

Technical Assessment of the Maricopa County Air Monitoring Network from 2005-2009

By

Ronald Pope
Air Monitoring Data Coordinator



WALK MORE USE CFLS MORE CARPOOL MORE
BIKE MORE RAKE MORE TELECOMMUTE
MORE DRIVE HYBRIDS MORE CONSOLIDATE
ERRANDS MORE RIDE PUBLIC TRANSPORTATION
MORE USE ENERGY EFFICIENT APPLIANCES
MORE CARRY REUSABLE TOTE BAGS MORE
CONSIDER SOLAR MORE RUN COLD WATER
CYCLES MORE USE REUSABLE CONTAINERS
MORE CONSERVE ELECTRICITY MORE REDUCE
WOODBURNING MORE RECYCLE MORE USE
ELECTRIC LAWN AND GARDEN EQUIPMENT
MORE REFUEL AFTER DARK MORE RIDE
THE BUS MORE RIDE THE LIGHT RAIL MORE
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MAKE
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Requirement to Conduct Network Assessments

- In October 2006 the EPA added the requirement to perform an assessment of air monitoring networks every five years (40 CFR 58.10(e)).
- The purpose of the assessment is to determine if:
 - The network meets monitoring objectives.
 - New sites are needed.
 - Existing sites are no longer needed.
 - New technologies are appropriate for the monitoring network.



Parameters Assessed

- Maricopa County Air Quality Department (MCAQD) is meeting this requirement by submitting this Network Assessment which considers the network between 2005-2009.
- The following criteria pollutants are assessed:
 - Carbon Monoxide (CO)
 - Nitrogen Dioxide (NO₂)
 - Ozone (O₃)
 - Particulates (PM10 and PM2.5)
 - Sulfur Dioxide (SO₂)

Lead Monitoring

- Lead (Pb) is also criteria pollutant; however, it was not monitored in Maricopa County during the 2005-2009 time period, so it is not addressed in this Network Assessment.
- A lead monitoring station was opened in 2010 at the Deer Valley airport to meet new EPA requirements.
- In accordance with the most recent regulations, this site will continue to operate for the foreseeable future. There are no plans to open additional lead monitoring sites.

Structure of the Assessment

Section	Description
Section 1	MCAQD Monitoring Sites: Background, Scale, and Objectives.
Section 2	Site-to-Site Comparisons. <ul style="list-style-type: none">• Evaluates and scores existing sites.
Section 3	Air Monitoring Adequacy. <ul style="list-style-type: none">• Scores areas of monitoring deficiency.• Used to find areas where new sites would be beneficial.
Section 4	Recommendations. <ul style="list-style-type: none">• Suggestions where to add, move, or discontinue sites.• Suggestions where to change scale or objective.

Section 1

- There were 22 monitoring sites operating in MCAQD's network during the 2005-2009 time period (not including Coyote Lakes and Zuni Hills)
- Coyote Lakes was a temporary special purpose monitor that operated from 2007-2009. It was replaced by Zuni Hills in December 2009. Neither site was included in the Network Assessment.

