Arkansas Ambient Air Monitoring Network
Five Year Assessment
2005 - 2009

Arkansas Department of Environmental Quality
July 1, 2010

EXECUTIVE SUMMARY

The Arkansas Department of Environmental Quality (ADEQ) has monitored air quality in the State of Arkansas for over thirty years. The list of air contaminants that are currently being monitored has grown to more than nine different parameters at this time. The Department's air monitoring network is composed of various types of intermittent and continuous monitors that are strategically located throughout the state. Site selection of these monitors was done in a manner insuring that the data from the monitors would contain the quality of information that could give assurances that public health was being protected and that environmental quality goals were being achieved.

The data generated from the monitoring network is used for a broad range of regulatory and research purposes, as well as to inform the public the status of air quality within the state.

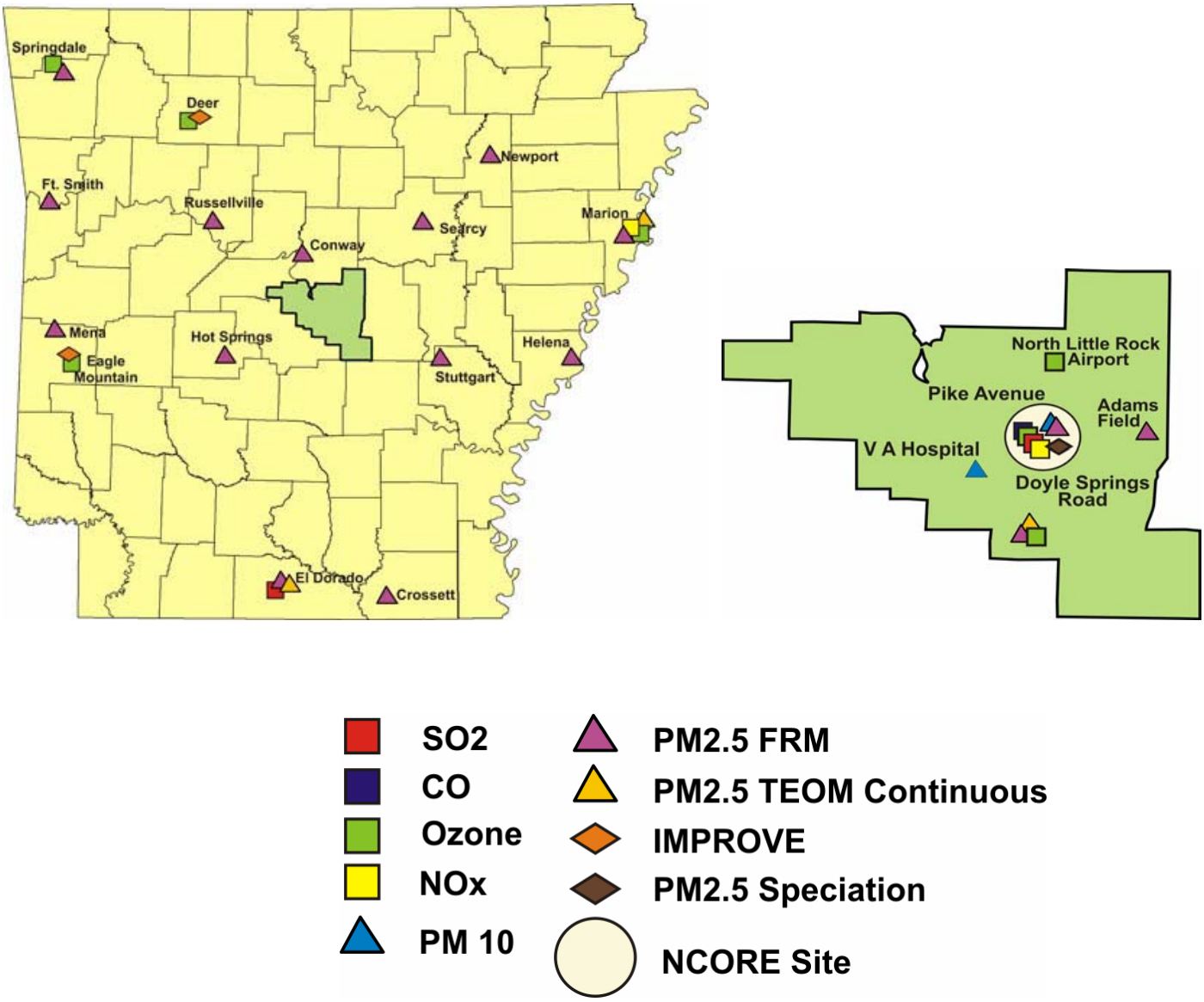
This report is a summary and assessment of the monitoring data obtained for five of the six designated criteria pollutants for the years 2005-2009. Meteorological data is also included as part of this report.

The quality of the air in Arkansas for the years 2005-2009 was, in general, very good to excellent. Portions of the Memphis, TN/AR/MS Consolidated Metropolitan Statistical Area (CMSA) were designated nonattainment for the 1997 8-hour ozone standard during this time period but have since been redesignated to attainment based on monitoring data showing that the area was meeting the National Ambient Air Quality Standard (NAAQS).

In the event that the EPA promulgates a new, lower ozone standard in the near future, ADEQ will be required to site additional ozone monitors in several areas of the State. It is almost certain that some of these monitored areas will be unable to show attainment of the standard and will be designated as nonattainment for any new standard.

Analysis was also performed using assessment tools designed by the EPA to determine if sites could be removed or if new sites were needed. The suite of EPA tools shows no clear indication of site redundancy, but the Area Served and New Sites tools do show that the additional ozone monitors would provide better state-wide coverage.

The following maps and legend provide an overview of the majority of ADEQ's current continuous and incremental monitoring network. The map shows twenty locations where at least one monitor is located. Pulaski County, with an estimated population of 381,904 people (U.S. Census Bureau 2009 estimate), has five sites where one or more monitors are located. The state's only NCORE site is located near the center of Pulaski County, which is in the center of the Little Rock- North Little Rock-Conway Metropolitan Statistical Area. This MSA consists of a six-county area located in central Arkansas with an estimated population of 685,488 (U.S. Census Bureau 2009 estimate).



The number of each type of monitor is as follows: SO_2 - 2 monitors, CO - 1 monitor, O_3 - 7 monitors (5 in urban locations, 2 in rural areas), NO_x - 2 monitors, PM_{10} - 2 monitors, $PM_{2.5}$ FRM - 16 monitors, $PM_{2.5}$ TEOM - 3 monitors, IMPROVE - 2 monitors, $PM_{2.5}$ Speciation - 1 monitor. There is also one meteorological station located at the NCORE site that measures and records wind speed, direction, relative humidity, and outside temperature.

Newer monitors that are not shown on the map include: (1) continuous NO_Y, and $PM_{2.5}$ TEOM monitors, and continuous trace level NO_2, SO_2, and CO monitors that are located at the NCORE site, (2) a $PM_{2.5}$ TEOM monitor located at the Springdale site.

AQS# Site ID	Pollutants Measured	Operating Schedule	Monitoring Objective	Spatial Scale	NAAQS Comp.	MSA
05-001-0011 Stuttgart	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-003-0005 Crossett	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-035-0005 Marion	PM2.5 PM2.5 Ozone NO2	Daily 1 in 3 Continuous Continuous Continuous	Regional Transport	Neighborhood Neighborhood Neighborhood Neighborhood	Yes No Yes Yes	Memphis
05-051-0003 Hot Springs	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-067-0001 Newport	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-107-0001 Helena	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-101-0002 Deer	Ozone	Continuous	Background	Neighborhood	Yes	Not in a MSA
05-113-0002 Mena	PM2.5	Daily 1 in 3	Background	Neighborhood	Yes	Not in a MSA
05-113-0003 Eagle Mtn	Ozone	Continuous	Regional Transport	Neighborhood	Yes	Not in a MSA
05-115-0003 Russellville	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-119-0007 PARR	PM2.5 PM2.5 PM10 Ozone NOx SO2 Speciation CO NOy Trace SO2 Trace CO	Daily 1 in 1 Continuous Daily 1 in 6 Continuous Continuous Continuous Daily 1 in 6 Continuous Continuous Continuous Continuous	Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure	Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood	Yes No Yes Yes Yes Yes No Yes No No No	Little Rock
05-119-1002 NLR Airport	Ozone	Continuous	Population Exposure	Neighborhood	Yes	Little Rock
05-119-1004 Adams Field	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Little Rock
05-119-1007 VA	PM10	Daily 1 in 6	Population Exposure	Neighborhood	Yes	Little Rock
05-119-1008 Doyle Springs Road	PM2.5 PM2.5 Ozone	Daily 1 in 1 Continuous Continuous	Population Exposure	Neighborhood Neighborhood Neighborhood	Yes No Yes	Little Rock
05-131-0008 Ft. Smith	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-139-0006 El Dorado	PM2.5 PM2.5 SO2	Daily 1 in 3 Continuous Continuous	Population Exposure Population Exposure Population Exposure	Neighborhood Neighborhood Neighborhood	Yes No Yes	Not in a MSA
05-143-0005 Springdale	PM2.5 PM2.5 Ozone	Continuous Daily 1 in 3	Population Exposure Population Exposure AQI	Neighborhood Neighborhood	No Yes	Fayetteville/ Springdale
05-145-0001 Searcy	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Not in a MSA
05-045-0002 Conway	PM2.5	Daily 1 in 3	Population Exposure	Neighborhood	Yes	Little Rock

Figure 1

Figure 1 provides an overview of the monitoring network and shows the type of monitors at each of the 20 sites as well as monitoring objectives and spatial scale.

