Density, Milwaukee, WI

### Distance to Nearest Monitor, km

- 0.9 - 3.3
- 3.5 - 6.3
- 6.4 - 12.2
- 13 - 34.2
- 34.5 - 190



## PM2.5 Maximum Site Correlations, Milwaukee, WI





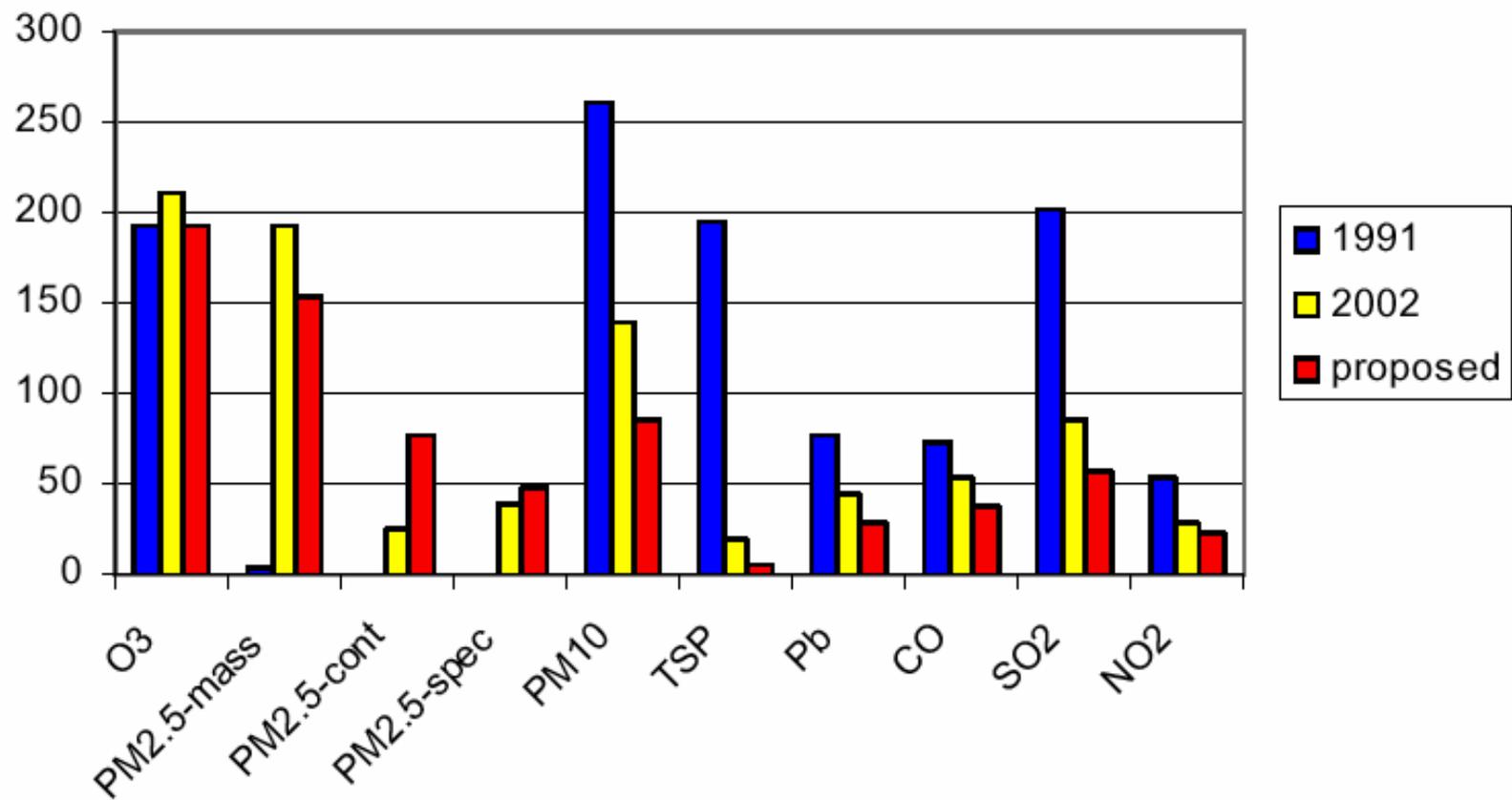
## Proposed network changes

- Based on core principles, each state reviewed their networks and identified proposed changes to be phased-in over 2-3 years.
- In general, changes reflect elimination of several existing monitors, establishment of a few new monitors, and a movement toward multi-pollutant sites.

# Number of sites in each state before/after changes

	O3	PM <sub>2.5</sub> Mass	PM <sub>2.5</sub> Cont	PM <sub>2.5</sub> Spec	PM10	TSP	Pb	CO	SO2	NO2
IL	42/35	36/29	4/14	6/6	17/12		15/6	9/7	23/14	10/8
IN	48/41	40/22	7/16	5/7	25/20		6/6	5/5	8/7	4/4
IN-ind.	1/1				6/2		4/4		24/24	1/0
MI	27/28	27/27	8/12	10/10	8/6		8/8	7/7	8/8	3/3
MN	7/17	17/15	1/12	1/8	19/9		2/2	10/7	8/6	4/4
OH	50/39	49/43	2/13	11/11	64/33		14/6	16/9	34/19	4/2
WI	38/32	28/19	3/9	6/7	6/5	19/5	0/0	5/2	5/4	4/4
WI-ind.						16/16				
Total	212/192	197/155	25/76	39/49	139/85	19/5	427/22	52/37	86/58	29/25

# Count by pollutant



## VII. SUMMARY OF RECOMMENDATIONS

The regional monitoring strategy recommends the following:

### Increase data collection

- more complete sampling (e.g., multi-pollutant sampling sites);
- more timely information (e.g., regional PM<sub>2.5</sub> continuous network); and
- more air pollutants (e.g., regional air toxics network)

Decrease (plus relocate and modify) existing state criteria pollutant monitoring networks (Note: the resource savings will not be sufficient to pay for some of the increased data collection, such as the regional air toxics monitoring network. Additional funding will be needed.)

Encourage additional tribal monitoring, especially in the vicinity of the Class I areas in northern Minnesota and Michigan

Promote new technology, especially for PM<sub>2.5</sub> and air toxics

Conduct public outreach effort to explain and seek “buy-in” for the proposed changes to the criteria pollutant monitoring networks

Revise the existing NAMS/SLAMS regulations to relieve the states of certain monitoring requirements and to allow some of the proposed network changes

Conduct periodic assessments

# So what happened?

- FRM network is the same size today, but “tweaked” in many areas
- Work with air toxics and new technologies continues
- Reduction in PM<sub>10</sub>, CO, NO<sub>2</sub>, SO<sub>2</sub>

	<u>Number of Monitors</u>								
<u>Row #</u>	<u>CO</u>	<u>NO2</u>	<u>O3</u>	<u>SO2</u>	<u>PM2.5</u>	<u>PM10</u>	<u>PB</u>	<u>Year</u>	<u>EPA Region</u>
<u>SORT</u>									
1	62	36	202	129	219	205	62	2000	05
2	49	30	206	101	221	148	75	2005	05
Grand Total	62	36	202	129	219	205	62	2000	
	49	30	206	101	221	148	75	2005	

## Next steps

- Assembling workgroup with States and LADCO to start the process over again
- Much more data to work with now
- Consider regulatory changes
- Consider funding structure for PM<sub>2.5</sub>