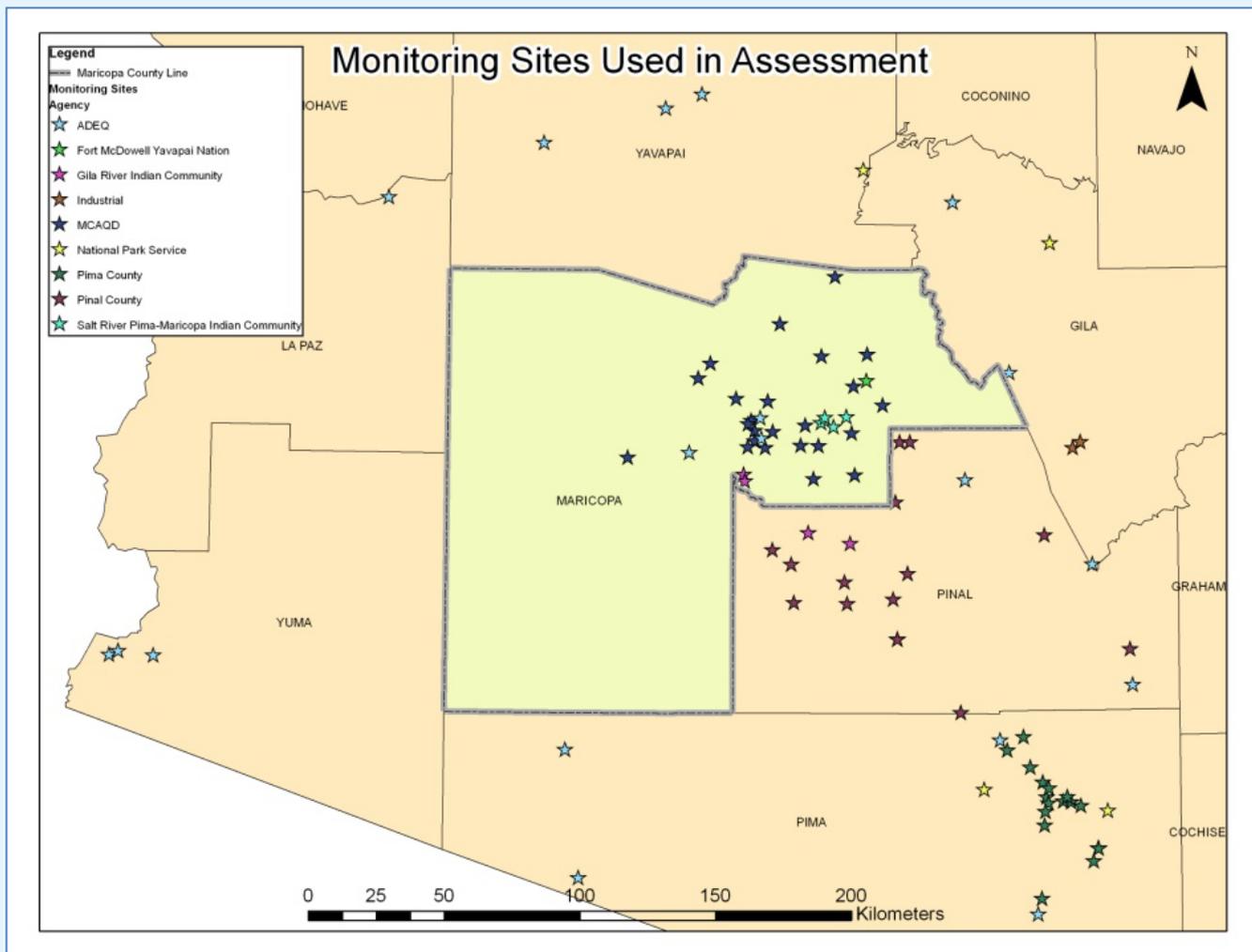
Section 1

- Data from other agencies monitoring networks were also used (though those other sites were not assessed).

Agency
Arizona Department of Environmental Quality (ADEQ)
Fort McDowell Yavapai Nation
National Park Service
Gila River Indian Community
Pima County Air Quality Department
Pinal County Air Quality Department
Salt River Pima-Maricopa Indian Community

Section 1

	#Sites in MCAQD Network	Total #Sites used (all networks)
CO	13	19
NO ₂	5	11
O ₃	17	46
PM10	14	52
PM2.5	4	20
SO ₂	2	16



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Section 2

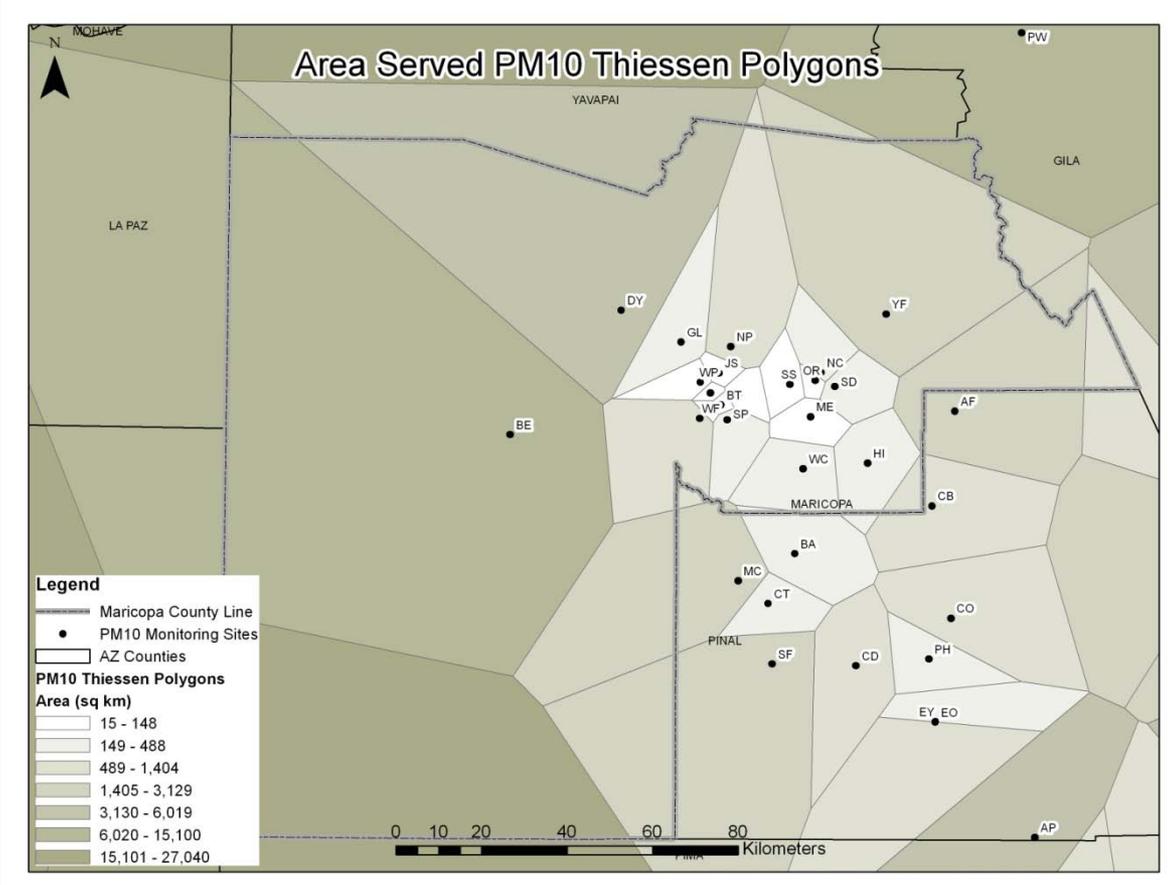
#	Indicator
1	Number of Other Parameters Monitored
2	Trends Impact
3	Measured Concentrations
4	Deviation from the NAAQS
5	Area Served
6	Population Served
7	Monitor-to-Monitor Correlation
8	Removal Bias
9	Emissions Inventory
9b	Predicted Ozone
10	Traffic Counts
11	Environmental Justice-Minority Population Served

Non-Spatial Indicators

1	Number of Other Parameters Monitored	Measures number of pollutants monitored, giving economic worth of site.
2	Trends Impact	Measures operating length of site.
3	Measured Concentrations	Measures design value of site.
4	Deviation from the NAAQS	Measures absolute design value difference from standards.