Site Name	No. of Parameters	County	Rank	Years in Service
NLR Airport	1	Pulaski	1	32
PARR	12	Pulaski	2	28
El Dorado	3	Union	3	28
VA Hospital	1	Pulaski	4	21
Marion	4	Crittenden	5	18
Deer	2	Newton	6	17
Stuttgart	1	Arkansas	7	11
Crossett	1	Ashley	7	11
Hot Springs	1	Garland	7	11
Helena	1	Phillips	7	11
Mena	1	Polk	7	11
Russellville	1	Pope	7	11
Ft. Smith	1	Sebastian	7	11
Searcy	1	White	7	11
Conway	1	Faulkner	15	10
Adams Field	1	Pulaski	16	9
Doyle Springs Road	3	Pulaski	17	7
Eagle Mountain	2	Polk	18	5
Newport	1	Jackson	19	4
Springdale	3	Washington	20	3

Figure 2

Figure 2 is a display of the state's monitoring network showing the number of parameters at each monitoring site, each site's ranking, and the number of years the site has been used as a monitoring site. The rankings reflect the number of years in service and the amount of data collected.

TRENDS ASSESSMENT
RANKING OF OZONE MONITORS

Rank	Site	County	Yrs in Service
1	NLR Airport	Pulaski	32
2	Pike Ave. Riverfront Rd. (PARR)	Pulaski	28
3	Marion	Crittenden	18
4	Deer	Newton	17
5	Doyle Springs Road (DSR)	Pulaski	7
6	Eagle Mountain	Polk	5
7	Springdale	Washington	3

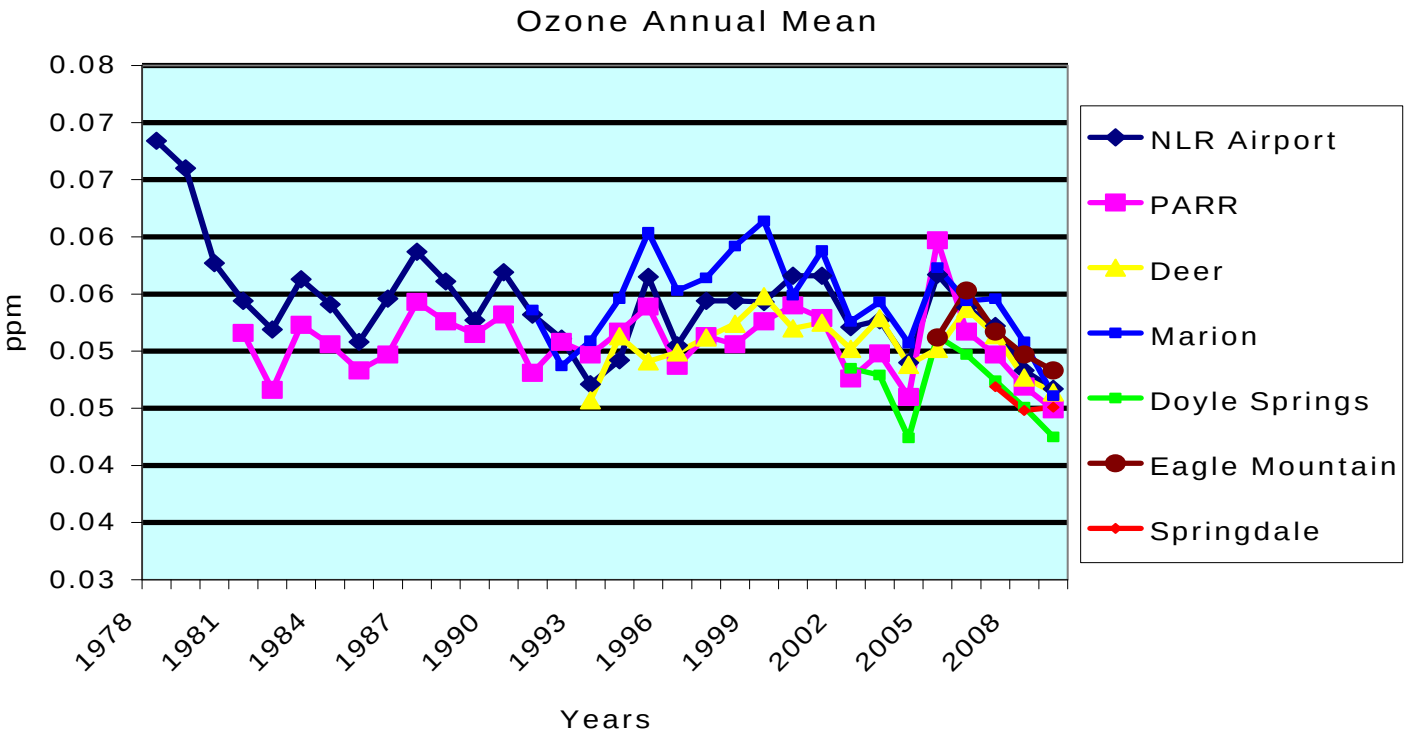


Figure 3

Figure 3 is a graphic display of the annual mean concentration of ozone for each of ADEQ's ozone monitors during the years 1978-2009. The graph shows that with the exception of the monitors at PARR and Marion, the annual mean concentration of ozone recorded at the department's ozone monitors since 2000 has been less than 0.060 ppm.

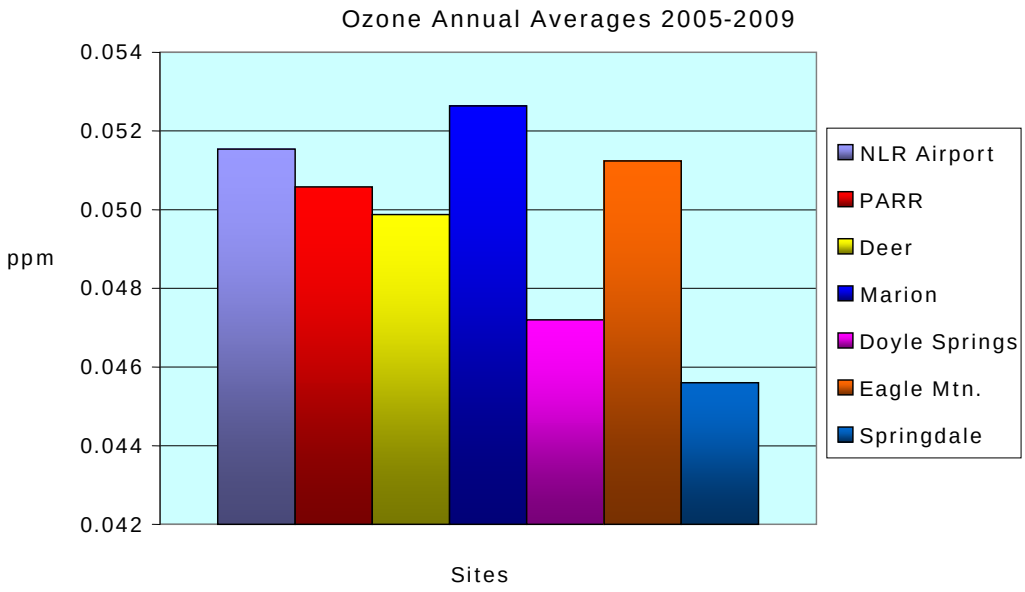


Figure 4

Figure 4 shows the averaged value of the concentration of ozone measured at each of ADEQ's ozone monitors for the years 2005-2009.

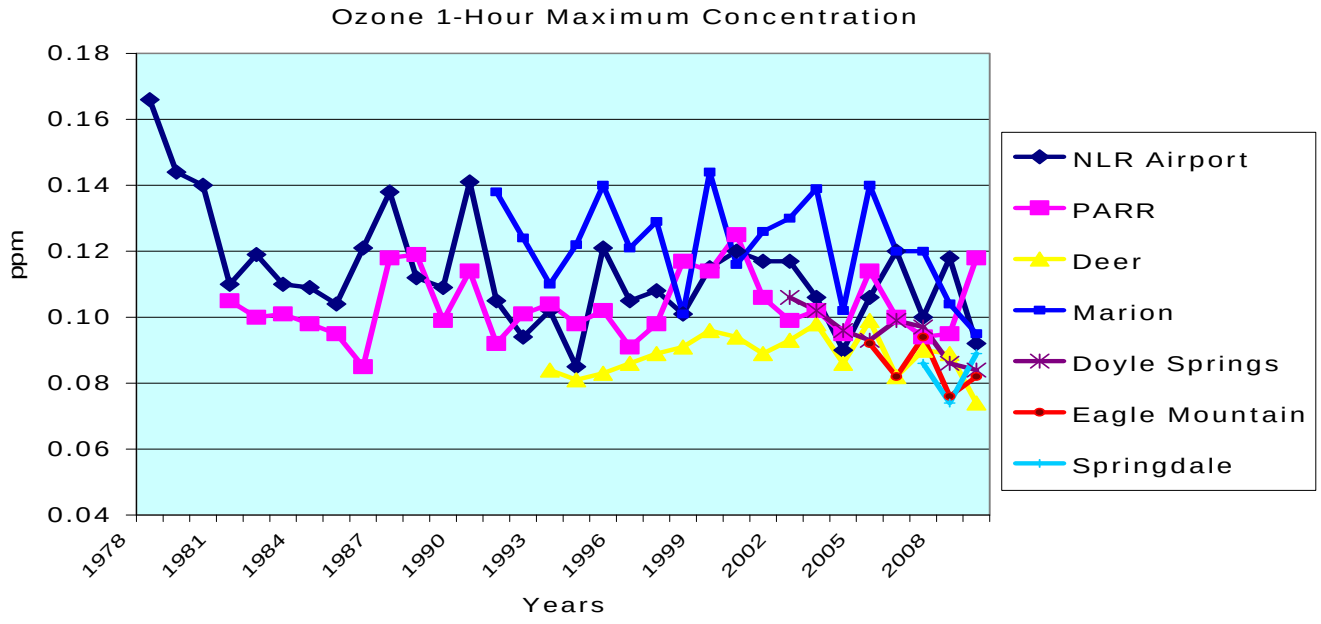


Figure 5

Figure 5 is a graphic display of the maximum 1-hour concentration of ozone for each of ADEQ's ozone monitors during the years 1978-2009. Since 1993, the monitor at Marion has measured the highest 1-hour maximum concentration of ozone in the State and seems to correspond fairly well with the 1-hour maximum value recorded by the monitor at the NLR Airport.

