

# *An Introduction to Monitoring Network Assessment*

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## *Focus of Training*

- Clarify what a network assessment is and why it is needed
- Describe a thought process for regional-scale network assessments
- Provide guidance on analytical techniques that can be used for the assessments

## *What is a Network Assessment?*

- A review of existing monitoring networks in an effort to optimize the network:
  - Identify and removing “low value” monitors
  - Identify and add monitoring to under monitored locations
  - Identify new objectives and technologies
- An opportunity to look for “found money” to implement new efforts
  - Shift funding from low priority monitoring to high priority monitoring
  - Increase efficiency/reduce costs

## *Why are Network Assessments Needed?*

- Air quality agencies need to re-evaluate and reconfigure monitoring networks because
  - Air quality has changed.
  - Populations and behaviors have changed.
  - New air quality objectives have been established (e.g., air toxics reductions, PM<sub>2.5</sub>, regional haze).
  - Understanding of air quality issues and monitoring capabilities have both improved.
- Reconfiguring air monitoring networks can enhance their value to stakeholders, scientists, and the general public
- Required by new monitoring rule [40 CFR Part 58.10(d)]
  - Once every 5 years
  - First assessment due July 1, 2010

## *What is the Difference Between a Network Plan and a Network Assessment?*

- Network Plan
  - Not a new requirement [40 CFR 58.10(a)]
  - Due every year
  - Simple accounting of changes expected for that year
- Network Assessment
  - Once every 5 years
  - Detailed evaluation of networks and objectives

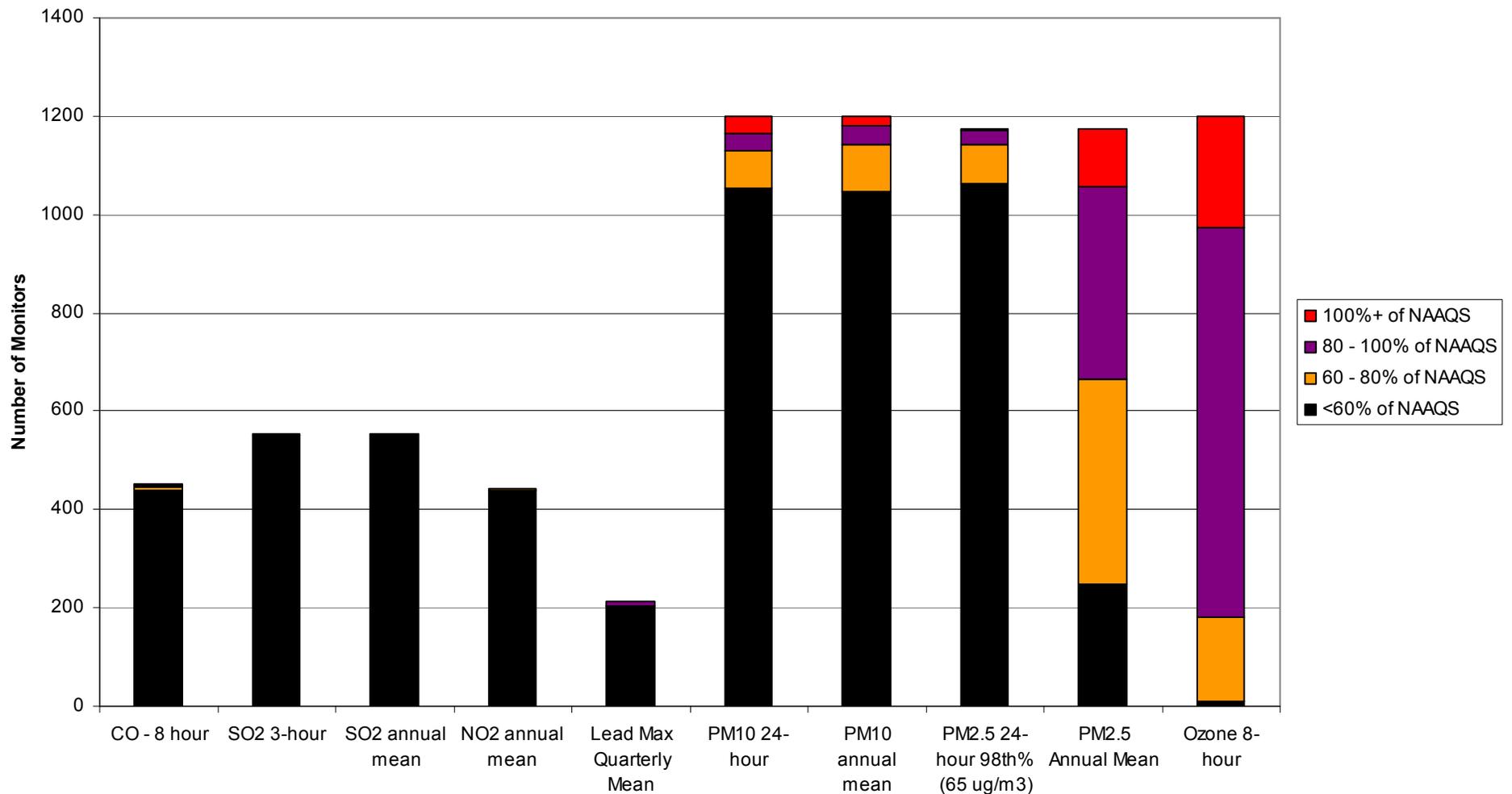
## ***Network Assessment Considerations (1 of 2)***