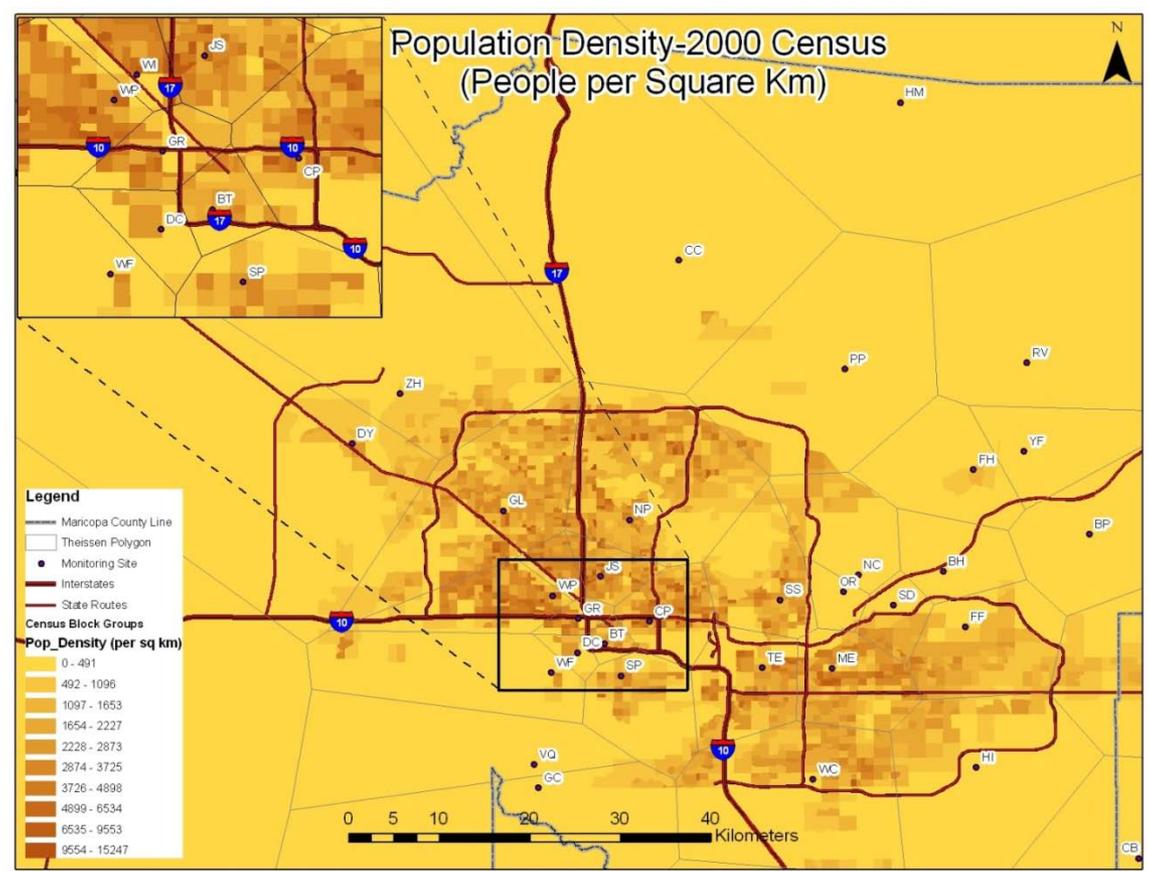
Spatial Indicators

5 Area Served Ranks based on the area of Thiessen polygon.



Spatial Indicators

6 Population Served Ranks based on the population density.

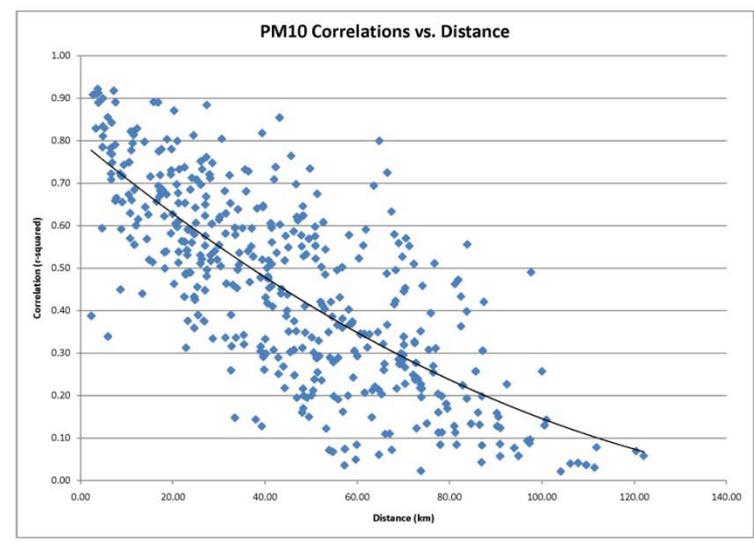
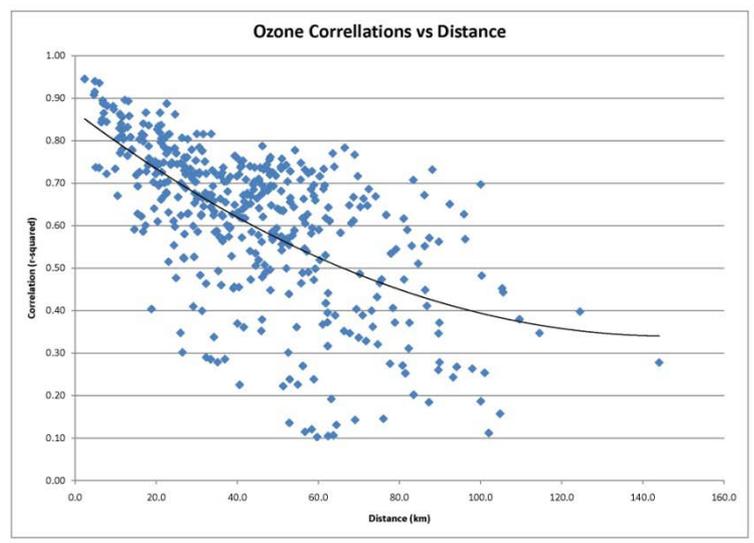