TRENDS ASSESSMENT
RANKING OF CO MONITORS

Rank	Site	County	Years in Service
1	PARR	Pulaski	8

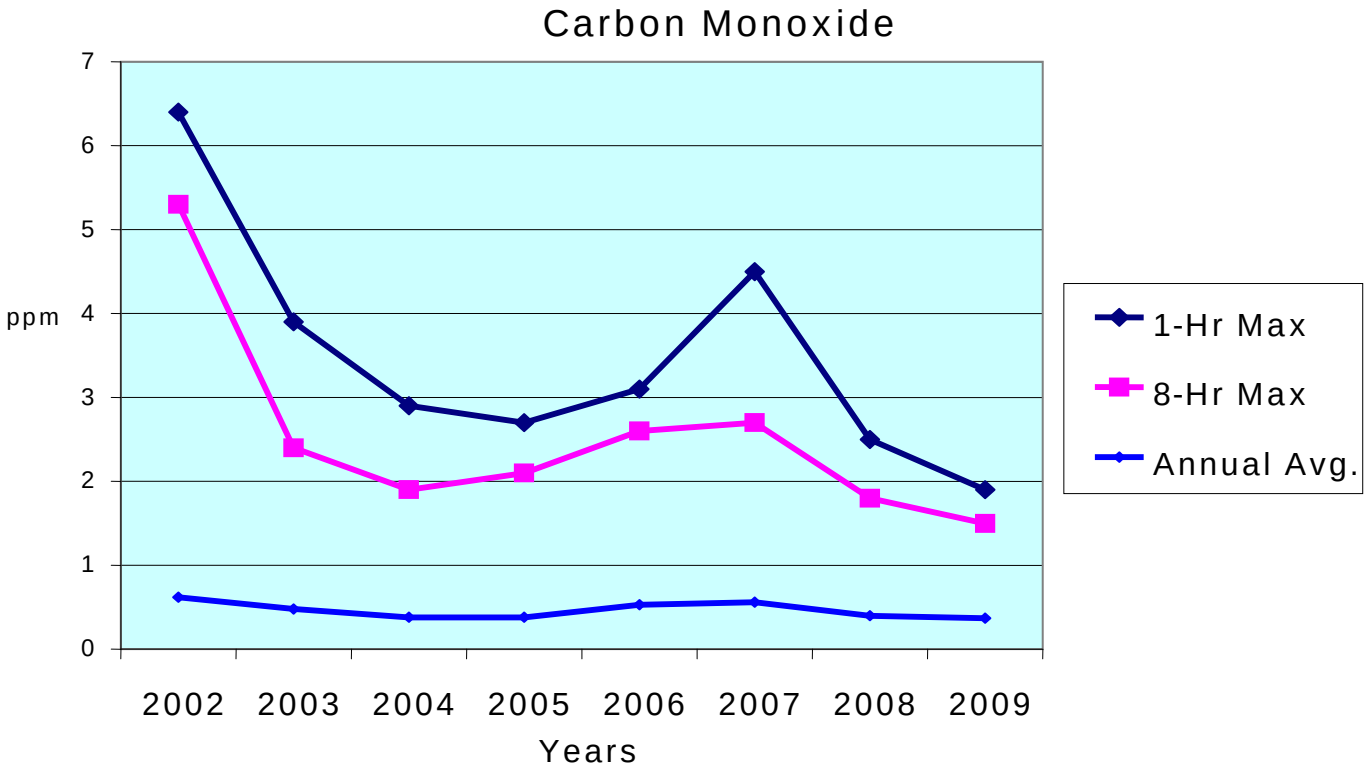


Figure 6

Figure 6 indicates that with the exception of the concentrations recorded in 2006 and 2007, the 1-hour maximum and 8-hour maximum values have decreased since the CO monitor was installed in 2002.

TRENDS ASSESSMENT
RANKING OF SO_2 MONITORS

Rank	Site	County	Years in Service
1	PARR	Pulaski	29
2	El Dorado	Union	27

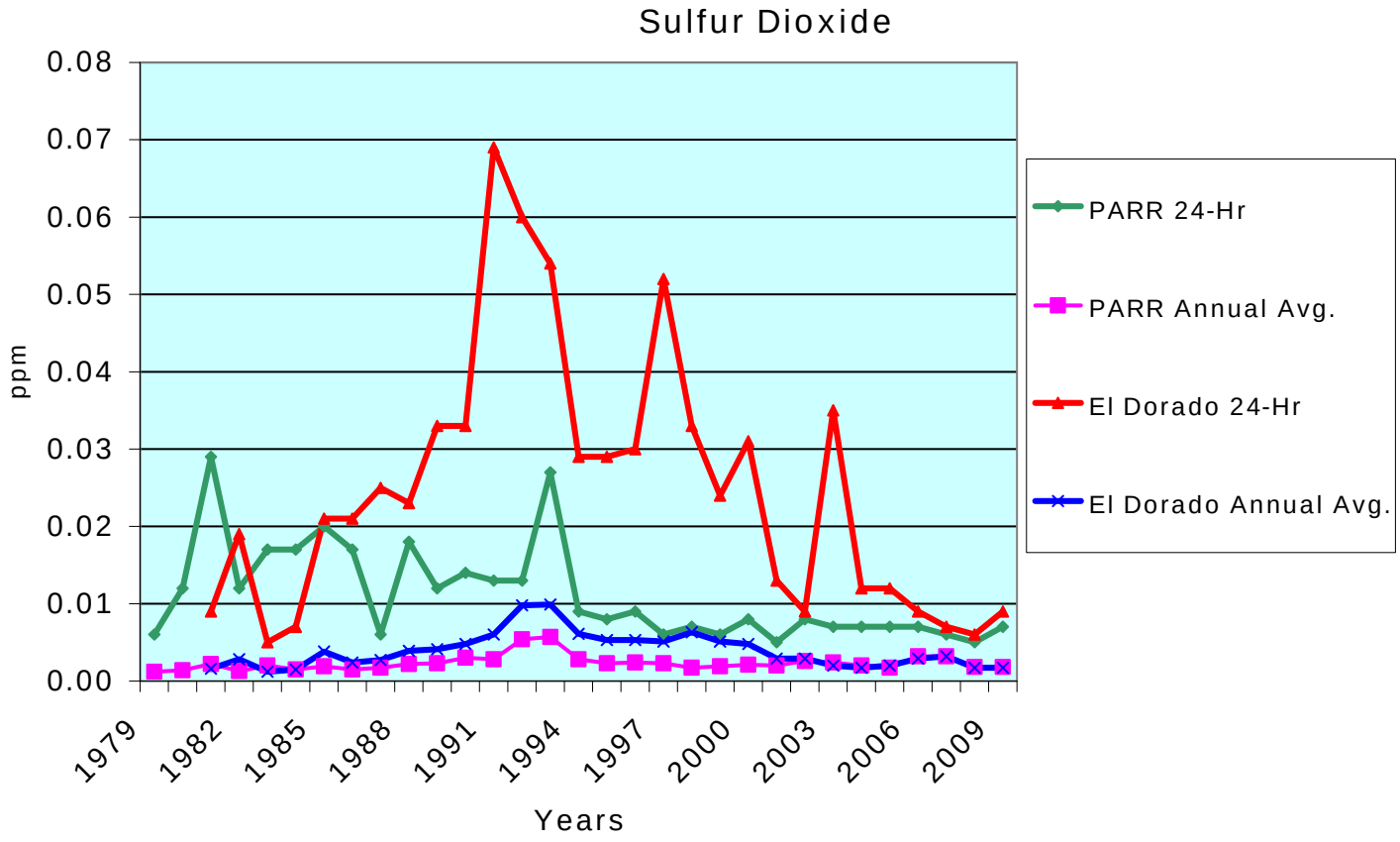


Figure 7

Figure 7 indicates that the 24-hour and the annual average concentrations of SO_2 measured at the monitor in El Dorado have been higher than the same measurements recorded at the PARR site. Annual average SO_2 concentrations at the PARR site have remained below 0.010 ppm since 1995.

