Regional Network Assessments in the Upper Midwest

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Lake Michigan Air Directors Consortium
November 2, 2009

Overview

- 2004 regional assessment (Assessment #1)
- 2008 PAMS assessment
- 2009-2010 regional assessment (Assessment #2)

Regional Assessment #1

Regional Monitoring Strategy

States of Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin

March 1, 2004

Summary of Strategy

- Increase data collection efforts
  - More air pollutants (air toxics)
  - More timely information ($PM_{2.5}$ continuous)
  - More complete sampling (“core” sites)
  - New technology

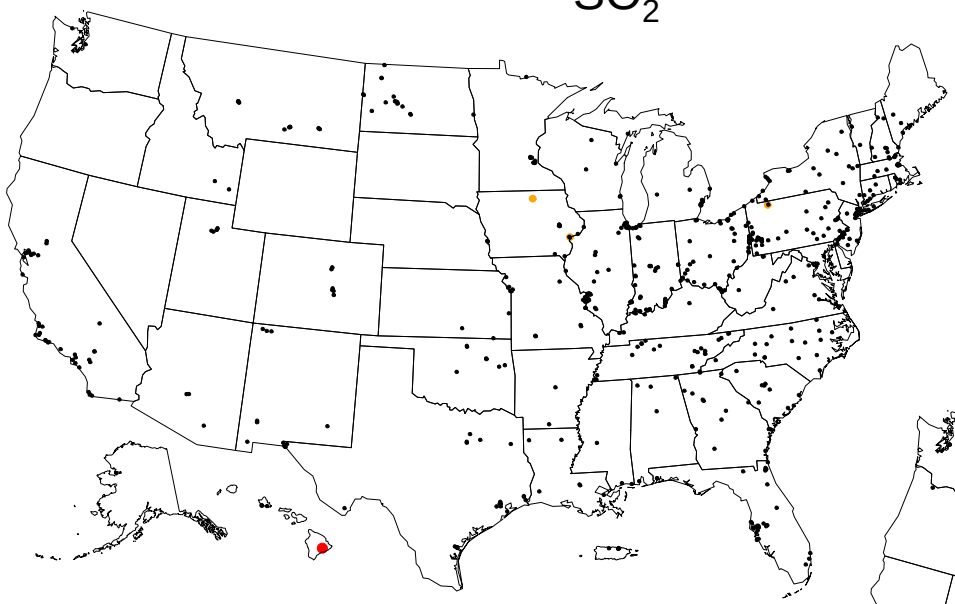
- Decrease existing criteria pollutant networks

Why are we doing this?

- Needs have changed
  - Air quality has gotten better for many pollutants
  - Health science has identified new pollutants of concern
- Monitoring is a “zero-sum” game
  - Funding and personnel limitations

Current Levels for Many Pollutants are Relatively Low

SO_2



SO2 2nd Max Percent of NAAQS:Red= >100%. Purple= 80-100%. Orange= 60-80%. Black= <60%

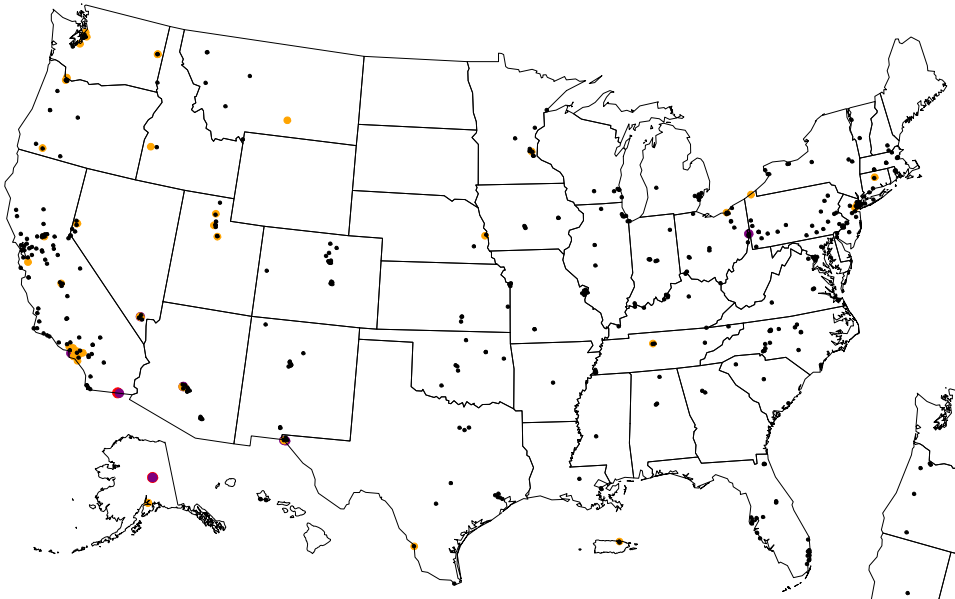
NO_2

NO2 Annual Mean Percent of NAAQS:Red= >100%. Purple= 80-100%. Orange= 60-80%. Black= <60%

Red= >100% of NAAQS, Purple= 80-100%, Orange= 60-80%, Black= <60

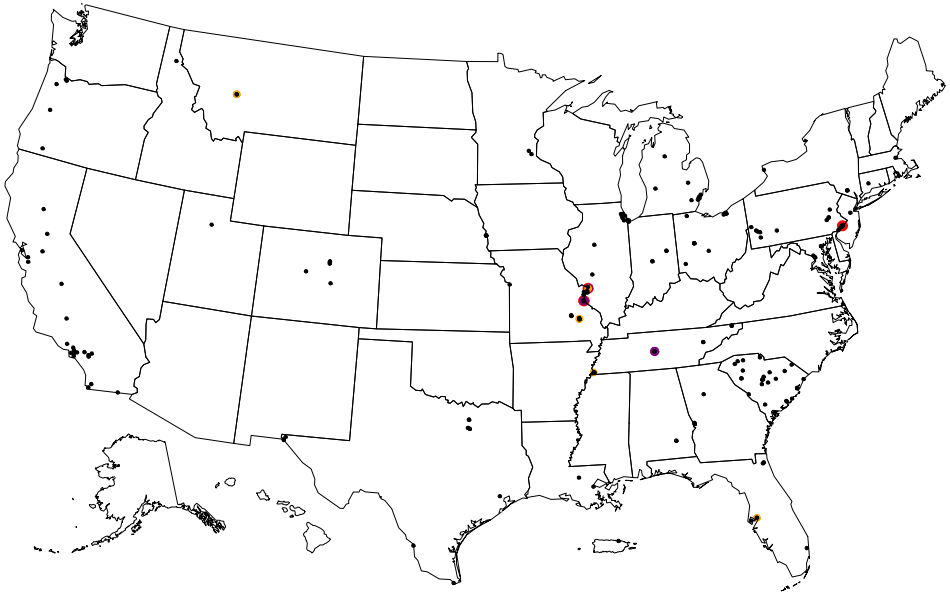
Current Levels for Many Pollutants are Relatively Low

CO



8-Hour CO 2nd Max Percent of NAAQS:Red= >100%. Purple= 80-100%. Orange= 60-80%. Black= <60%

Pb

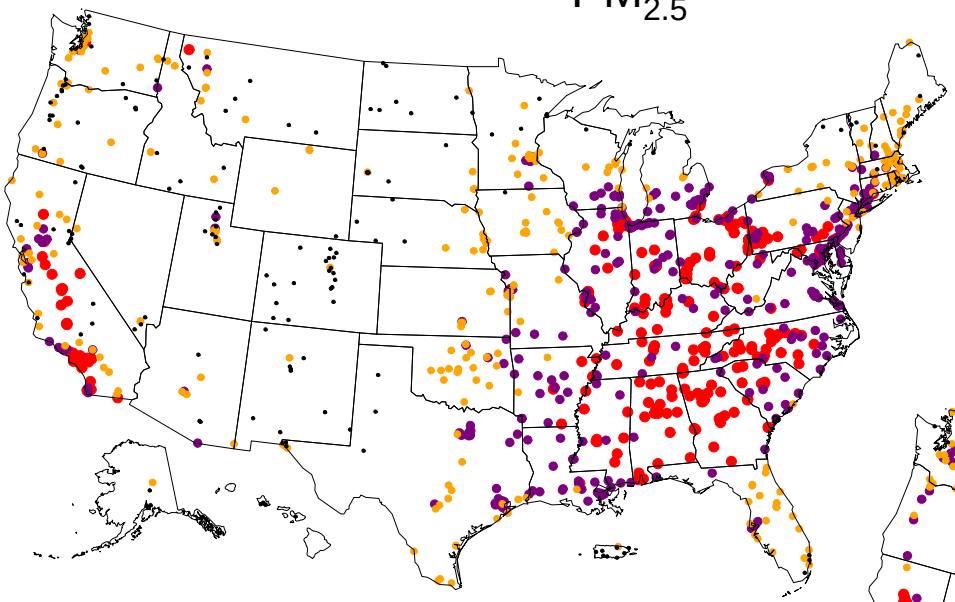


Pb Max Quarterly Average Percent of NAAQS:Red= >100%. Purple= 80-100%. Orange= 60-80%. Black= <60%