Spatial Indicators

7 Monitor-to-Monitor Correlation Concentrations are correlated between all monitors. High correlations may be redundant.

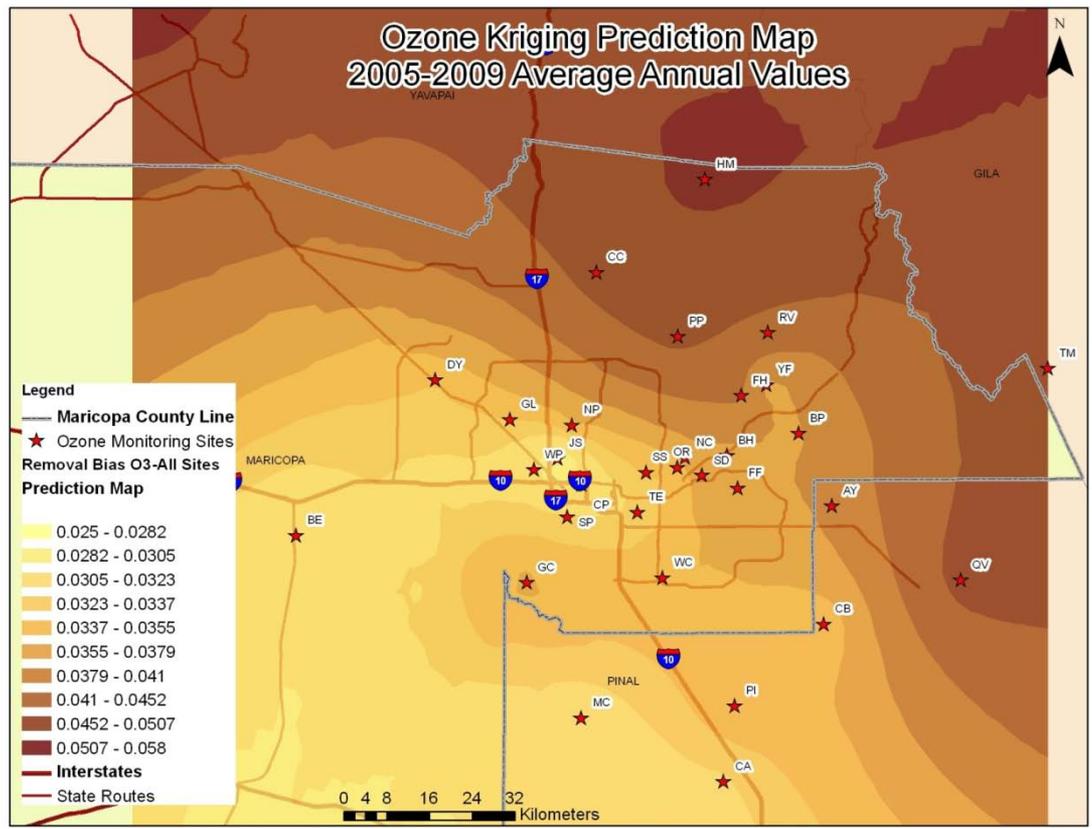
Ozone Correlations

PM10 Correlations



Spatial Indicators

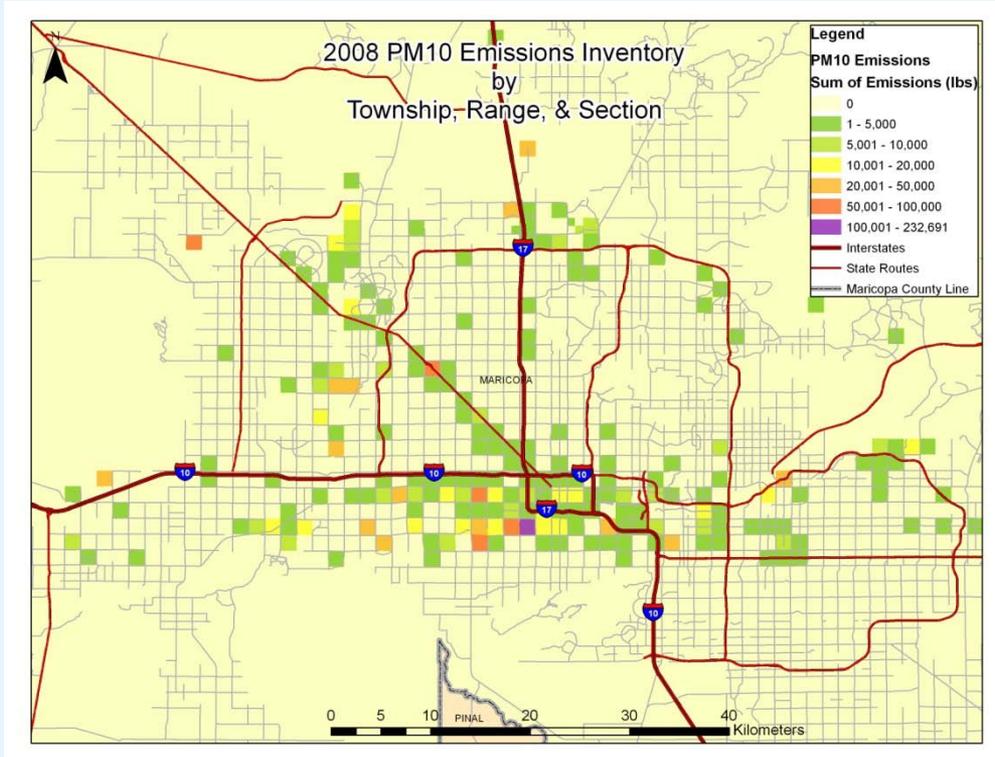
8	Removal Bias	Pollution Surface is created by kriging. Sites are removed and surface is recreated. The difference is the removal bias
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Section 2