TRENDS ASSESSMENT
RANKING OF NO_2 MONITORS

Rank	Site	County	Years in Service
1	NLR Airport	Pulaski	12
2	PARR	Pulaski	8
3	Marion	Crittenden	4

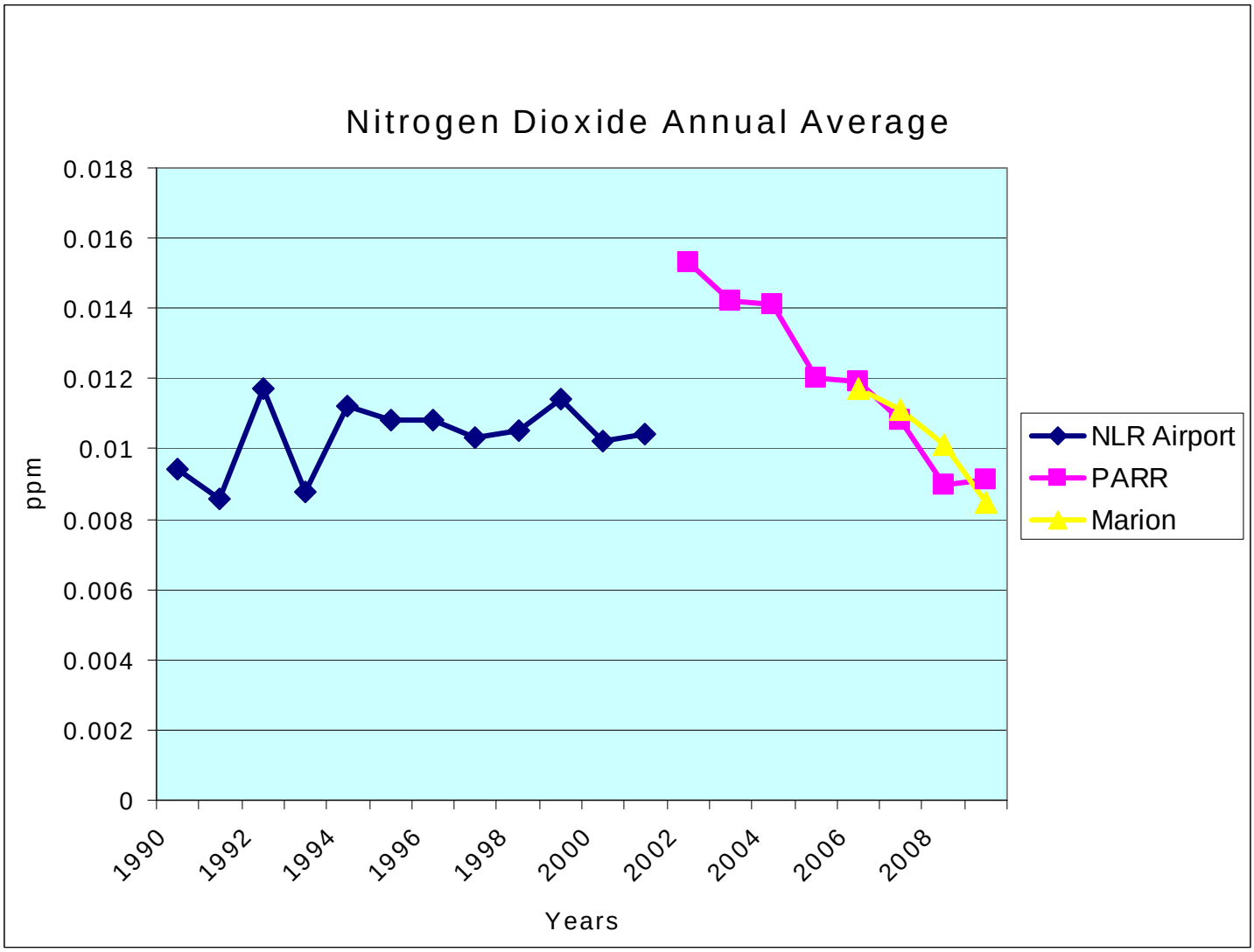


Figure 8

Figure 8 depicts a decrease of the annual average concentration of NO_2 measured at the two monitoring sites since their installation in 2002 and 2006.

TRENDS ASSESSMENT
RANKING OF $PM_{2.5}$ MONITORS

Rank	Site	County	Years in Service
1	PARR	Pulaski	11
1	El Dorado	Union	11
1	Marion	Crittenden	11
1	Stuttgart	Arkansas	11
1	Crossett	Ashley	11
1	Hot Springs	Garland	11
1	Helena	Phillips	11
1	Mena	Polk	11
1	Russellville	Pope	11
1	Ft. Smith	Sebastian	11
1	Adams Field	Pulaski	11
1	Doyle Springs Road	Pulaski	11
2	Searcy	White	10
2	Conway	Faulkner	10
3	Newport	Jackson	4
4	Springdale	Washington	2