Red= >100% of NAAQS, Purple= 80-100%, Orange= 60-80%, Black= <60

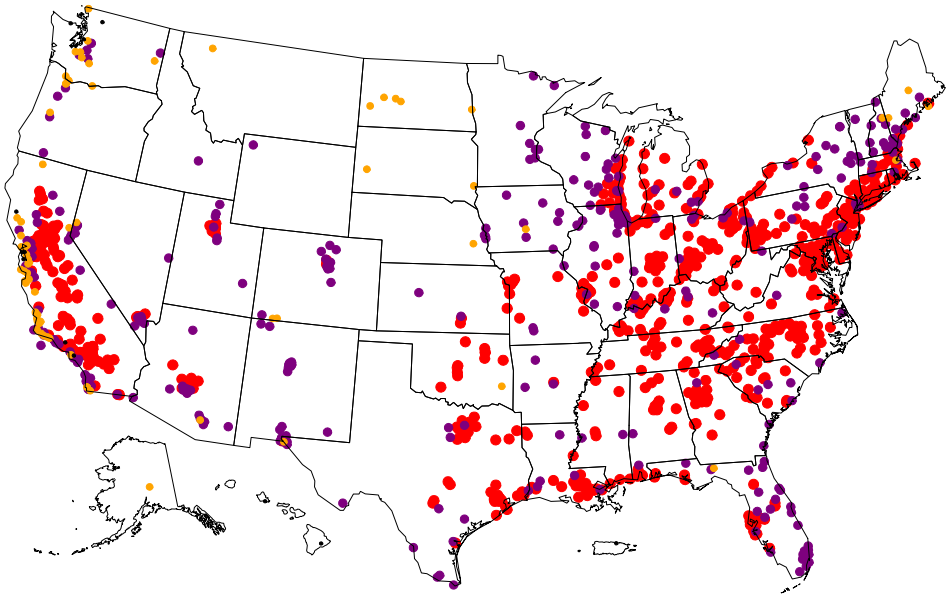
On the Other Hand, Current Levels for Some Pollutants are Still High

$PM_{2.5}$



PM25 Annual Mean Percent of NAAQS:Red= >100%. Purple= 80-100%. Orange= 60-80%. Black= <60%

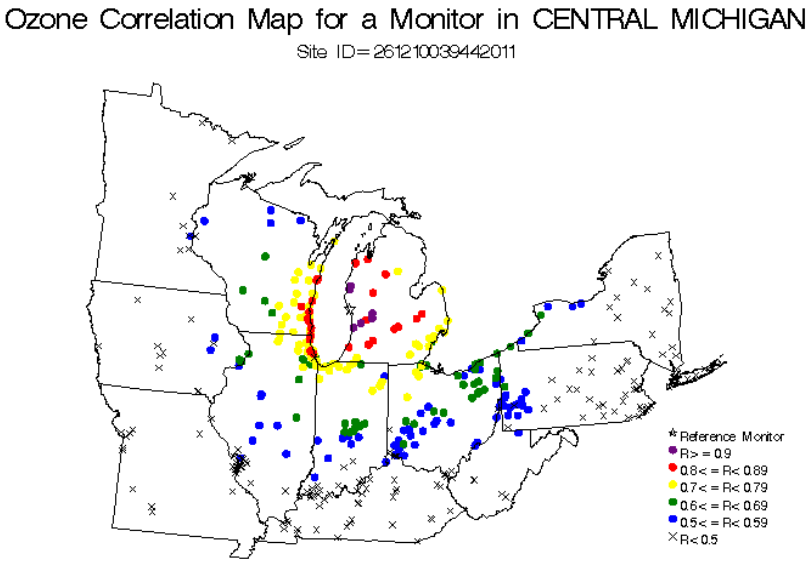
Ozone

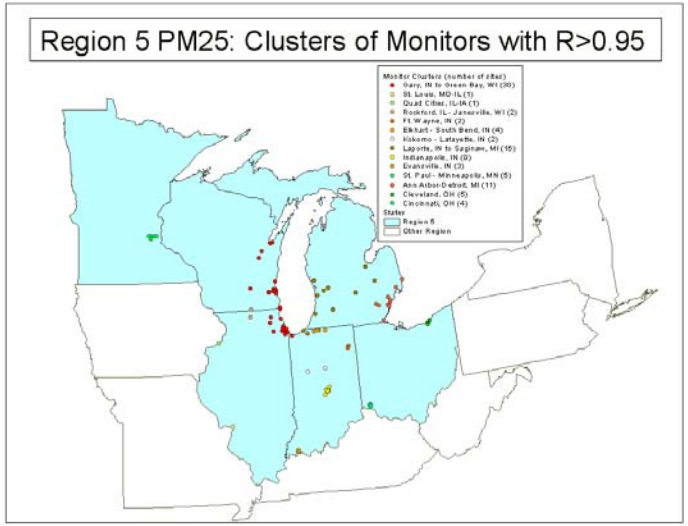


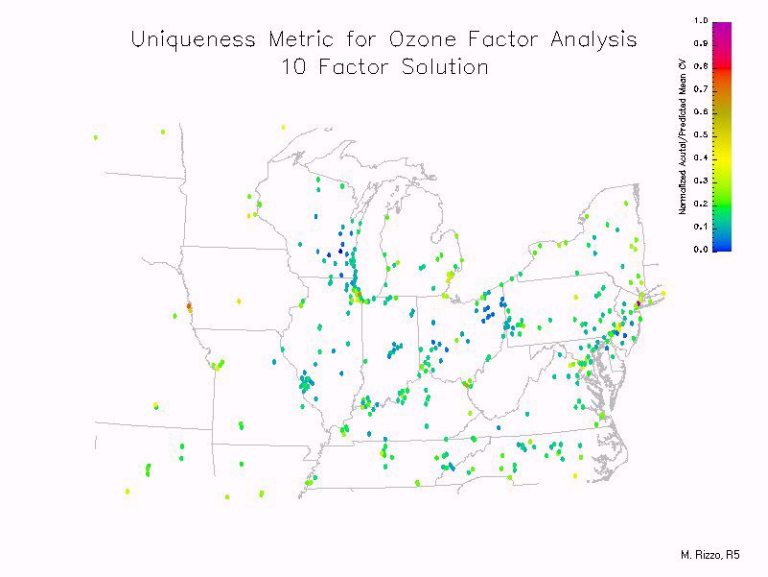
98-00 8-Hour O3 2nd Max Percent of NAAQS:Red= >100%. Purple= 80-100%. Orange= 60-80%. Black= <60%

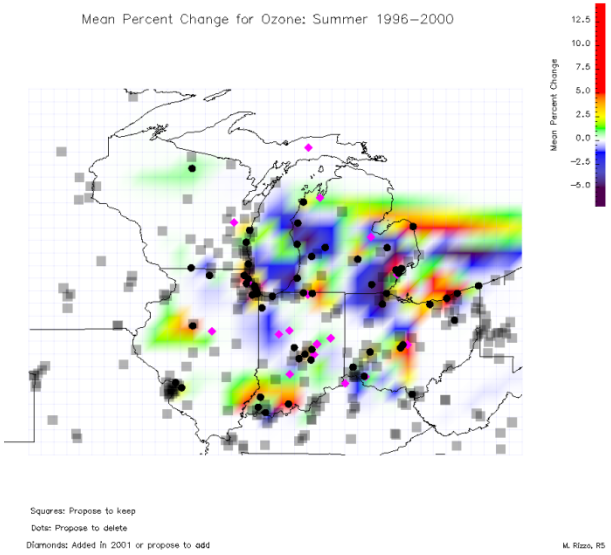
Red= >100% of NAAQS, Purple= 80-100%, Orange= 60-80%, Black= <60