Spatial Indicators

9	Emissions Inventory	Emissions within each Thiessen polygon are ranked.
9b	Predicted Ozone	Ozone only; averaged with Emissions Inventory

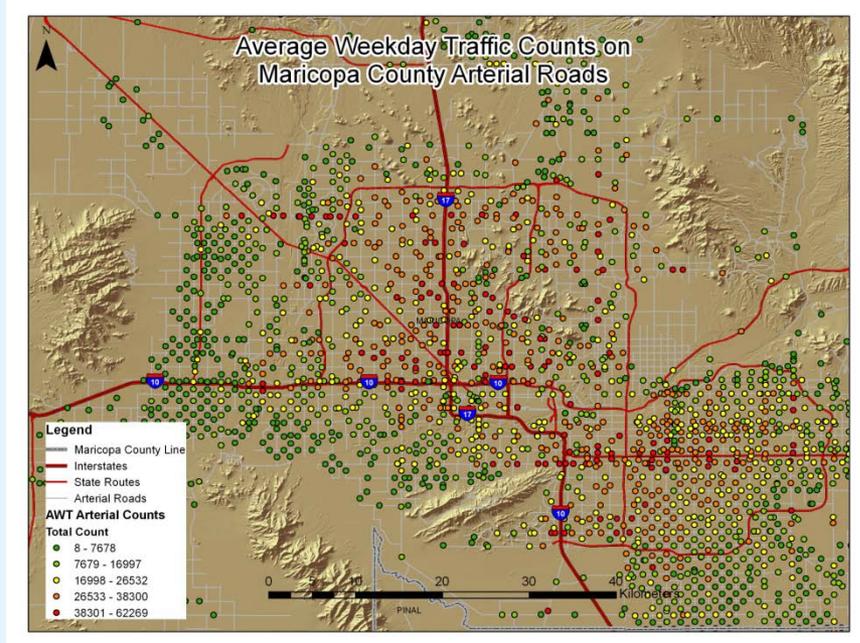
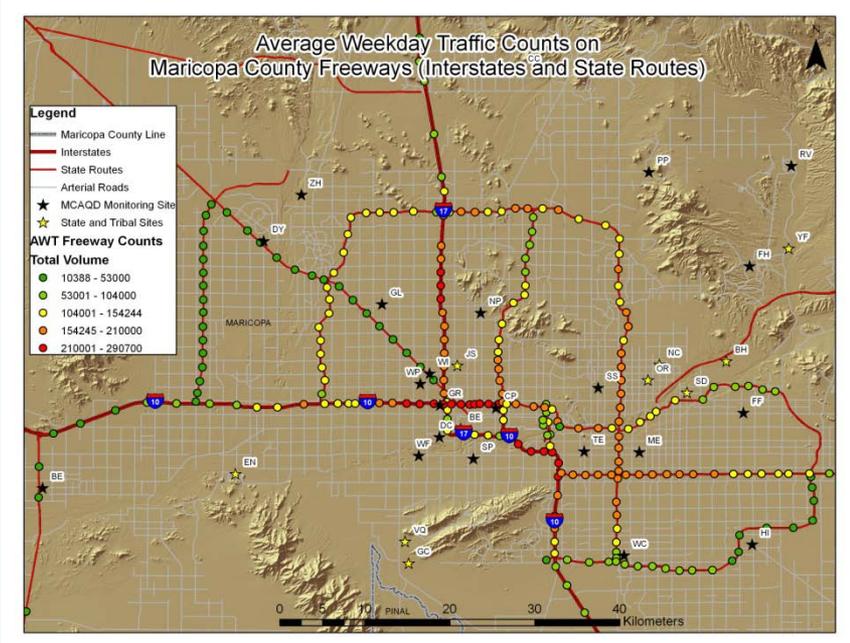