- Networks may
  - Have unnecessary or redundant monitors
  - Have ineffective and inefficient monitoring locations for some pollutants
  - Lack monitors for key pollutants
  - Need to refocus resources on pollutants that are new or persistent challenges (i.e., air toxics, PM<sub>2.5</sub>, ozone)
  - Need to deemphasize monitoring for pollutants that are better understood and less problematic (i.e., CO, SO<sub>2</sub>, lead)
  - Need to adjust to protect today's population and environment

## ***Network Assessment Considerations (2 of 2)***

- Networks may
  - Be required to maintain the ability to understand long-term historical air quality trends
  - Need to take advantage of new monitoring technologies and improved scientific understanding of air quality issues
  - Need to address multiple, interrelated air quality issues
  - Have to better operate with other types of air quality assessments (e.g., photochemical modeling, emission inventory assessments)
  - Need to be better designed to track emissions changes

## Number of Criteria Pollutant Monitors Reporting to EPA's AQS Database (2004)



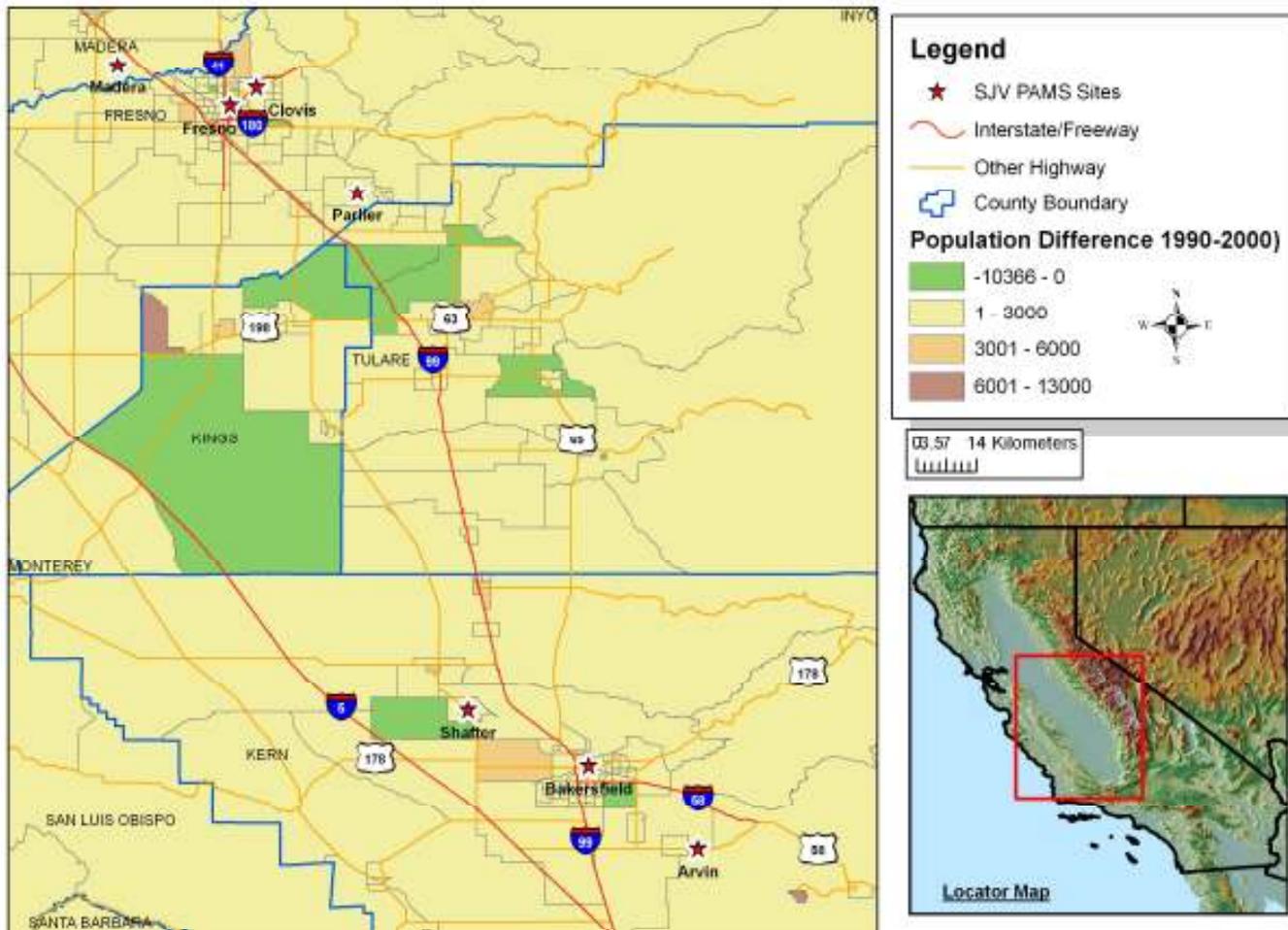
## *Elements of Network Assessments*

- Re-evaluation of the objectives and budget for air monitoring
- Evaluation of a network's effectiveness and efficiency relative to its objectives and costs
- Development of recommendations for network reconfigurations and improvements

## Network Assessment Steps

Step	Description	Examples
1	Prepare or update a regional description, discussing important features that should be considered for network design	Topography, climate, population, demographic trends, major emissions sources, and current air quality conditions