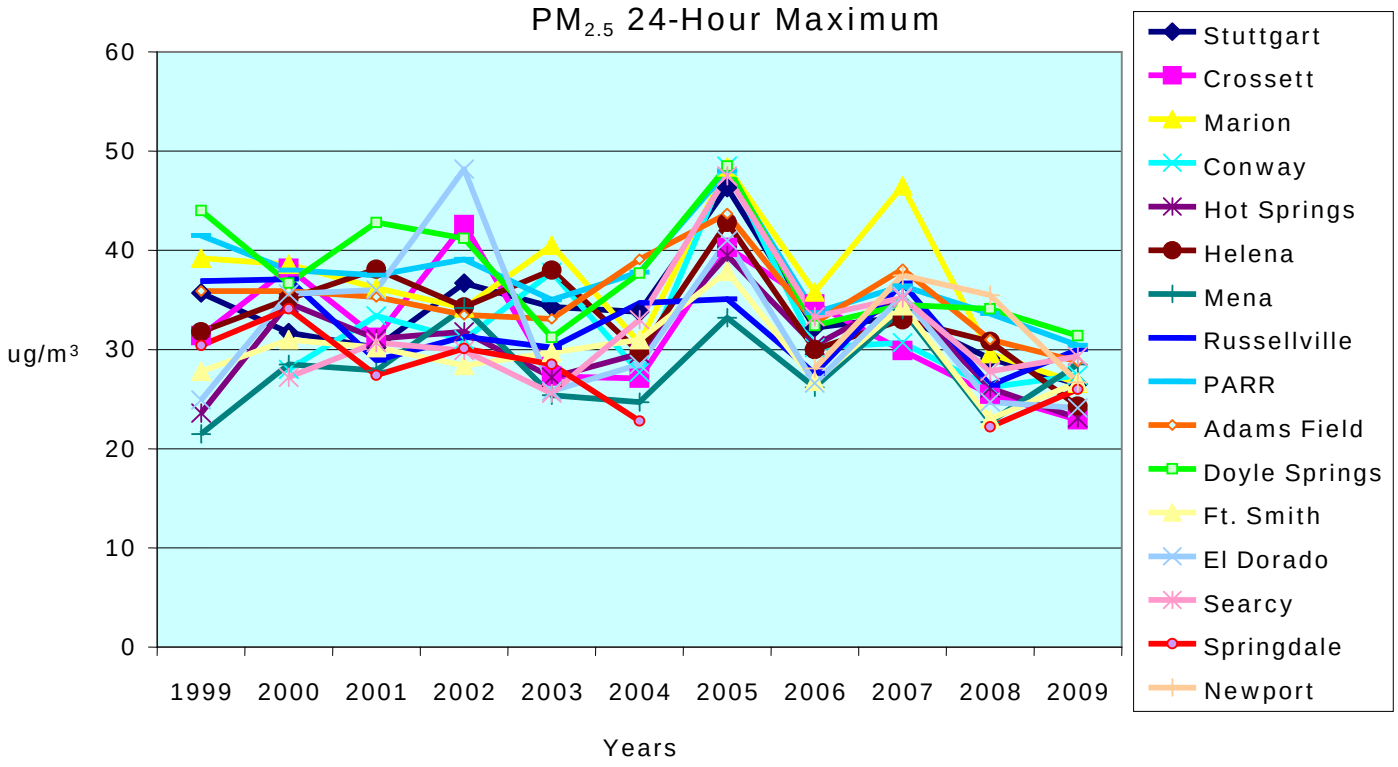


Figure 9

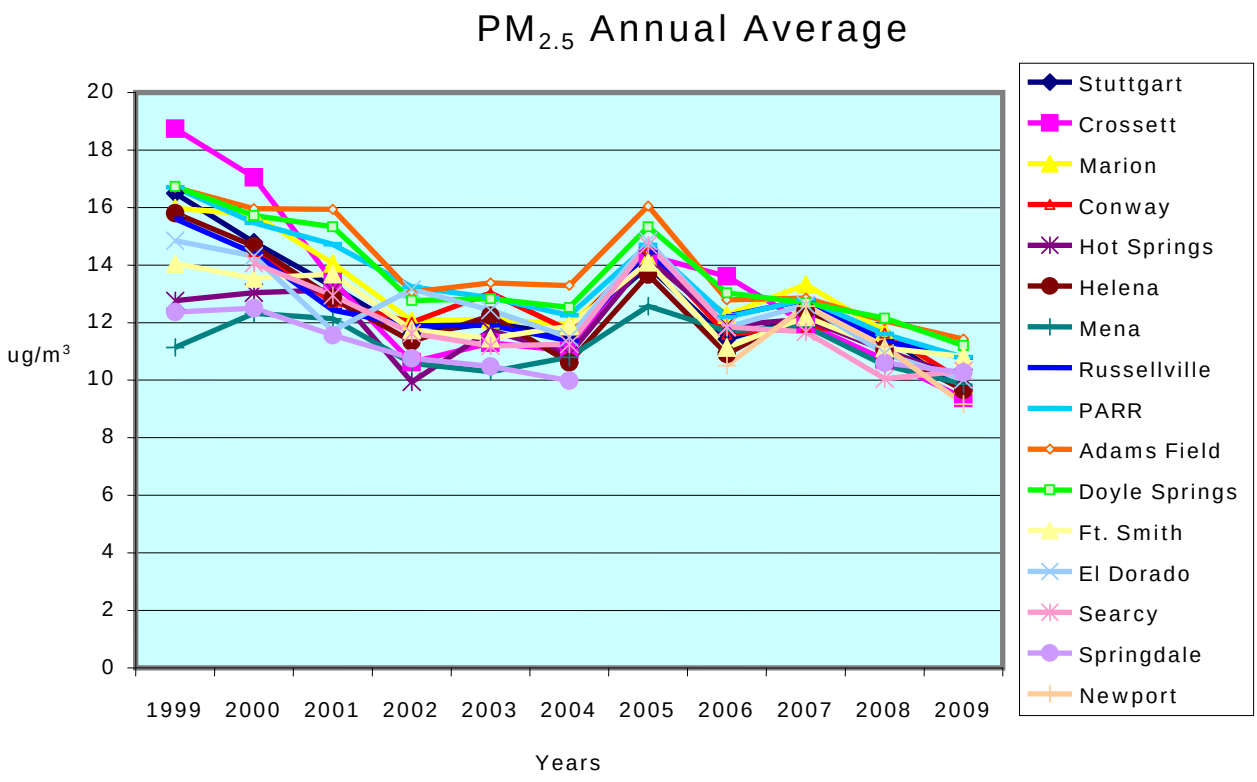
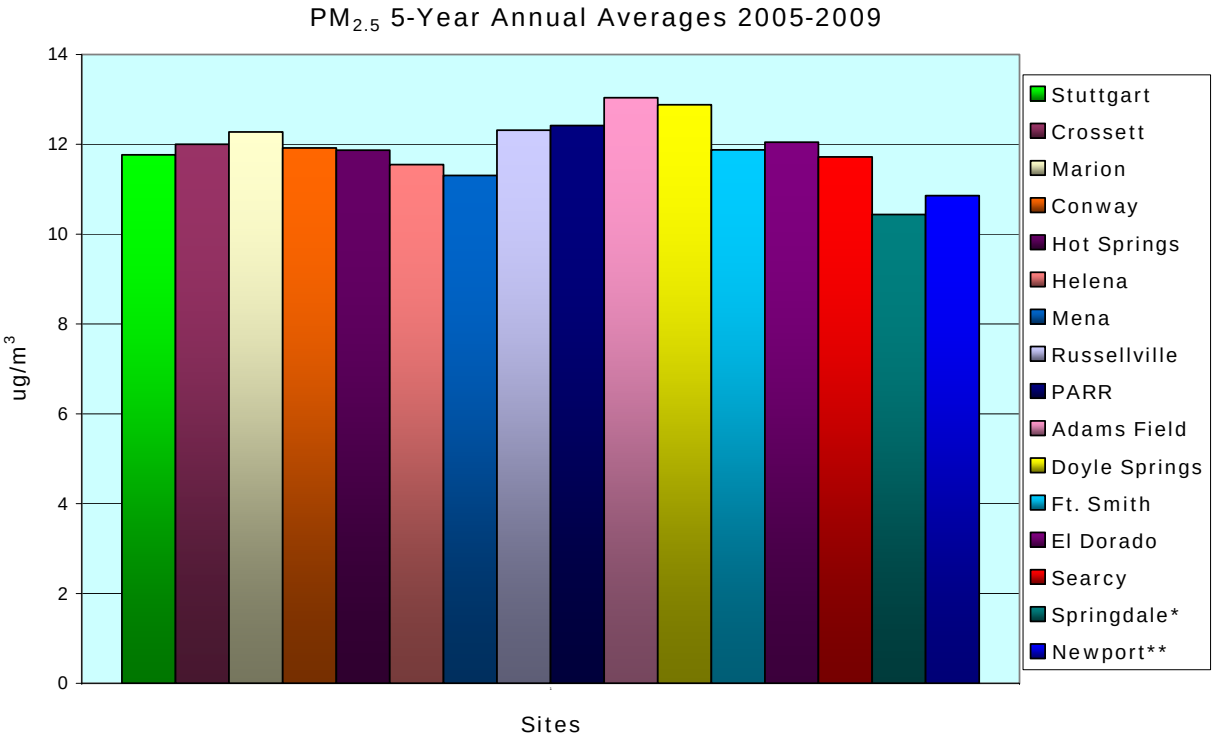