Spatial Indicators

10	Traffic Counts	Traffic count and road density are calculated within each Thiessen polygon.
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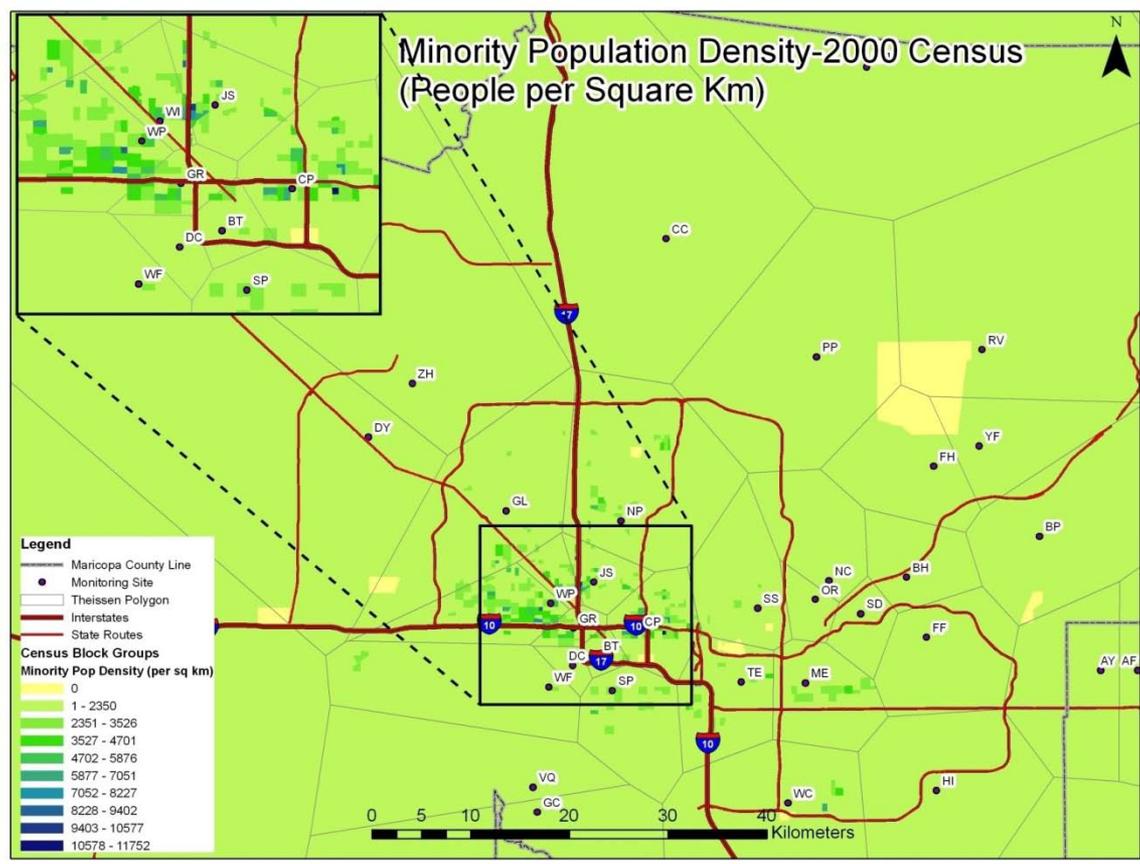
Freeway Counts

Arterial Road Counts



Spatial Indicators

11	Environmental Justice- Minority Population Served	Identical to Population served-only uses the minority population density.
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Section 2 Results

- Weights were added to indicators based on their relative importance.

Analysis #	Analysis	Weight Percentage
1	Number of other parameters monitored	50%
2	Trends Impact	100%
3	Measured Concentrations	200%
4	Deviation from the NAAQS	100%
5	Area Served	100%
6	Population Served	150%
7	Monitor-to-Monitor Correlation	150%
8	Removal Bias	125%
9	Emissions Inventory	175%
9b (ozone only)	Predicted Ozone	175%
10	Traffic Counts	150%
11	Environ-mental Justice	150%

Section 2 Results

Example of Rankings in Ozone Monitors

Site	Rank
North Phoenix	1
Glendale	2
West Chandler	3
Tempe	4
West Phoenix	5
Pinnacle Peak	6
Falcon Field	7
Humboldt Mountain	8
Cave Creek	9
South Scottsdale	10
Central Phoenix	11
Fountain Hills	12
South Phoenix	13
Dysart	14
Rio Verde	15
Buckeye	16
Blue Point	17

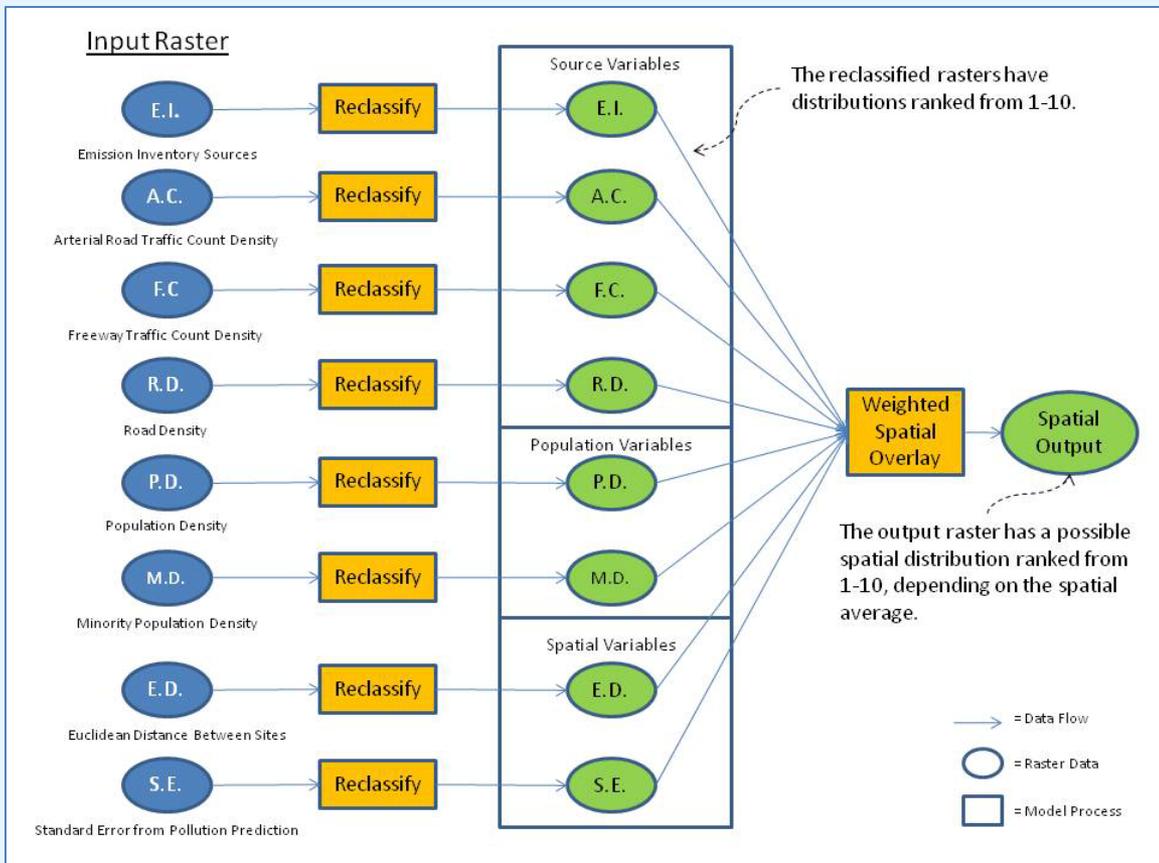


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Section 3

The Section 3 analyses follow this model:



The output is a spatially-explicit scored map. The score represents the suitability of the location to add an additional monitoring site.