# Update a Regional Description



## Network Assessment Steps

Step	Description	Examples
2	Prepare or update a network history that explains the development of the air monitoring network over time and the motivations for network alterations, such as shifting needs or resources.	Historical network specifications (e.g., number and locations of monitors by pollutant and by year in graphical or tabular format); history of individual monitoring sites

## Prepare a Network History

### California PAMS and PAMS-like data (1990-1997)

City	1990	1991	1992	1993	1994	1995	1996	1997
Elk Grove-Bruceville							7/8-9/30	7/2-10/1
Del Paso Manor					7/1-9/29	7/1-9/30	7/2-9/30	7/2-10/1
Folsom						7/28-10/30		
New Folsom							7/5-9/30	7/2-10/1
Bakersfield Golden St. Ave.					7/1-9/29	7/2-9/30	7/1-9/30	7/2-10/1
Arvin						7/1-9/30	7/1-9/30	7/2-10/1
Clovis-Villa				6/24-10/16 <sup>2</sup>	7/6-9/29	7/1-9/30	7/1-9/30	7/2-10/1
Fresno – 1 <sup>st</sup> Street	6/10-9/29 <sup>1</sup>		6/5-10/15 <sup>2</sup>	6/15-10/31 <sup>3</sup>	7/1-9/30	7/1-9/30	7/1-9/30	7/1-10/1
Parlier						7/1-9/30	7/3-9/30	7/2-10/1
El Cajon						7/8-10/30	7/2-9/29	7/3-10/4
Overland						7/8-10/30	7/2-10/27	7/3-10/4
Alpine						7/8-10/27	7/2-9/29	7/3-10/4
San Diego - 12 <sup>th</sup> Street	6/1-9/26 <sup>4</sup>	6/14-10/15 <sup>1</sup>	6/5-10/15 <sup>2</sup>	6/15-10/1 <sup>2</sup>	7/1-9/29 <sup>2</sup>	7/2-10/3 <sup>2</sup>	7/2-9/30 <sup>2</sup>	7/3-10/1 <sup>2</sup>
L.A.-North Main St.	6/4-9/26 <sup>4</sup>	6/18-10/15 <sup>1</sup>	6/5-9/30 <sup>2</sup>	6/15-10/4 <sup>2</sup>	7/7-10/5 <sup>2</sup>	7/2-10/6 <sup>2</sup>	7/2-9/30 <sup>2</sup>	7/3-10/1 <sup>2</sup>
Emma Wood State Beach							7/26-9/24	6/3-9/29
El Rio						6/5-10/30	6/2-9/24	6/3-10/31
Simi Valley						6/5-10/30	6/20-9/24	6/3-10/31