Assessments: Examples





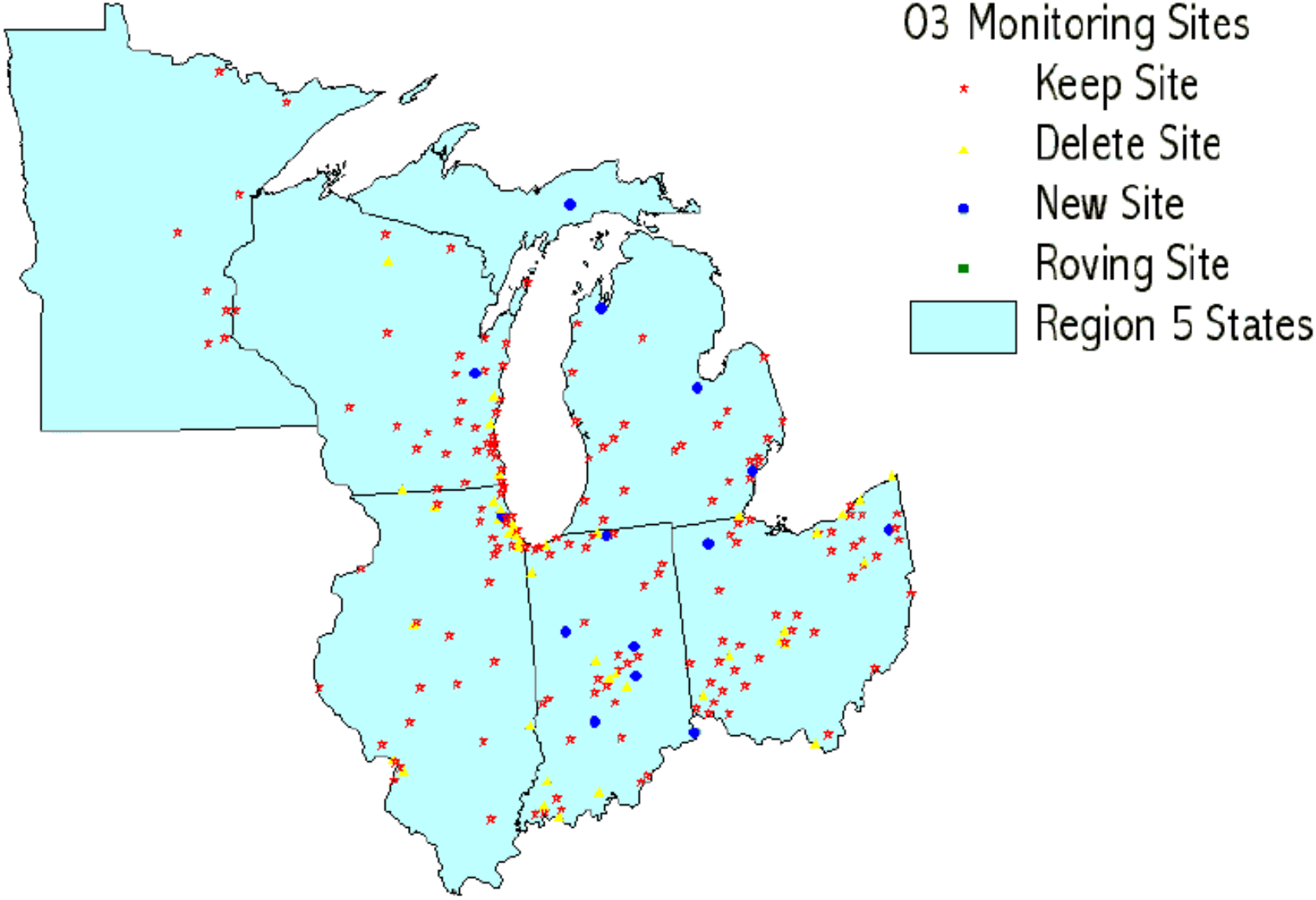




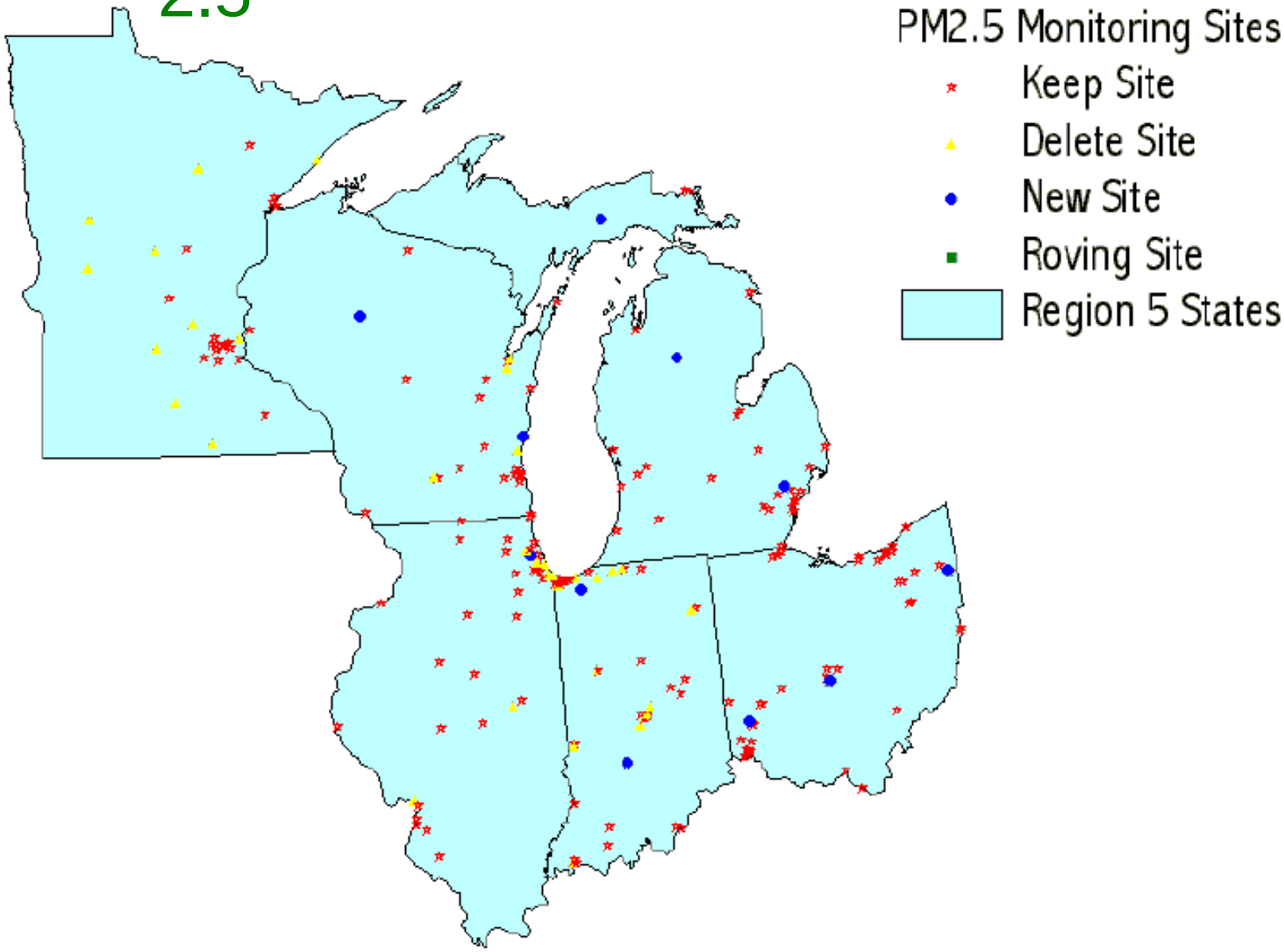
Elements of Regional Strategy

- Focus on pollutants posing greatest risk to public health (ozone, $PM_{2.5}$, air toxics)
- Establish new “core” multi-pollutant sites
- Real-time reporting of air quality data
- New technology
- Flexibility to address local needs
- Shutdown unnecessary sites

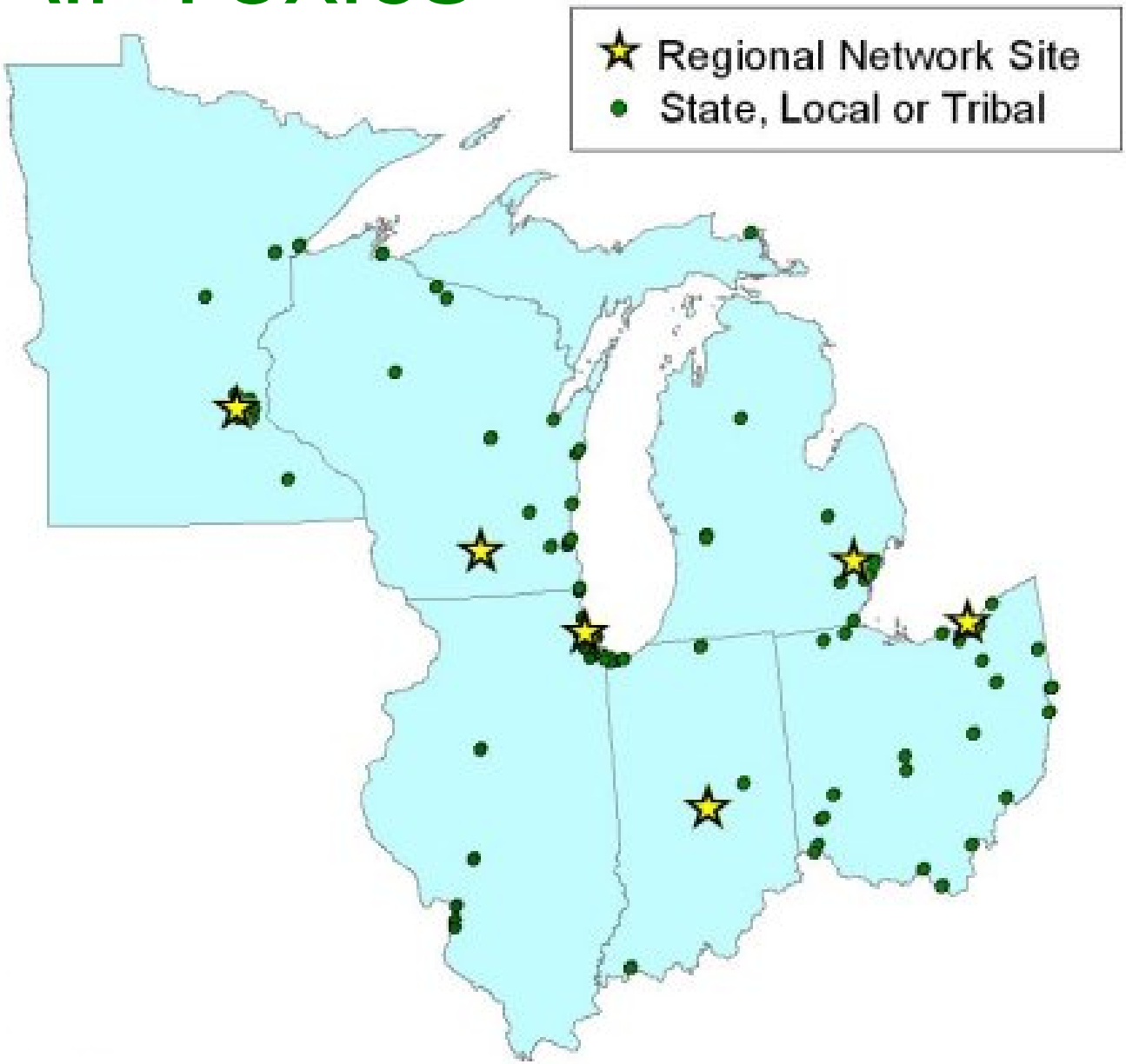
Ozone


O3 Monitoring Sites
Keep Site
Delete Site
New Site
Roving Site
Region 5 States

$PM_{2.5}$


PM2.5 Monitoring Sites
Keep Site
Delete Site
New Site
Roving Site
Region 5 States