Figure 10



*** Denotes 2 years of data, ** Denotes 4 years of data**

Figure 11

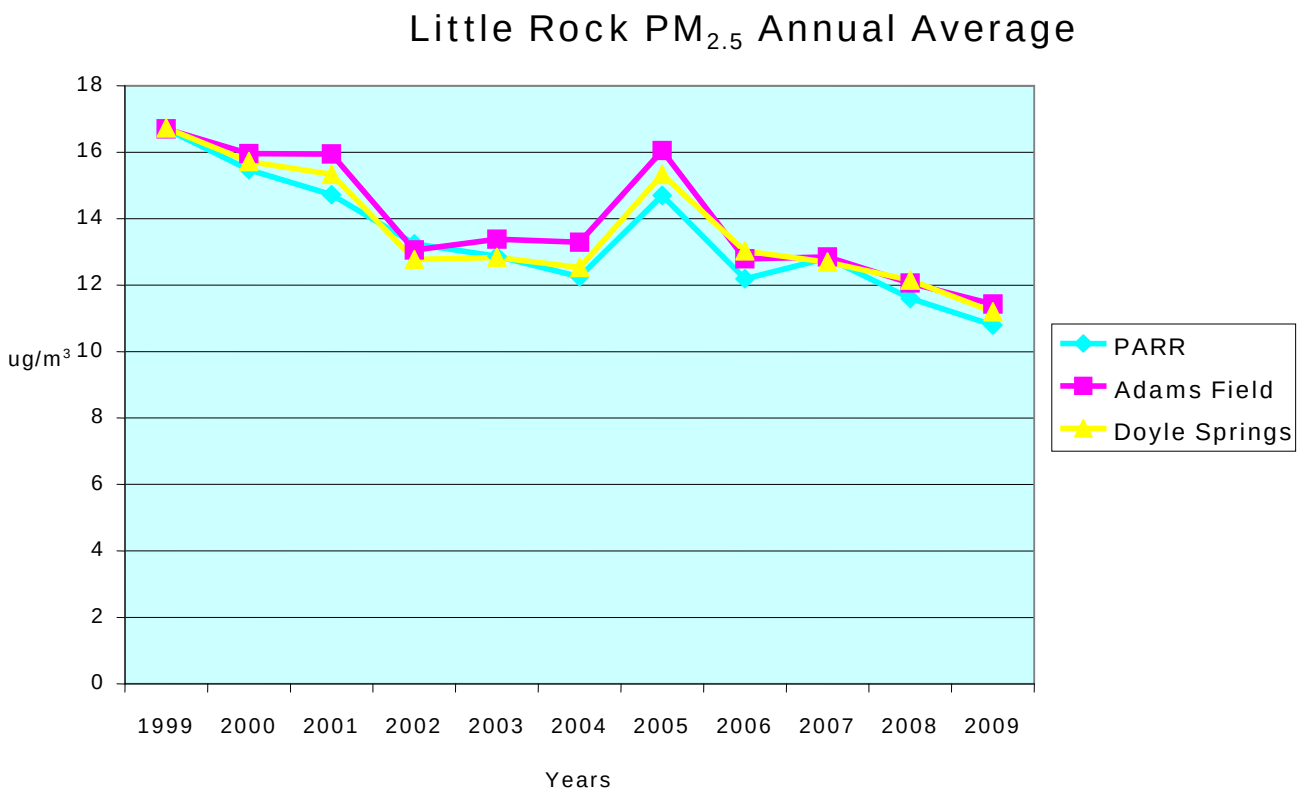


Figure 12

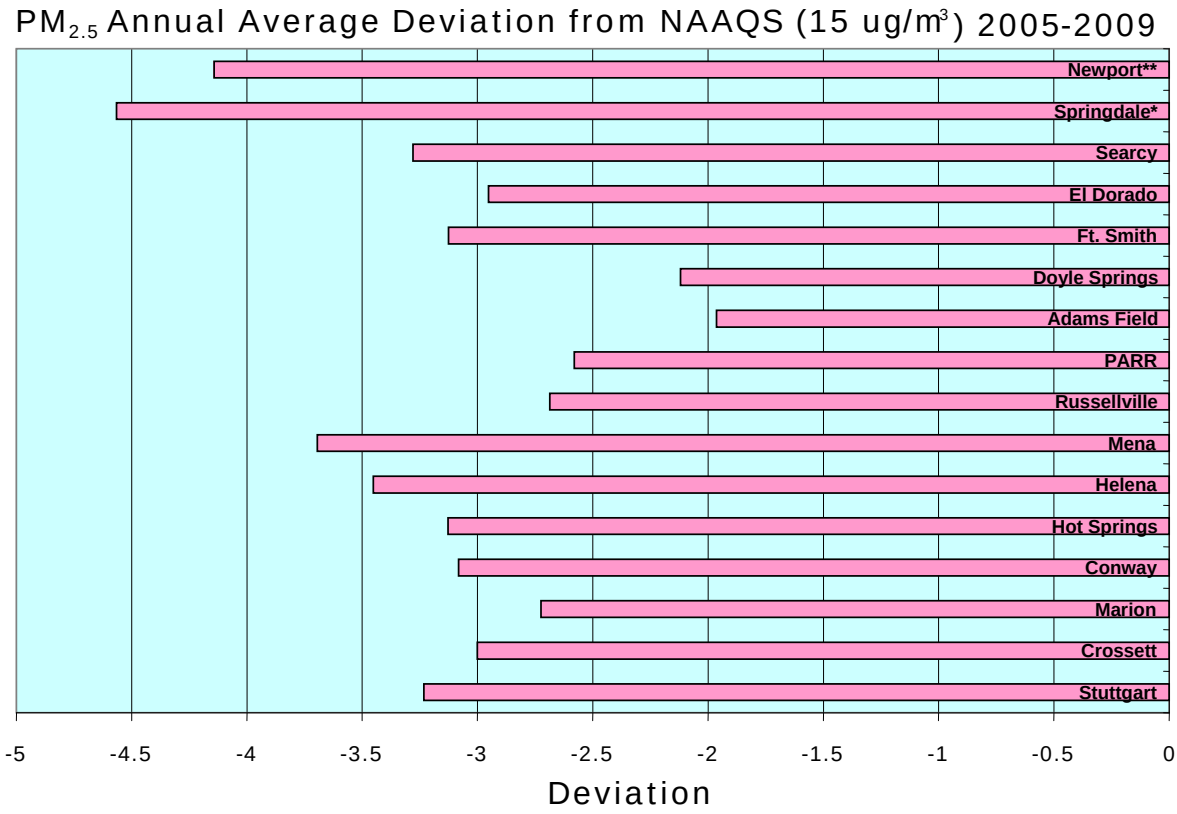
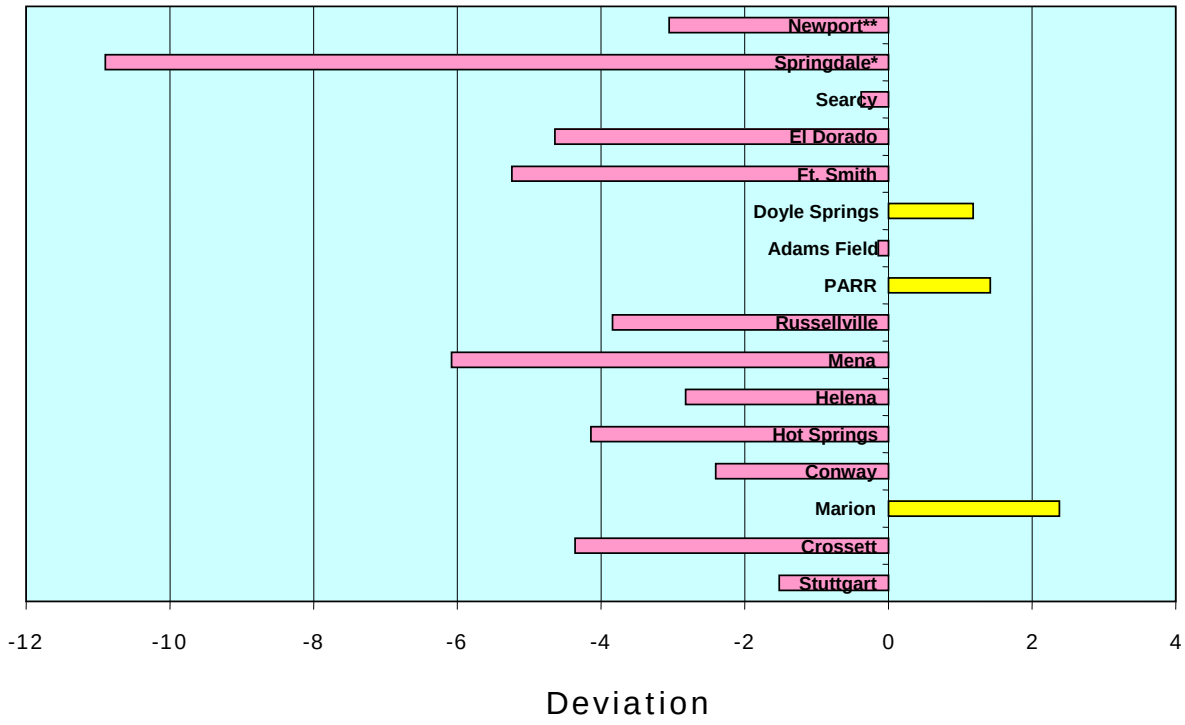


Figure 13



*** Denotes 2 years of data, ** Denotes 4 years of data**
Figure 14

Figures 9 and 10 both depict elevated $PM_{2.5}$ concentrations in the year 2005 and to a lesser extent in 2007 for several of the $PM_{2.5}$ monitors.

Figure 11 shows that the annual average concentration of $PM_{2.5}$ for the years 2005-2009 is below 14 ug/m^3 for each of the $PM_{2.5}$ monitoring station.

Figure 12 depicts good correlation between the three $PM_{2.5}$ monitoring stations located in Pulaski County. With the exception of the year 2005, the annual average concentration of $PM_{2.5}$ measured at each of these three stations has decreased in value over the 11 years the monitors have been in operation.

Figure 13 depicts the averaged values of the deviation from the NAAQS primary standard of 15 ug/m^3 for the annual concentrations of $PM_{2.5}$ for the years 2005-2009.

Figure 14 depicts the averaged values of the deviation from the second NAAQS primary standard of 35 ug/m^3 for the 24 hour concentrations of $PM_{2.5}$ for the years 2005-2009 for each of the $PM_{2.5}$ monitors.

TRENDS ASSESSMENT
RANKING OF PM_{10} MONITORS

Rank	Site	County	Years in Service
1	VA Hospital	Pulaski	12
2	PARR	Pulaski	9

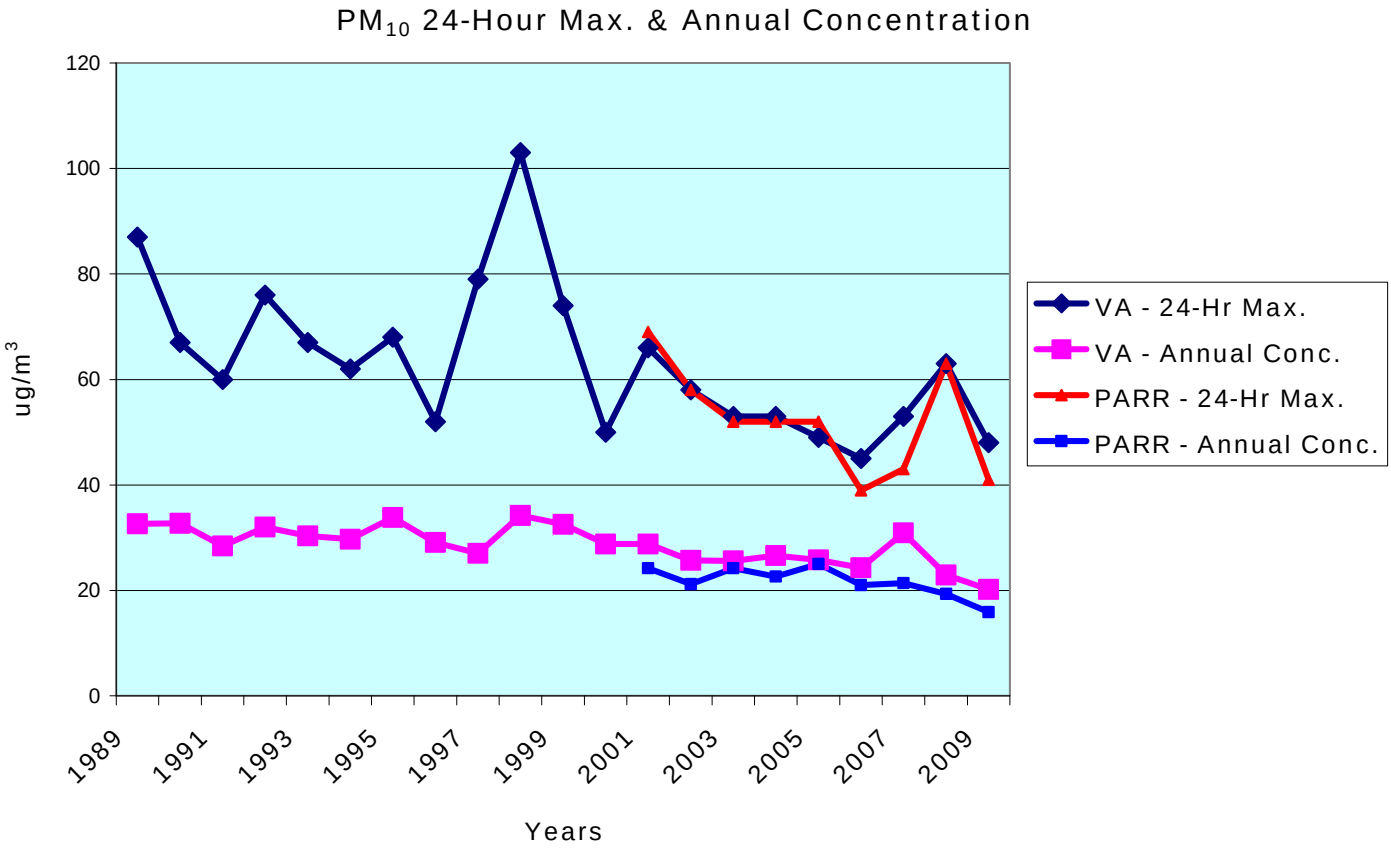


Figure 15

Figure 15 depicts the average of the 24-hour maximum concentration and the average annual concentration of PM_{10} for the two monitoring sites located within Pulaski County. Both monitors suggest a general downward trend for both measured values suggesting that the average concentration of PM_{10} has become lower in Pulaski County over the years that the monitors have been in service.