1 = one sample per day, every third day

2 = two samples per day, every third day

3 = eight samples per day, every third day

4 = one sample per day, every sixth day

## Network Assessment Steps

Step	Description	Examples
3	Perform statistical analyses of available monitoring data. These analyses can be used to identify potential redundancies or to determine the adequacy of existing monitoring sites.	Site correlations, comparisons to the NAAQS, trend analysis, spatial analysis, and factor analysis

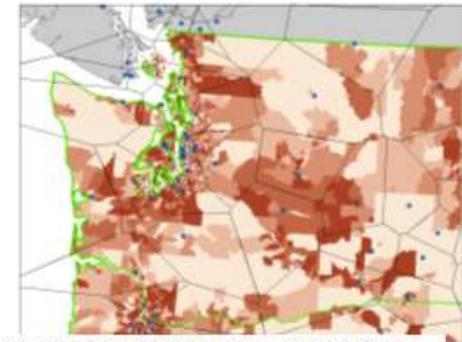
# Perform Statistical Analyses

- Front page of summary sheet for the “Population Served” analysis
- Statistical analyses are the focus of later training

## Population Served

### Overview

Large populations are associated with high emissions. Sites are ranked based on the number of people they represent. Area of representation can be determined using the Thiessen polygons technique or a more sophisticated method (see Area Served). Populations at the census-tract or block-group level that fall within the area of representation of a monitor are assigned to that monitor. This technique gives the most weight to sites that are in areas of high population and have large areas of representation.



Population density and ozone monitor areas of representation in western Washington. Darker colors represent greater population.

Type: Site-by-site analysis

Complexity: \*\*\*

Size of network: Moderate or larger

Pollutants: O<sub>3</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, some toxics

### Objectives Assessed

- Population exposure
- Environmental justice

### Resources

	Tools		Data						
	GIS	Statistical Software	Concentrations	Site Locations	Population	Historical Data	Site Information	Emission Inventory	Other
Required	✓			✓	✓				
Helpful									Demographics

### Advantages

- Assesses site importance for population exposure, an important regulatory goal
- Flexible (a few possible methods)

### Disadvantages

- Does not take into account topography or actual air basins (using basic method)
- Highly resolved population data may be difficult to work with