Section 3

- **Weights**
 - Weights were decided for each individual pollution parameter. The decisions were made based on the dynamics of each pollutant and variable group.

Ozone Weights

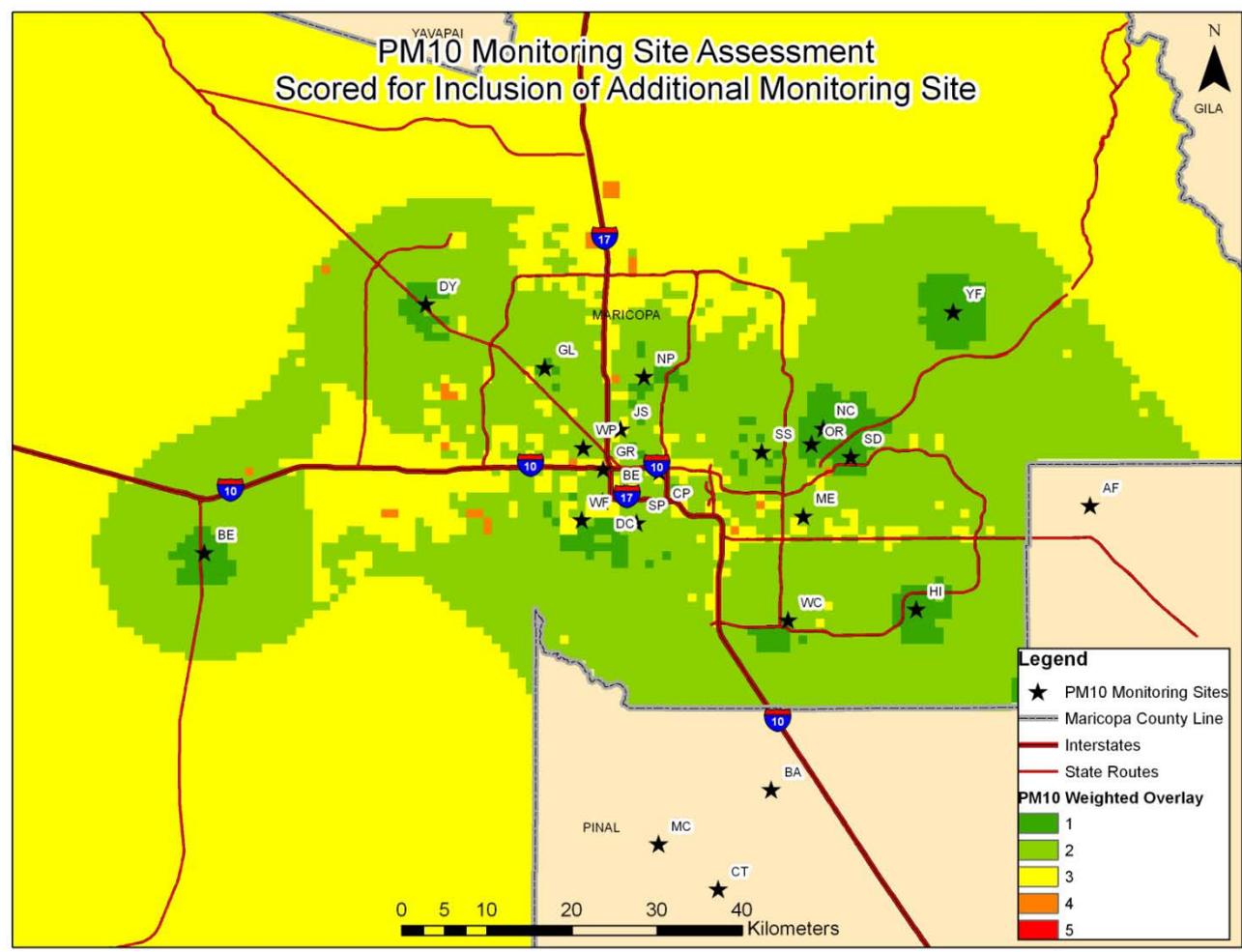
Area	Indicator	Weights	
Source-Oriented Variables		.30	
	Emissions Inventory Point Sources		.16
	Arterial Road Traffic Count		.05
	Freeway Traffic Count		.04
	Road Density		.05
Population-Oriented Variables		.34	
	Population Density		.19
	Minority Population Density		.15
Spatially-Oriented Variables		.36	
	Euclidean Distance Between Monitors		.14
	Standard Error from Predicted Pollution		.22
Totals		1.0	1.0

PM10 Weights

Area	Indicator	Weights	
Source-Oriented Variables		.40	
	Emissions Inventory Point Sources		.22
	Arterial Road Traffic Count		.06
	Freeway Traffic Count		.06
	Road Density		.06
Population-Oriented Variables		.36	
	Population Density		.16
	Minority Population Density		.20
Spatially-Oriented Variables		.24	
	Euclidean Distance Between Monitors		.10
	Standard Error from Predicted Pollution		.14
Totals		1.0	1.0