Information about the state's emissions inventory can be found in the Appendix.

MONITOR TO MONITOR CORRELATION ANALYSIS

Correlation analysis was performed for the $PM_{2.5}$ and ozone monitors networks using EPA's correlation Matrix Tool which generates an image that depicts the correlation, relative difference, and distance between pairing of sites for each monitor in the network. The shape of the ellipse in the image represents the Pearson squared correlation (r^2) between any two sites where a circle represents zero correlation and a straight diagonal line represents a perfect correlation. The correlation between any two sites quantitatively describes the degree of relatedness between measurements made at those two sites. The color of the ellipse represents the average relative difference of measurements between any two sites.

The purpose of performing this analysis is to provide a means of revealing possibly redundant monitoring sites that could then be retired or removed. Such possibly redundant sites would exhibit fairly high correlations of 0.6 or higher and would have low average relative difference despite the distance between them.

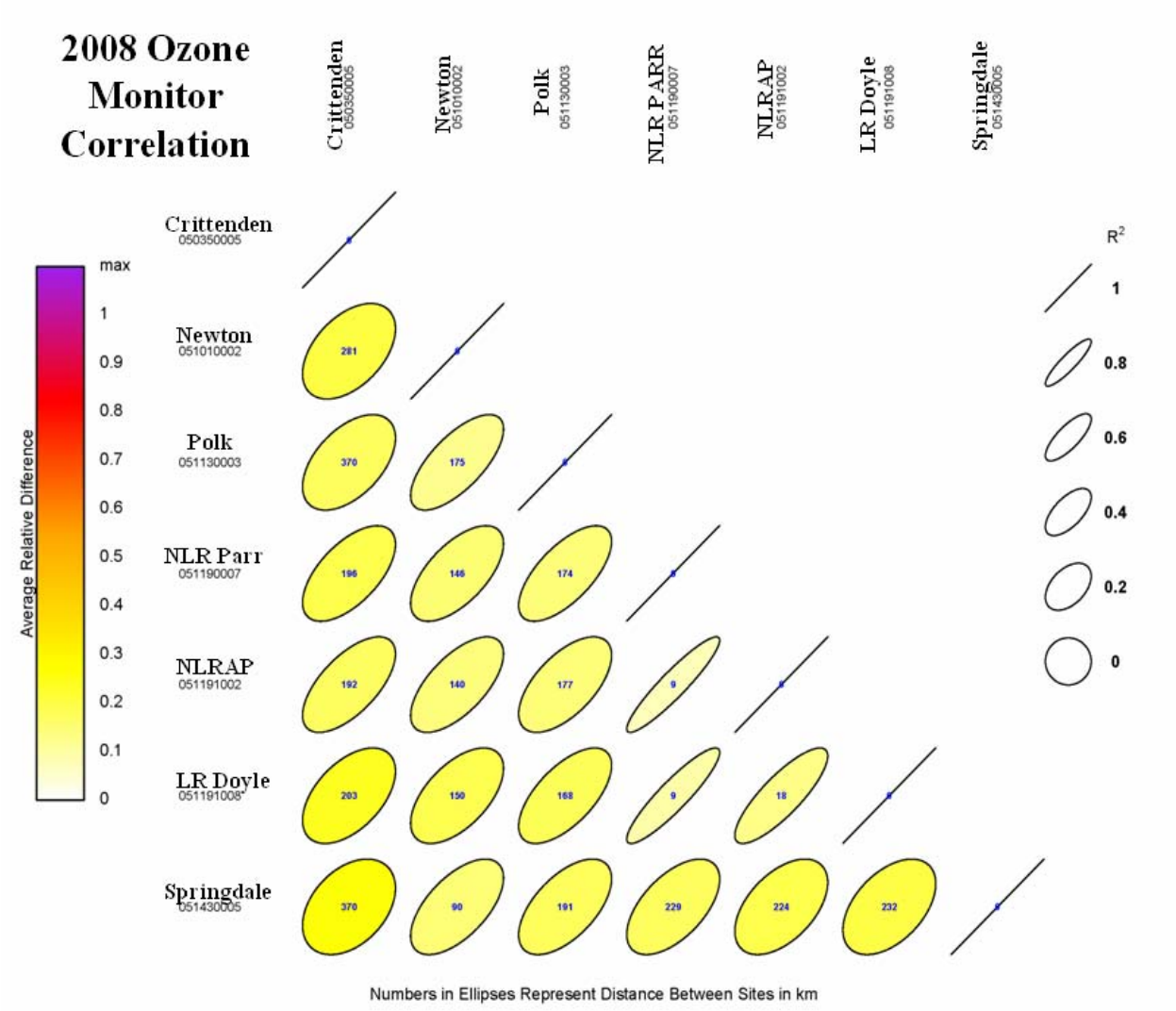


Figure 16

Figure 16 depicts the pairing of each ozone monitor in Arkansas with every other ozone monitor using the Correlation Matrix Tool provided by EPA for the year 2008. Analysis of the results show that with the exception of the three ozone monitors located in Pulaski County, all other ozone monitors are located sufficient distance away from each other that they do not exhibit a correlation factor of 0.6 or greater.

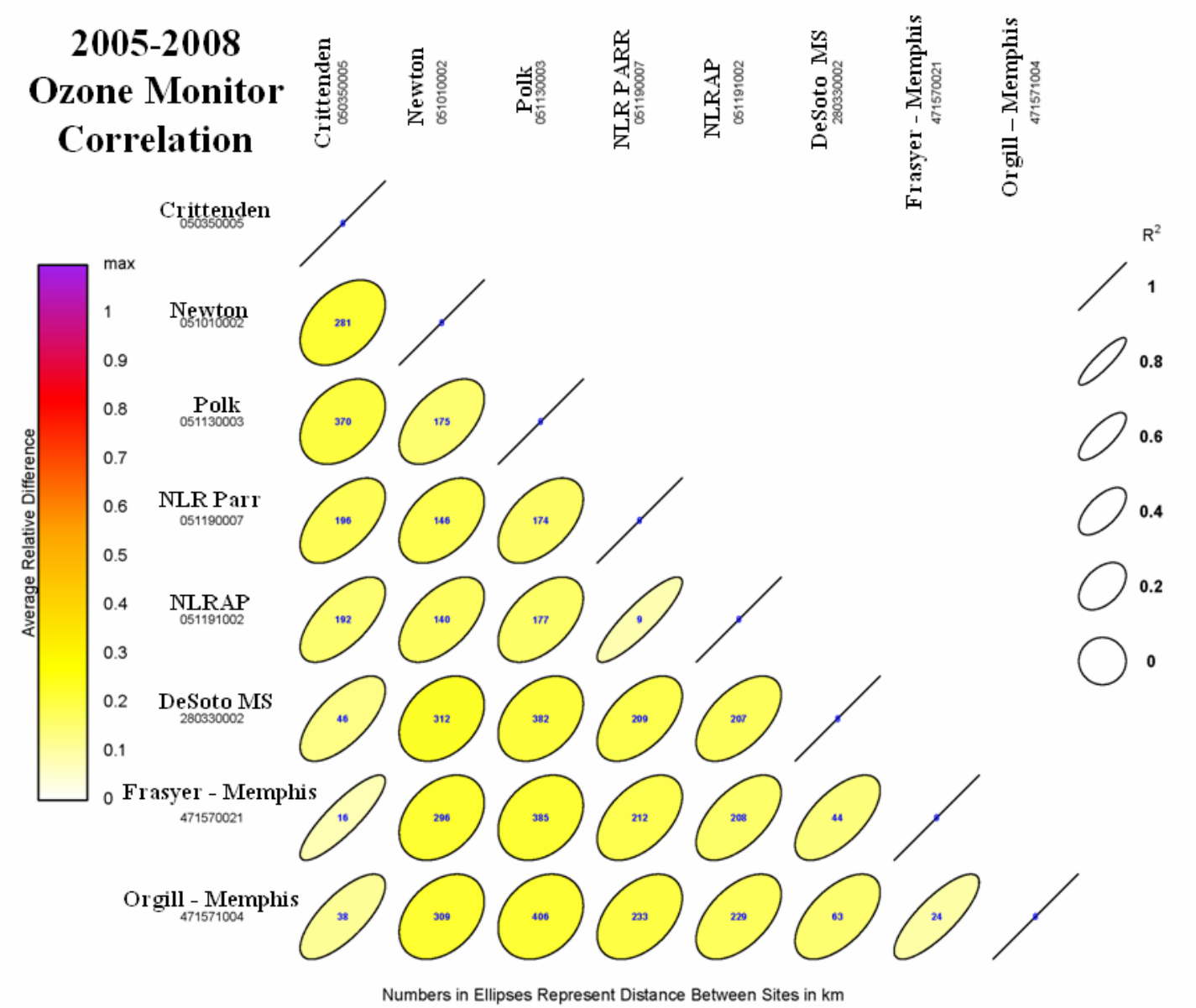


Figure 17

Figure 17 depicts the pairing of five of the ozone monitors in Arkansas with three of the ozone monitors associated with Memphis MSA using the Correlation Matrix Tool provided by EPA. Analysis of the results show that with the exception of the two ozone monitors located in Pulaski County and the ozone monitor in Crittenden County along with the two of the three monitors in the Memphis MSA, all the other ozone monitors are located sufficient distance away from each other that they do not exhibit a correlation factor of 0.6 or greater.