### Similar Analyses (Complexity)

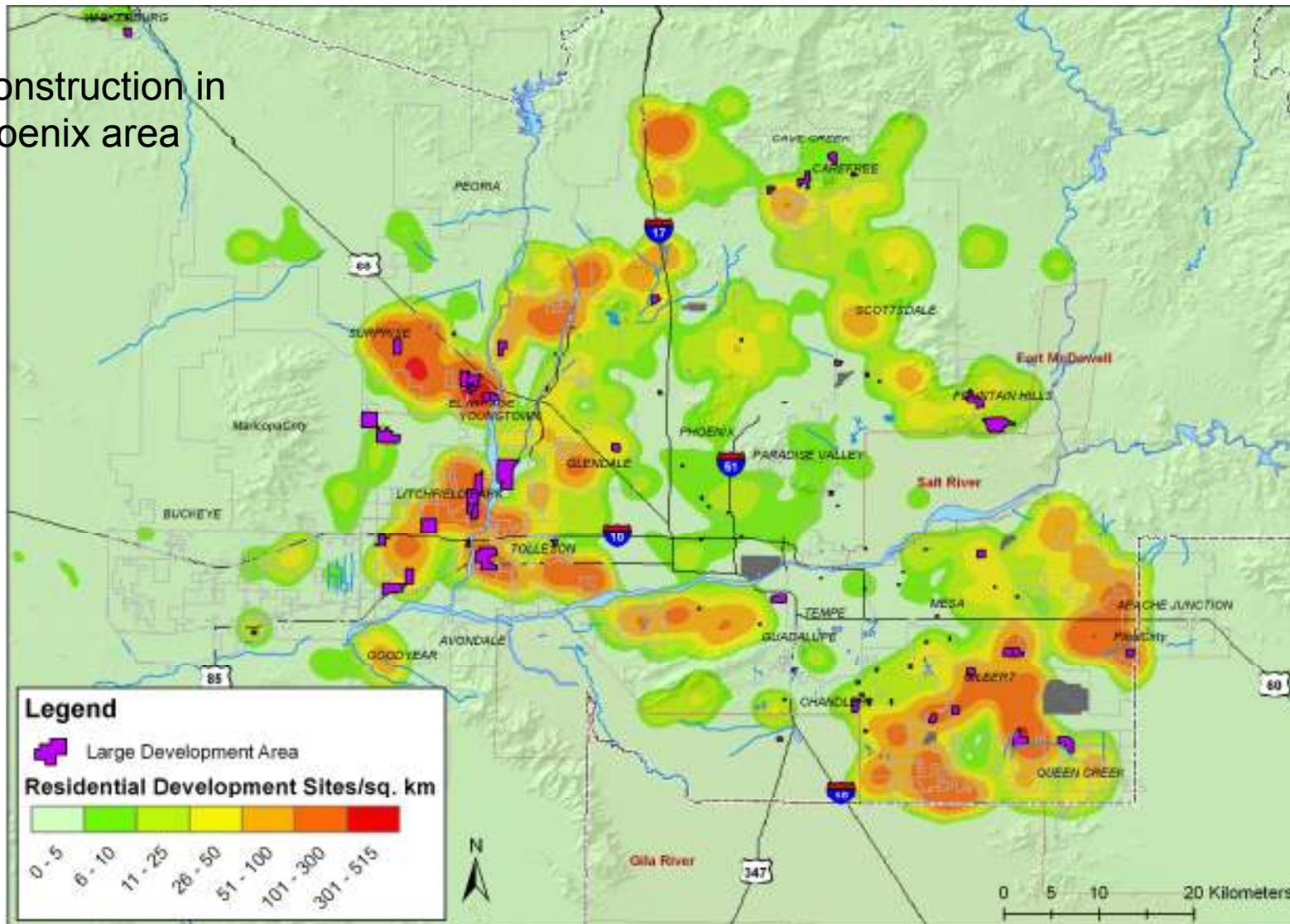
- Area served (\*\*)
- Counties served (\*\*)
- Population change (\*\*\*)
- Suitability modeling (\*\*\*\*)

## Network Assessment Steps

Step	Description	Examples
4	Perform situational analyses, which may be objective or subjective. These analyses consider the network and individual sites in more detail, taking into account research, policy, and resource needs.	Risk of future NAAQS exceedances, demographic shifts, requirements of existing state implementation plans (SIP) or maintenance plans, density or sparseness of existing networks, scientific research or public health needs, and other circumstances (such as political factors)