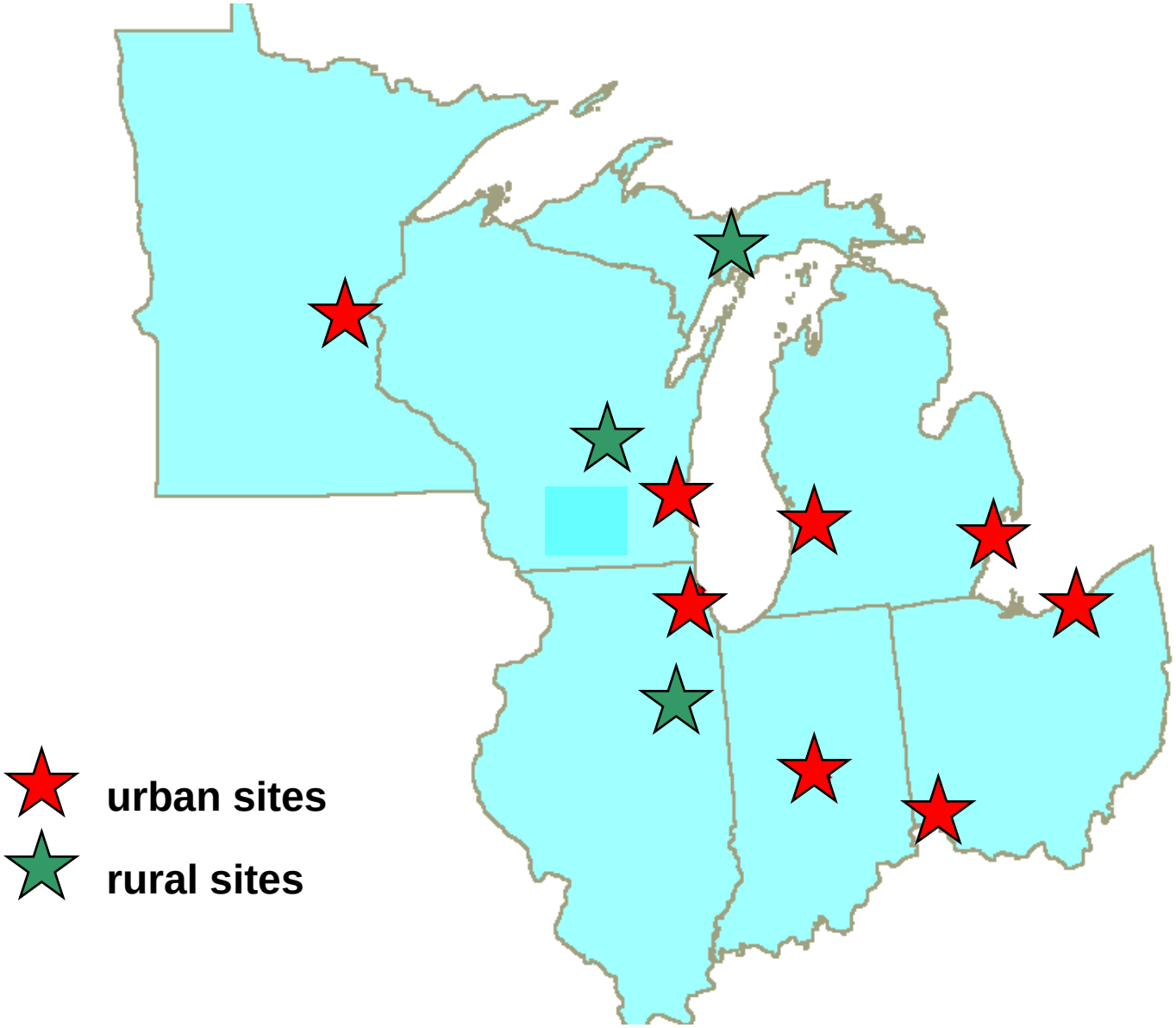
Air Toxics



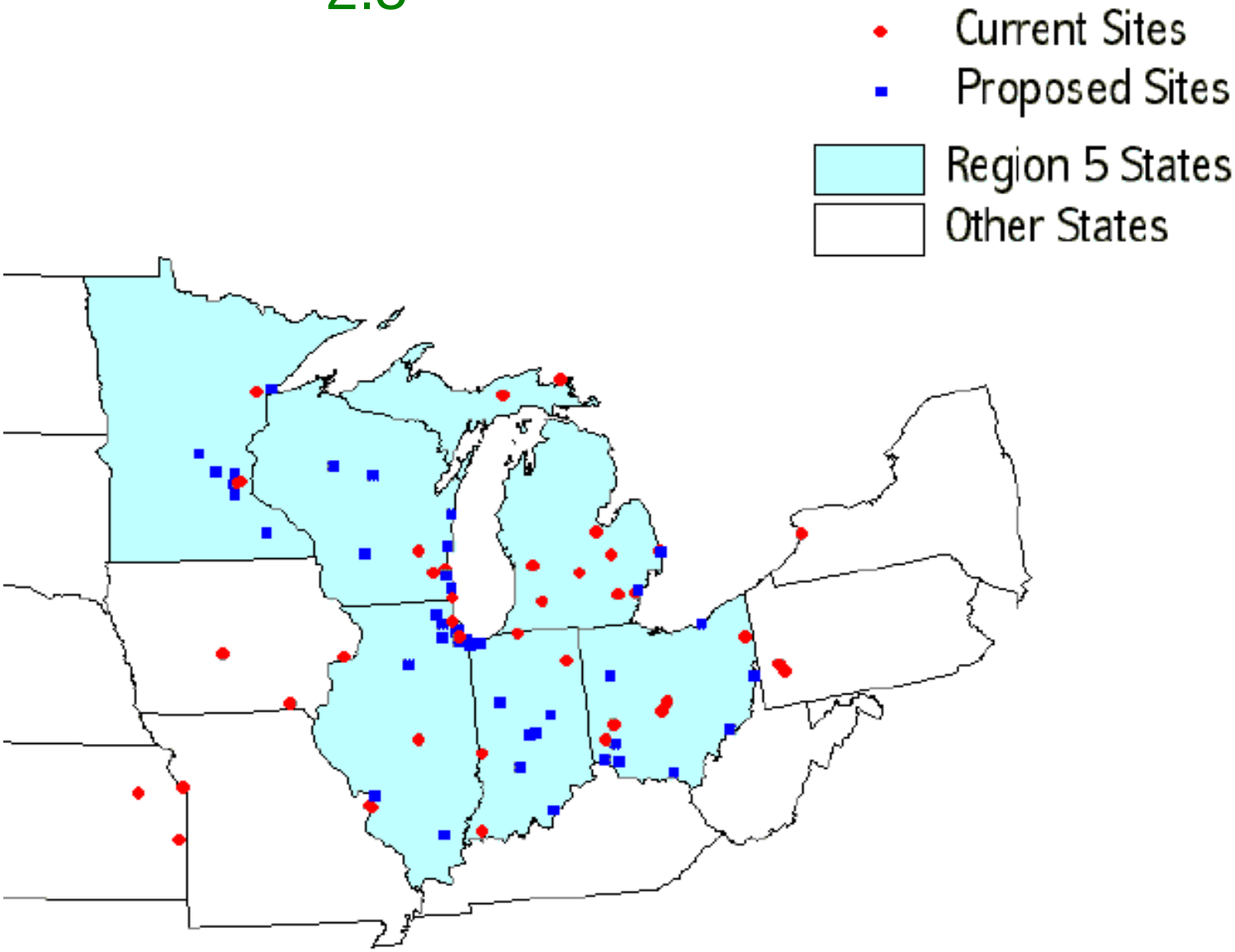
“Core” Multi-Pollutant Monitoring

- Gases
  - ozone, SO_2, NO_x/NO_y, CO, VOC/carbonyls
- Particles
  - $PM_{2.5}$ (mass), $PM_{2.5}$ (speciation), $PM_{2.5}$ (continuous), light scattering, black carbon
- Meteorology
  - wind speed, wind direction, temperature, pressure, relative humidity

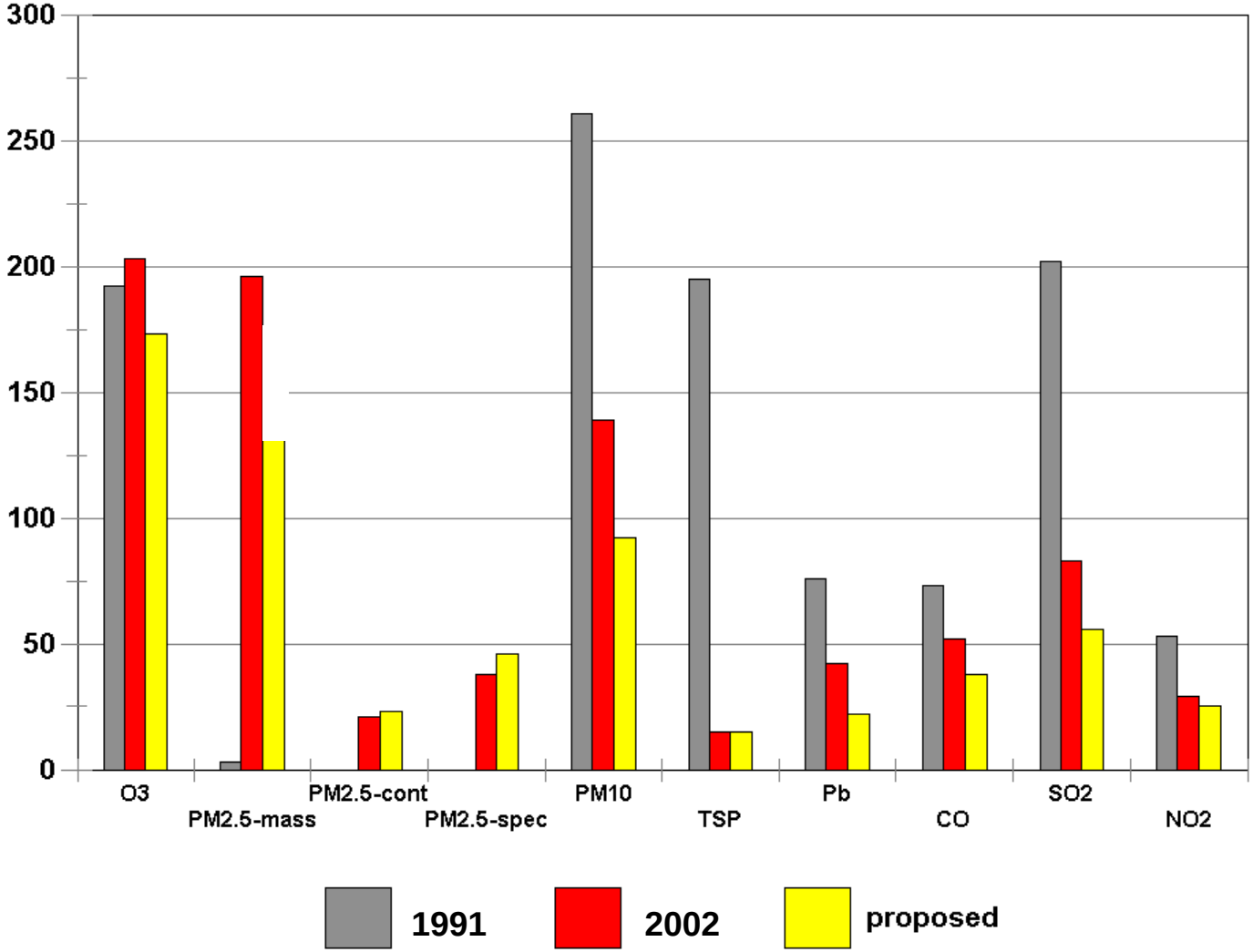
“Core” Multi-Pollutant Sites



Regional $PM_{2.5}$ Continuous Sites



Network Changes (by pollutant)