Section 3 Results

PM10 Results:



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Suggested Changes to the CO Network:

Sites suggested for closure:	<ul style="list-style-type: none"> West Indian School (closed summer 2010)
Sites suggested being moved or changed:	<ul style="list-style-type: none"> None to be moved Change the West Phoenix objective from Population Exposure to Highest concentration.
Suggested new sites:	<ul style="list-style-type: none"> None (though adding CO monitors to an existing Gila Bend site, micro-scale near road monitoring site, or existing Higley site would be beneficial)

Section 4

Suggested Changes to the NO₂ Network:

Sites suggested for closure:	<ul style="list-style-type: none"> ▪None
Sites suggested being moved or changed:	<ul style="list-style-type: none"> ▪South Scottsdale moved to the existing Tempe site. ▪If a new site is created in Gila Bend, it is recommended to move Buckeye there. ▪If Buckeye is not moved, it is recommended to change the objective from Source Oriented to Upwind Background.
Suggested new sites:	<ul style="list-style-type: none"> ▪Two near-road monitors along a high traffic corridor are necessary. ▪It is also possible to add a new site in Gila Bend with a new monitor instead of moving Buckeye.

Section 4

Suggested Changes to the Ozone Network:

Sites suggested for closure:	<ul style="list-style-type: none"> ▪None
Sites suggested being moved or changed:	<ul style="list-style-type: none"> ▪None moved, though the possibility of moving South Scottsdale north to the Deer Valley or Paradise Valley area should be considered (if necessary). ▪Blue Point is recommended to be changed from a Maximum Ozone Concentration to an Extreme Downwind objective.
Suggested new sites:	<ul style="list-style-type: none"> ▪Deer Valley area ▪Avondale/Goodyear area ▪Gila Bend Area ▪Wickenburg area.

Suggested Changes to the PM10 Network:

Sites suggested for closure:	<ul style="list-style-type: none">▪ None
Sites suggested being moved or changed:	<ul style="list-style-type: none">▪ West Chandler scale changed from Middle to Neighborhood.▪ Possibly moving South Scottsdale to Tempe should be considered.
Suggested new sites:	<ul style="list-style-type: none">▪ Deer Valley area▪ Avondale/Tolleson area▪ Gila Bend Area

Suggested Changes to the PM2.5 Network:

<p>Sites suggested for closure:</p>	<ul style="list-style-type: none"> ▪None
<p>Sites suggested being moved or changed:</p>	<ul style="list-style-type: none"> ▪None
<p>Suggested new sites:</p> <p>The following are hotspots that were identified in the analyses.</p>	<ul style="list-style-type: none"> ▪North Phoenix in the Bell Rd/SR51 area. ▪Phoenix in the Northern Ave/I-17 area. ▪West Phoenix in the Indian School Rd/67th Ave area. ▪Along the I-10 west of the I-17 interchange (near the existing Greenwood monitor). ▪Phoenix in the McDowell Rd/32nd St area, just north of Sky Harbor airport. ▪Chandler in the Pecos Rd/Arizona Ave area, 4 km east of the existing West Chandler site. ▪Wintersburg area (power plants near the Palo Verde nuclear generating station). ▪West of Tonopah at 491st Ave/Courthouse Rd. ▪There is also an emission point source in Gila Bend, though that area did not score as high as the others listed above.

Section 4

Suggested Changes to the SO₂ Network:

Sites suggested for closure:	<ul style="list-style-type: none"> ▪None
Sites suggested being moved or changed:	<ul style="list-style-type: none"> ▪South Scottsdale moved to an area with a higher score: <ul style="list-style-type: none"> ▪Avondale near the Salt River ▪Surprise in the Bell Rd/Grand Ave area ▪Central Mesa near U.S. 60/Gilbert Rd ▪Tempe near U.S. 60/I-10 interchange ▪I-17 near the Durango Curve (greatest source conglomeration) ▪It is only recommended to move South Scottsdale to an already existing site.
Suggested new sites:	<ul style="list-style-type: none"> ▪None

Section 4

- Recommendation for New Technologies:
 - MCAQD is committed to keeping the network technologically advanced.
 - Filter-based PM10 monitors are being gradually phased out and replaced with continuous monitors.
 - Filter-based PM2.5 monitors are being replaced by new continuous monitors as budget allows.
 - Other gaseous monitors are replaced and/or upgraded on a five to seven-year cycle.
 - Data acquisition software is upgraded continuously as it becomes available.
- It is not recommended to make any changes in these policies.



Planned Network Changes

- Shutting Down Sites
 - West Indian School Rd. (CO) (6/1/10)
 - City of Phoenix selling building
 - Max. Concentration label moved to West Phoenix site (1 mile)
 - South Scottsdale (CO, O3, PM-10, NO2, SO2)
 - City of Scottsdale may sell building
 - Long-term site (over 30yrs)
 - Central Phoenix site similar monitoring history
 - Monitors will be reallocated to other sites (Tempe, Mesa)
 - Pinnacle Peak site (O3) in North Scottsdale

Planned Network Changes

- New sites (Special Purpose Monitors)
 - PM-10, PM-2.5, and Ozone
 - North of Deer Valley lead site (7th St. and Happy Valley Rd.).
 - PM-10 and Ozone
 - Existing Avondale site (Avondale Blvd. and Southern Ave.)
 - NO₂ and (???) at **two** near-road sites
 - New EPA regulations
 - Less than 50m from Source
 - Near the intersection of 202, I-10, and S-51
 - Near the intersection I-10 and I-17 or US-60 and I-10
 - SO₂ at Durango site
 - Started Jan. 1, 2011

Thank You

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Maricopa County
Air Quality Department

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