# Perform Situational Analyses

New construction in the Phoenix area



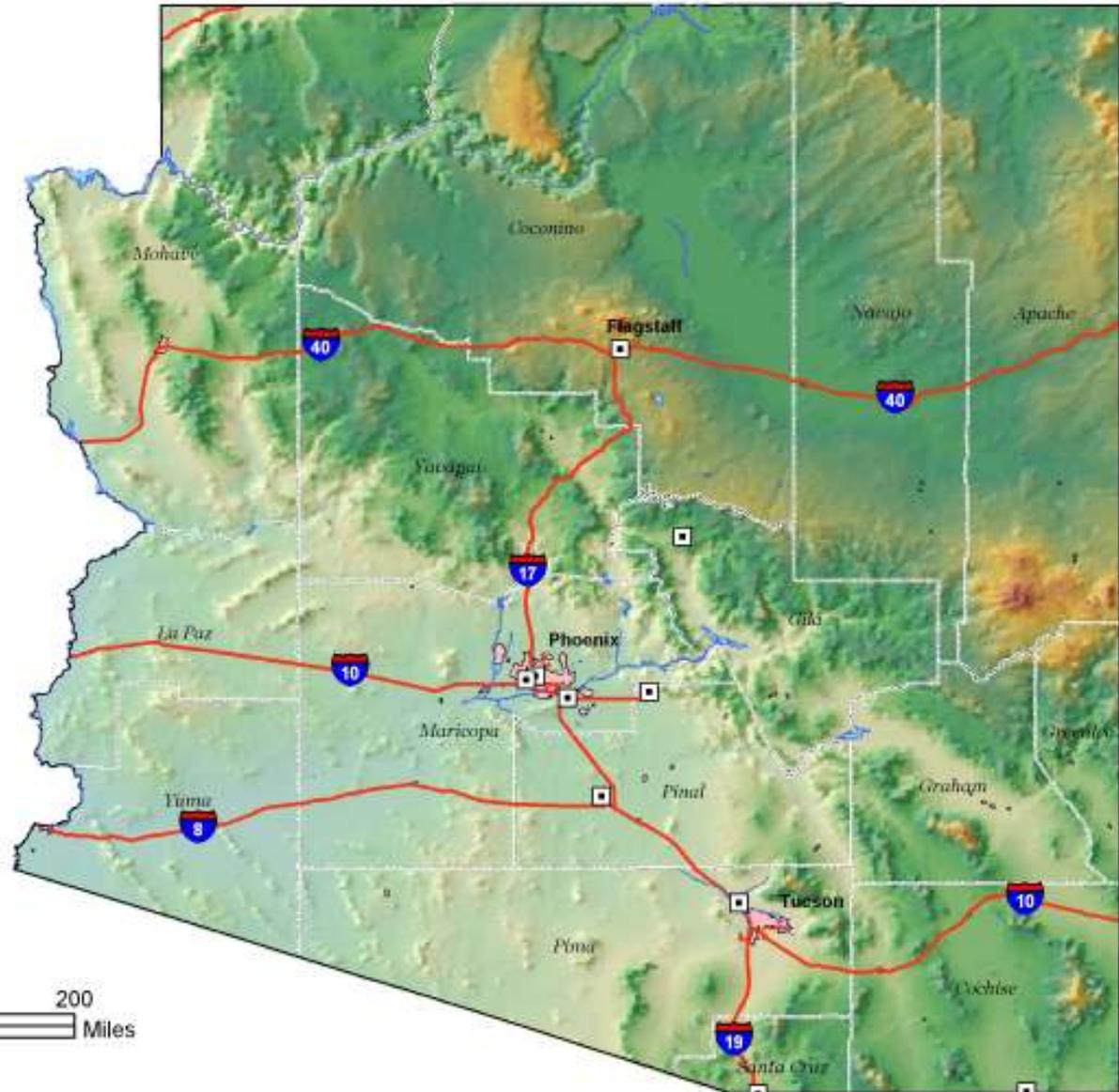
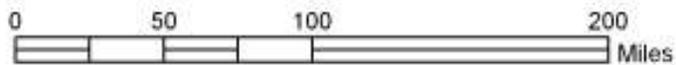
## *Network Assessment Steps*

Step	Description	Examples
5	Suggest changes to the monitoring network on the basis of statistical and situational analyses and specifically targeted to the prioritized objectives and budget of the air monitoring program.	Reduction of number of sites for a selected pollutant, enhanced leveraging with other networks, and addition of new measurements at sites to enhance usefulness of data

# PM 2.5 Monitor Locations

## Legend

- PM 2.5 Monitor
- ↗ Interstate/Highway
- Urban Boundary
- County Boundary
- State Boundary