Summary

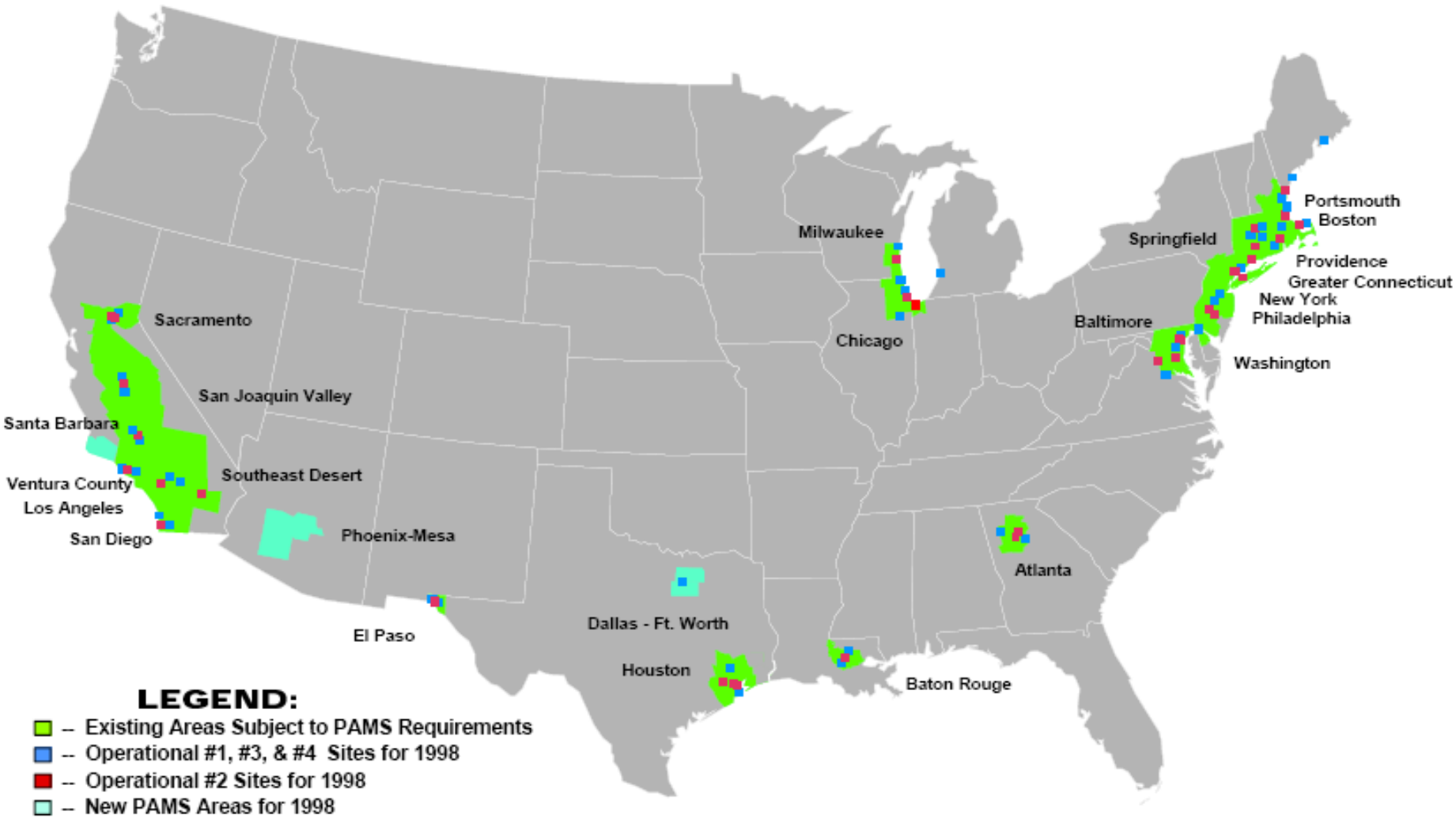
- Provide more relevant, complete, and timely air pollution information
  - Focus on pollutants posing greatest threat to public health
  - Collect data for more pollutants
  - Report data on a near real-time basis to the public

Reflections on Assessment #1

- Strengths
  - First regional scale assessment
  - Technical rationale for network changes
  - Management support
    - » March 1, 2004, letter signed by 6 Region V State Air Directors
- Weaknesses
  - Too much of a bottom-up assessment
  - Took a long time (i.e., 3 years!!)
  - Did not consider potential changes in NAAQS or monitoring requirements

PAMS National Network Assessment

Operating PAMS Sites, 1998



Current Regional PAMS Network

Type	State	Site	Ozone	VOC	Carbonyl	NOx/NOy	CO	MET
1	IL	Braidwood	X					
2	IL	Chicago-Jardine	X			NOx		
	IN	Gary - IITRI	X	AutoGC plus 1/6 day canister	X	NOx		X
	WI	Milwaukee - SE Headquarters	X	AutoGC plus 1/6 day canister	X	NOx/NOy		X
3	IL	Northbrook	X	AutoGC plus 1/6 day canister	X	NOx	X	
	MI	Holland	X					
	WI	Harrington Beach	X					X
4	IL	Zion	X					
	WI	Manitowoc	X			NOx/NOy		X

Note: current regional network meets minimum PAMS requirements

PAMS Area List (based on 1-hr ozone)

Nonattainment Areas Subject to PAMS	Classification
Atlanta, GA	Serious
Baltimore, MD	Severe
Baton Rouge, LA	Serious
Boston-Lawrence-Worcester, MA-NH	Serious
Chicago-Gary-Lake County (IL), IL-IN-WI[1]	Severe
Dallas-Fort Worth, TX	Serious
El Paso, TX	Serious
Greater Connecticut, CT	Serious
Houston-Galveston-Brazoria, TX	Severe
Los Angeles-South Coast Air Basin, CA[2]	Extreme
Milwaukee-Racine, WI[1]	Severe
New York-New Jersey-Long Island, NY-NJ-CT	Severe
Phoenix, AZ	Serious
Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD	Severe
Portsmouth-Dover-Rochester, NH-ME	Serious
Providence-Pawtucket-Fall River, RI-MA	Serious
Sacramento, CA	Severe
San Diego, CA	Serious
San Joaquin Valley, CA	Serious
Santa Barbara-Santa Maria-Lompac, CA	Serious
SE Desert Modified AQMA, CA[2]	Severe
Springfield, MA	Serious
Ventura County, CA	Severe
Washington, DC-MD-VA	Serious

1) Chicago and Milwaukee are combined into one PAMS area referred to as Lake Michigan.

2) Los Angeles-South Coast and SE Desert Modified AQMA are combined into one PAMS area referred to as South Coast-SEDAB

PAMS Funding

Region		Monitoring	Data Analysis	Total			PAMS Areas	
1		$2,125,815	$726,297	$2,852,112	20%		5	21%
2		$571,060	$232,415	$803,475	6%		1	4%
3		$1,087,907	$348,623	$1,436,530	10%		3	13%
4		$366,848	$145,259	$512,107	4%		1	4%
5		$959,749	$290,519	$1,250,268	9%		2	8%
6		$2,061,029	$617,603	$2,678,632	19%		4	17%
7		$0	$0	$0	0%		0	0%
8		$0	$0	$0	0%		0	0%
9		$3,307,303	$1,162,075	$4,469,378	32%		8	33%
10		$0	$0	$0	0%		0	0%
		$10,479,711	**$3,522,791**	**$14,002,502**			**24**	