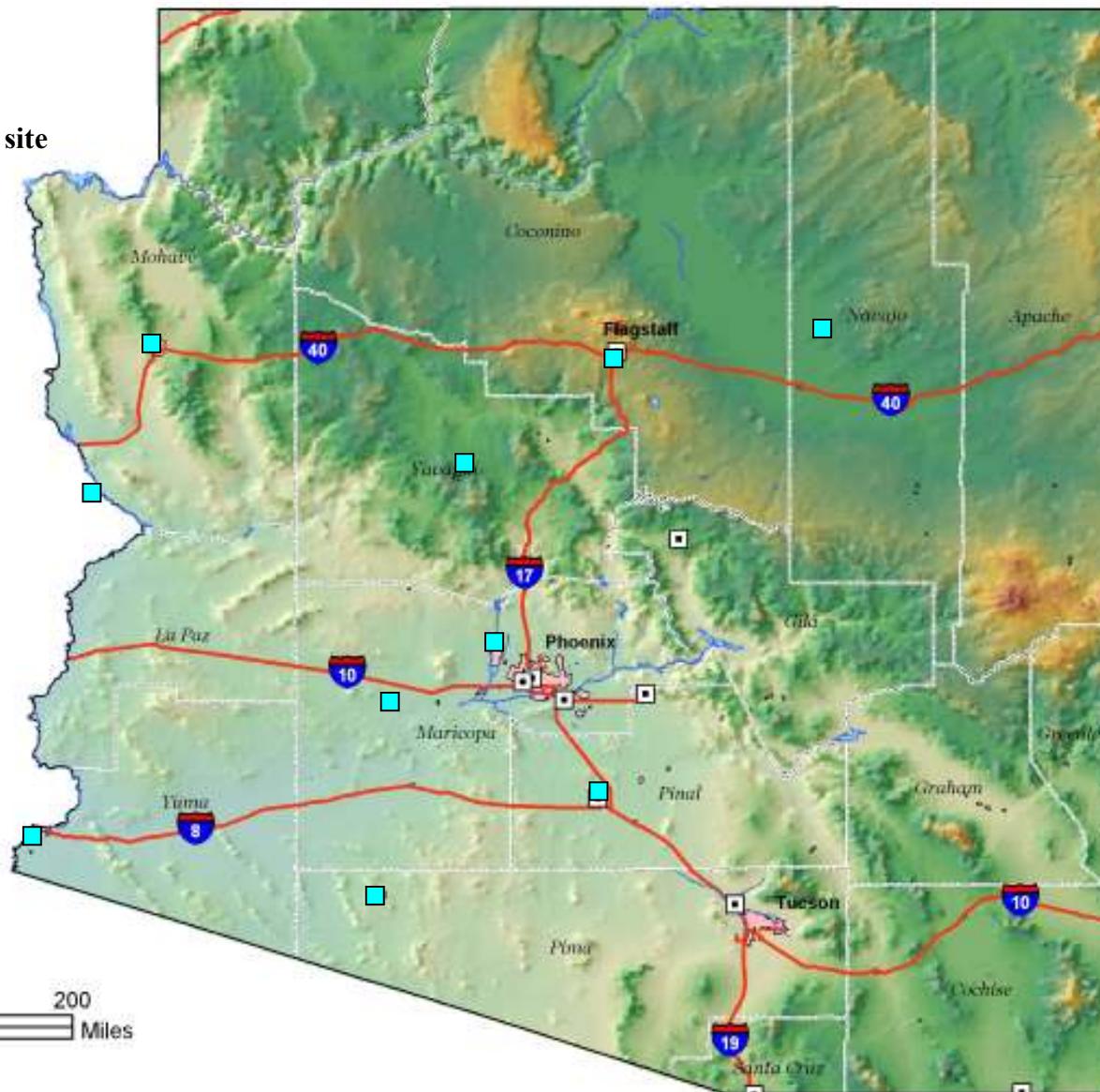
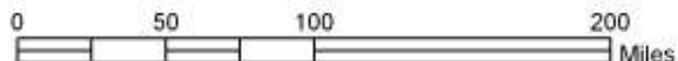


# PM 2.5 Monitor Locations

■ Suggested additional PM<sub>2.5</sub> FRM site

## Legend

- PM 2.5 Monitor
- Interstate/Highway
- Urban Boundary
- County Boundary
- State Boundary



## *Network Assessment Steps*

Step	Description	Examples
6	Acquire the input of state and local agencies or stakeholders and revise recommendations as appropriate	

## *Notes on Removing a NAAQS Monitor*

- New requirements in monitoring rule [40 CFR 58.14(c)]
- Site/monitor must meet certain criteria
  - monitor has shown attainment during the previous five years and is not likely to exceed 80 percent of the applicable NAAQS during the next three years, or
  - monitor has consistently measured lower concentrations than another monitor for the same pollutant in the same area, or
  - monitor has not measured violations of the applicable NAAQS in the previous five years, and the approved SIP provides for an approach to representing the air quality in the absence of actual monitoring data, or
  - A PM<sub>2.5</sub> SLAMS monitor which EPA has determined cannot be compared to the relevant NAAQS because of the siting of the monitor, or
  - upwind monitor characterizing transport into the area if discontinuation of the monitor is tied to start-up of another monitor also characterizing transport, or
  - logistical problems beyond the State's control make it impossible to continue operation at its current site.

*Questions?*