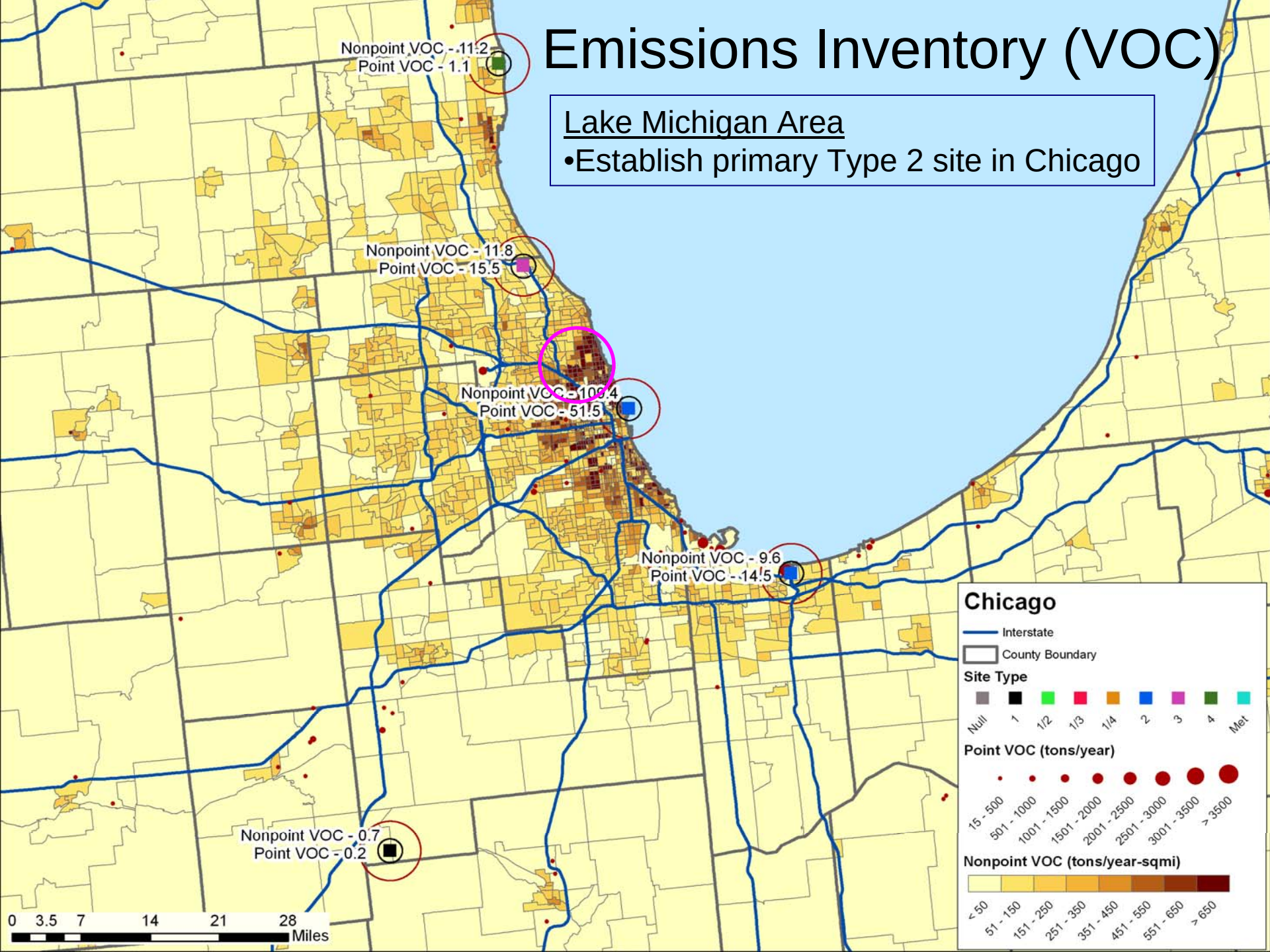
PAMS Areas: Options

- Maintain original list (based on 1-hr ozone)
  - Serious nonattainment areas (design values 33% above standard)
- Define areas based on 8-hr ozone
  - Areas with design values 33% above standard (i.e., 100 ppb) – only CA (5 areas) and TX (1 area)
  - Areas with design values comparable to areas on original list (i.e., low 90's ppb)

Emissions Inventory (VOC)

<u>Lake Michigan Area</u>

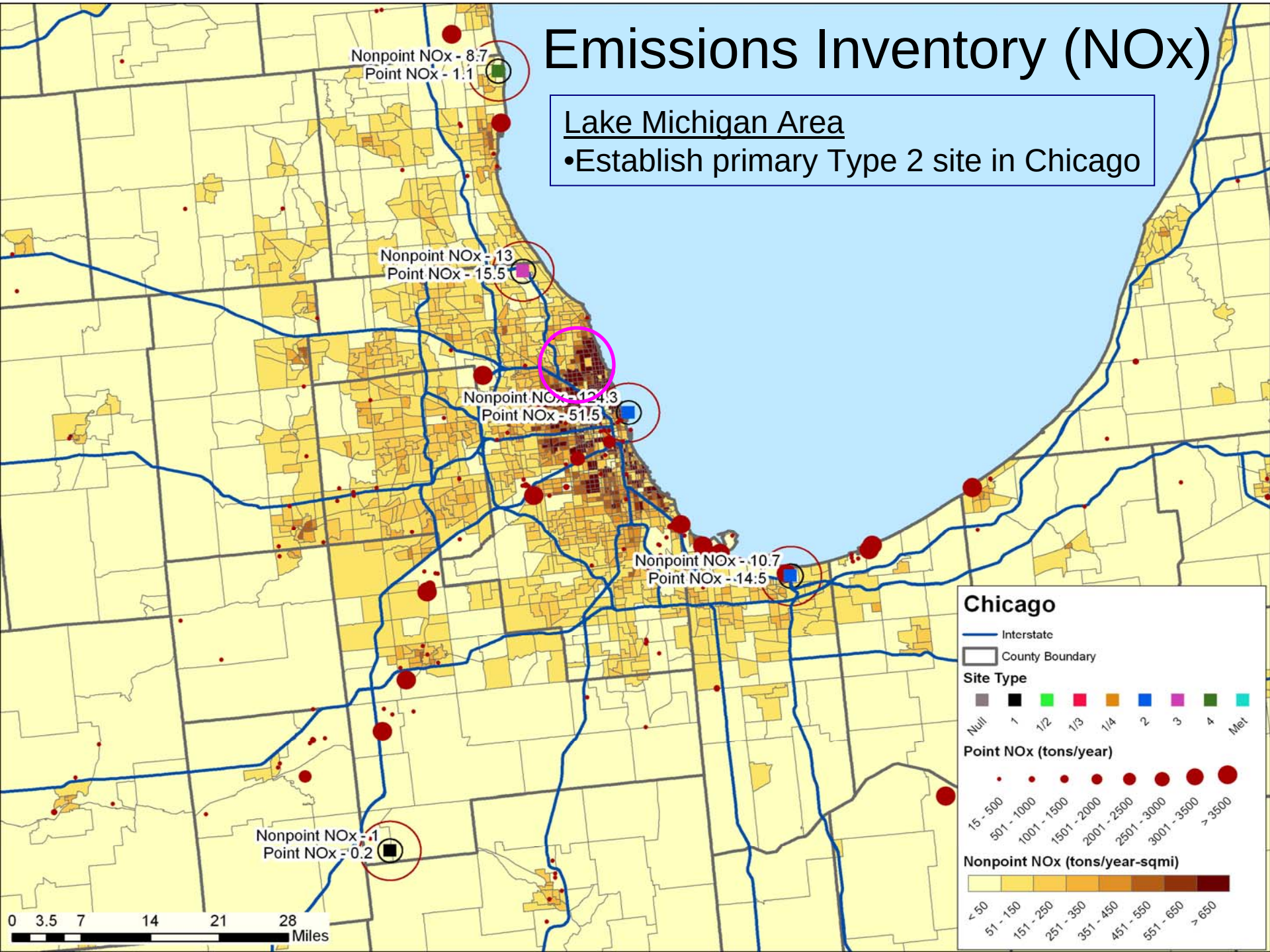
- Establish primary Type 2 site in Chicago



Emissions Inventory (NOx)

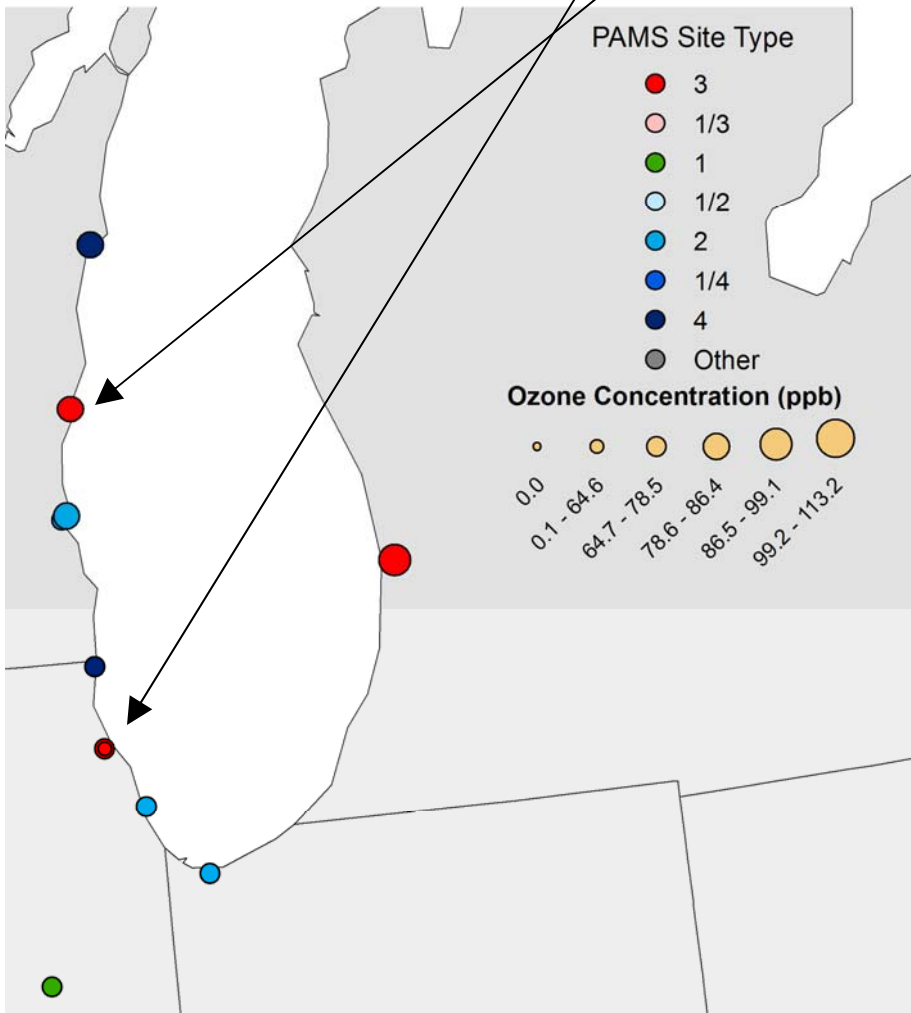
<u>Lake Michigan Area</u>

•Establish primary Type 2 site in Chicago



AQS_CODE	State	County	Nonattainment Area	Site type	0406DV	0507DV	Comment
170314201	IL	Cook	Chicago-Gary-Lake County	3	72	75	Type 3 sites lower than type 2 sites
180890022	IN	Lake	Chicago-Gary-Lake County	2	75	82	
170310072	IL	Cook	Chicago-Gary-Lake County	2	69	74	
171971011	IL	Will	Chicago-Gary-Lake County	1	71	72	
170971007	IL	Lake	Chicago-Gary-Lake County	4	77	80	
550890009	WI	Ozaukee	Milwaukee-Racine	3	80	84	OK
550790026	WI	Milwaukee	Milwaukee-Racine	2	74	78	
550790041	WI	Milwaukee	Milwaukee-Racine	2	79	82	
550710007	WI	Manitowoc	Manitowoc Co	4	83	86	

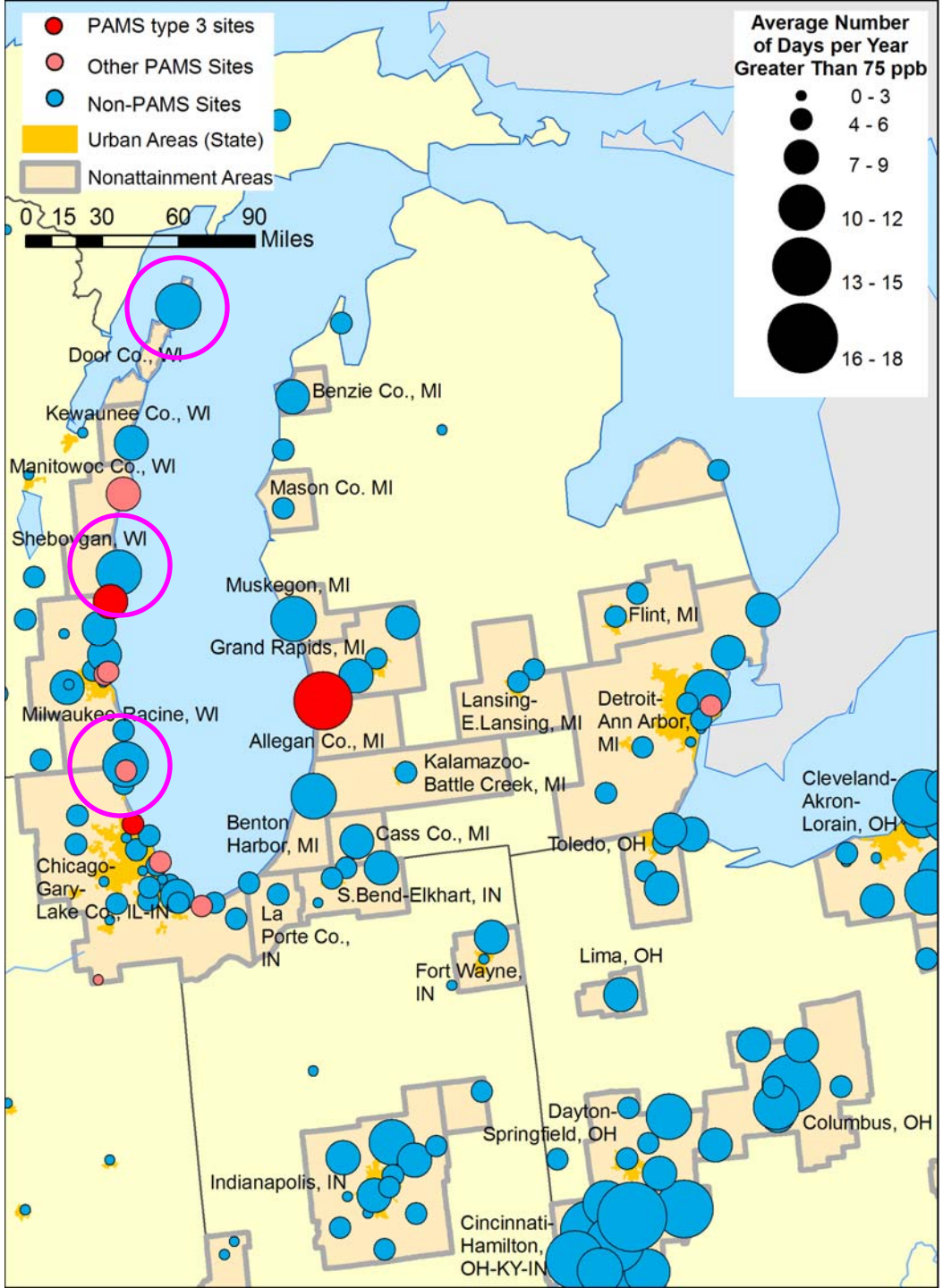
Attainment Status



<u>Lake Michigan Area</u>

- Keep Holland (good Type 3 site)
- Reclassify Northbrook (low concentration)

Maximum 8-Hour Ozone Concentration



<u>Lake Michigan Area</u>

- Keep Holland (good Type 3 site)
- Classify Chiwaukee as Type 3 (Zion)
- Classify Sheboygan as Type 3 (Harr Beach)
- Classify Newport as Type 4 (Manitowoc)
- Re-classify Northbrook as Type 2

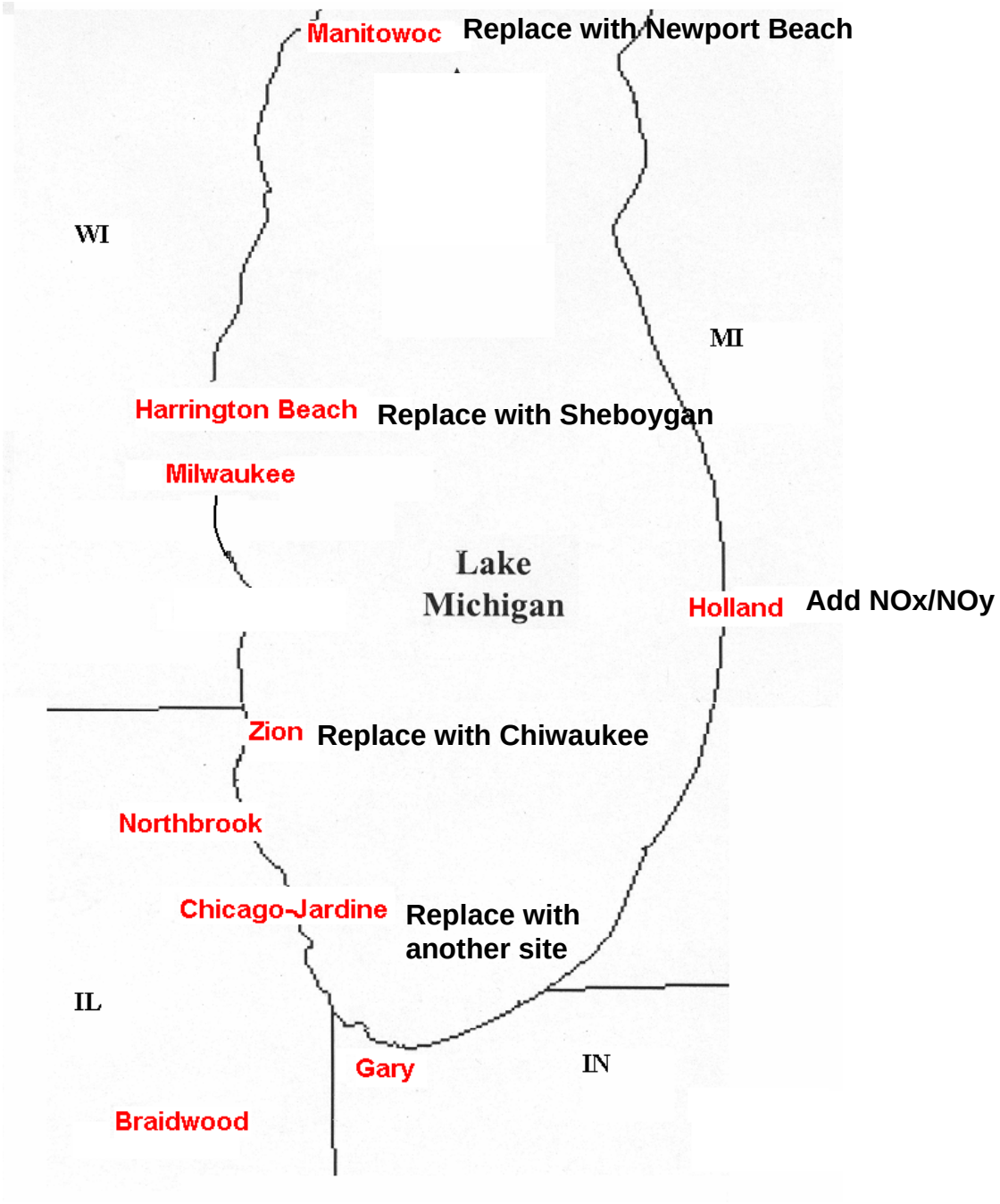
Recommendations (DRAFT)

- PAMS Areas: Options to identify areas include:
  1) Maintain current list (based on 1-hour ozone serious areas)
  2) Areas based on 8-hour ozone (≥ 100 ppb - 33% above standard)
  3) Areas based on 8-hour ozone (≥ low 90's ppb - equivalent level for areas on current list)

- Funding: Regional allocations based on either # PAMS areas (see comment above) or equitable distribution based on state cost estimates

- Lake Michigan Area Network: Although current network meets the minimum PAMS requirements, several changes should be considered ***(subject to funding availability)***:
  - Keep: Milwaukee, Gary, Braidwood, Holland (add NOx/NOy)
  - Substitutions: Chiwaukee for Zion, Sheboygan for Harrington Beach, Newport Beach for Manitowoc (move NOx/NOy to another WI site)
  - Reclassifications: Northbrook (secondary Type 2)
  - Additions: Primary Type 2 site in Chicago

- Other Midwest Areas
  - What to do about other areas (e.g., Cleveland) with design values ≥ 90 ppb (i.e., Option 3 above)?


Manitowoc
Replace with Newport Beach
WI
MI
Harrington Beach
Replace with Sheboygan
Milwaukee
Lake
Michigan
Holland
Add NOx/NOy
Zion
Replace with Chiwaukee
Northbrook
Chicago-Jardine
Replace with
another site
IL
Gary
IN
Braidwood

Regional Assessment #2

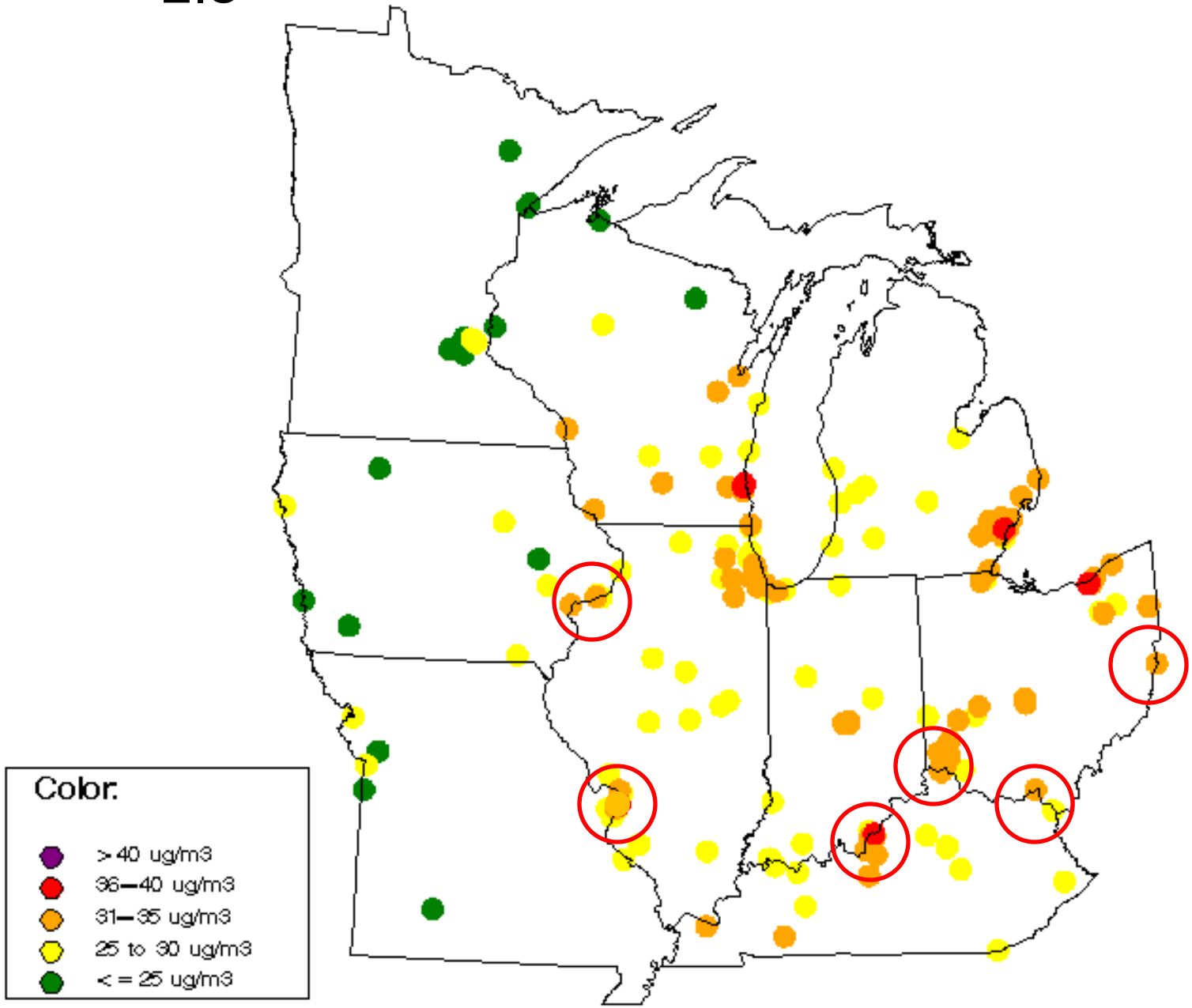
Periodic Assessment v. Annual Network Plan

- Similarities
  - CFR requirements
  - Demonstrate compliance with minimum monitoring requirements
  - Due July 1, 2010
- Differences
  - Monitoring Network Plan (day-to-day operations)
    - Required every year; review changes for next year; provide details for each monitoring site (site ID, objectives, lat/ long)
  - Periodic Network Assessment (long-range planning)
    - Required every five (5) years; regional scale analysis; evaluate monitoring network, locations, equipment, and objectives; solicit data users and stakeholder input

Issues

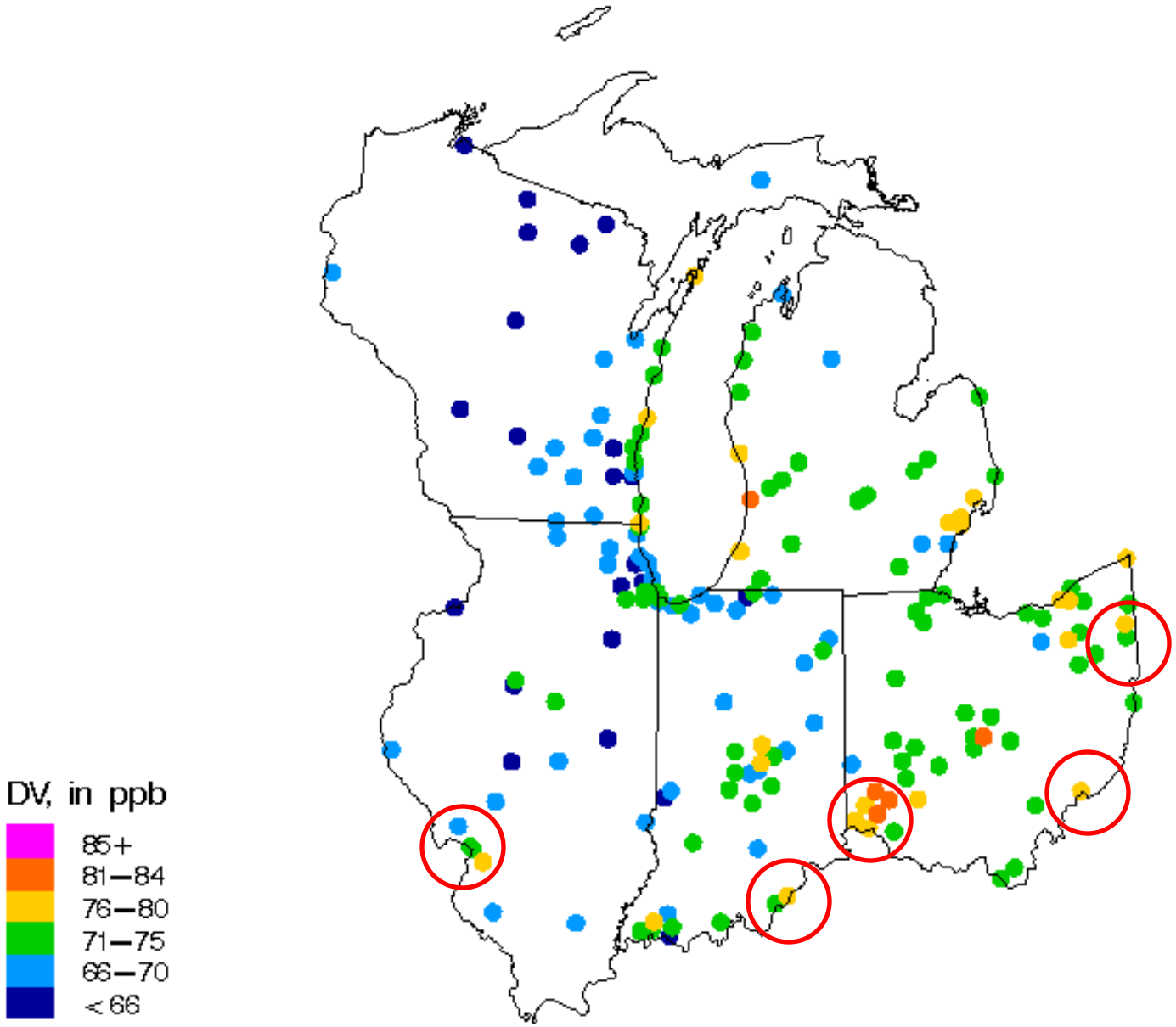
- Should we address criteria pollutants and HAPs?
- Do we need to same level of effort for all criteria pollutants?
- What should we do for border cities?
    - St. Louis, Louisville, Cincinnati, etc.

$PM_{2.5}$ Design Value: Daily Standard



2006-2008

Ozone Design Values, Preliminary 2007_2009



Ground Rules

- Current monitoring requirements may not be consistent with regional priorities or monitoring objectives
  - Need EPA to be flexible in granting waivers
- Many new monitoring requirements likely between now and next 5-year assessment
  - Need guidance from EPA on upcoming requirements
- Available resources may not be sufficient to implement all new monitoring requirements and all recommended network changes

Proposed Approach

- Establish regional air quality priorities
  - Ozone, $PM_{2.5}$, and their precursors
- Summarize existing monitoring programs and resources
- Identify monitoring objectives (for regional priorities) and associated analyses
- Address requirements of network assessment
- Prepare recommendations

Objective	Sub-Objective	Analysis	Responsibility	Schedule
Provide data to public in a timely manner	Public reporting	Spatial coverage analyses: 1. "importance of site" analyses 2. correlation analyses 3. removal bias analysis 4. review "unmonitored area" analysis results	1. EPA - Rizzo 2. LADCO - Kenski 3. EPA - Rizzo 4. LADCO - Koerber	1. October 2009 2. November 2009 3. November 2009 4. November 2009
		Population served analysis (sites are ranked based on the number of people they represent)	EPA – Region V	December 2009
Support compliance with NAAQS	Attainment analysis	Measured concentration analysis (sites are ranked by concentration - i.e., sites with higher design values are ranked higher than sites with low design values)	WDNR – Hoch	December 2009
		Deviation from NAAQS analysis (sites with design values close to the NAAQS are ranked higher than those with design values farther from NAAQS)	WDNR – Hoch	December 2009
Support control strategy development	Characterize regional concentrations	Spatial coverage analysis	(see above)	(see above)
		Area served analysis (sites are ranked based on area covered)	EPA – Rizzo and Region V	December 2009
		Identify/establish an urban-rural monitoring pair for each major urban area	MPCA to coordinate state responses	December 2009
	Track progress (trends)	Length of measurement record analysis (identify sites with long [>10 yrs] of measurements by parameter)	MPCA	December 2009
		Emissions inventory analysis (gridded emission map are used to ensure monitoring in areas of high emissions)	LADCO - Koerber and Janssen	December 2009
Support air pollution research		Number of parameters analysis (sites are ranked based on the number of parameters measured)	EPA - Region V	December 2009
		Evaluate new NCORE network		

Schedule

2009	Oct-Dec	Conduct analyses
2010	February	Prepare draft recommendations
		Present draft recommendations to State Air Directors
	March	Solicit stakeholder input
	April	Finalize recommendations
	July 1	State submittals to EPA