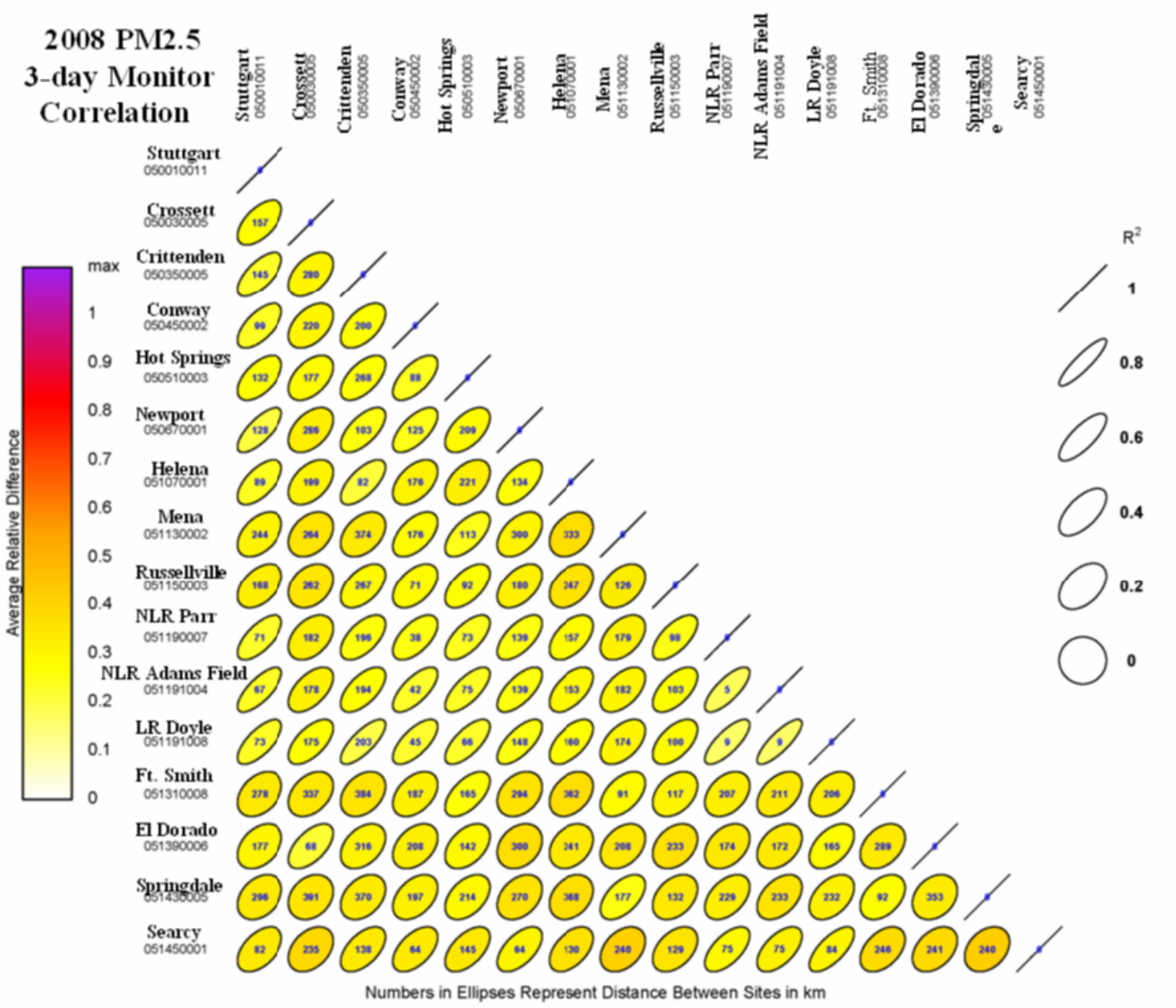


Figure 18

Figure 18 depicts the pairing of each of the fifteen $PM_{2.5}$ monitors within Arkansas with every other $PM_{2.5}$ monitor in the state using data that was generated in 2008. Analysis of the results suggests that with the exception of the Pulaski County $PM_{2.5}$ monitors which are only 5-9 kilometers apart, no other monitor pairings generate a correlation factor greater than 0.6.

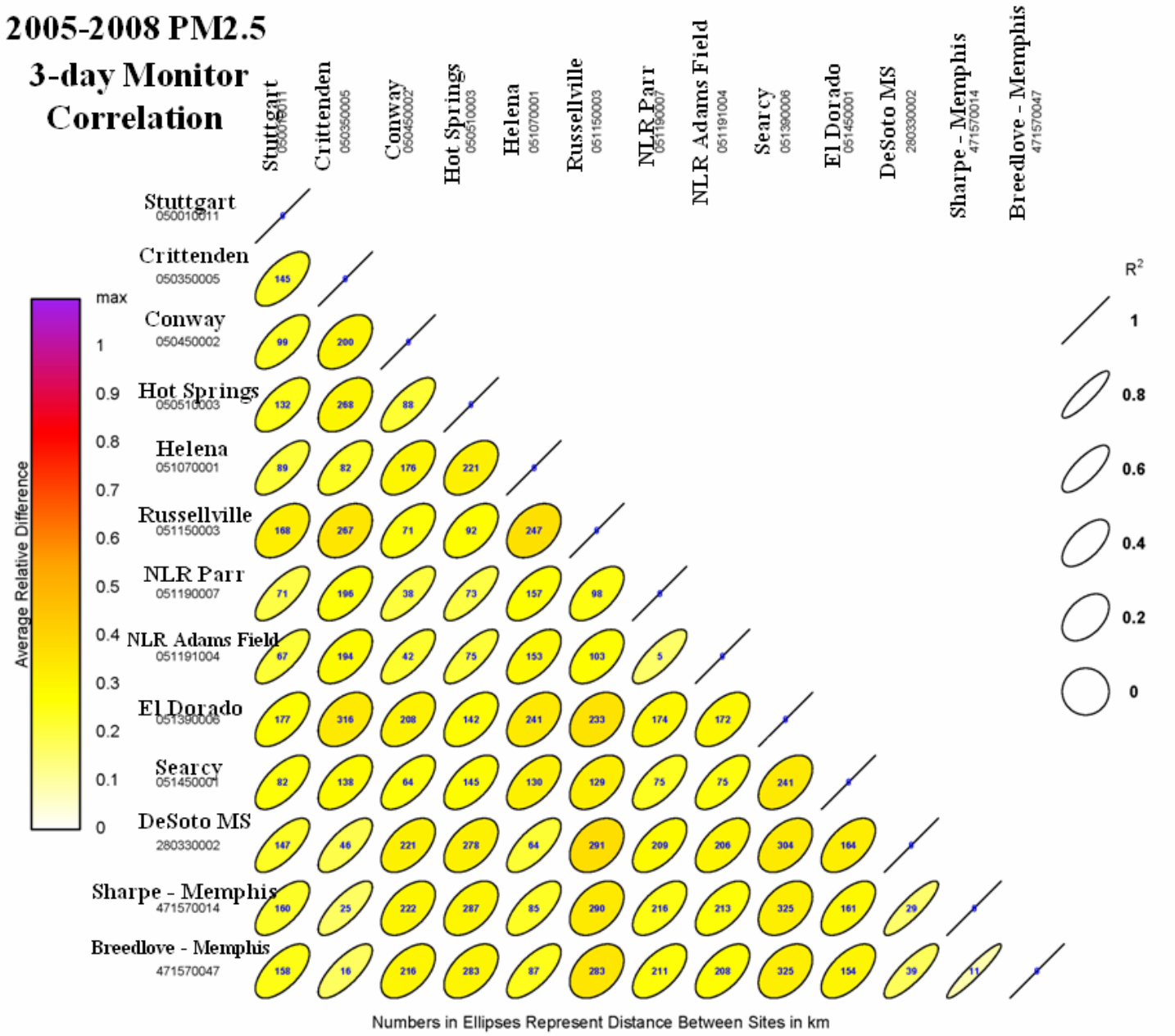


Figure 19

Figure 19 depicts the pairing of each of the $PM_{2.5}$ monitors within Arkansas that have at least four years of data with three of the $PM_{2.5}$ monitors that are located in the Memphis MSA. With the exception of two of the $PM_{2.5}$ monitors that are located in the Memphis MSA, no other monitor pairings generate a correlation factor greater than 0.6.

MONITOR REMOVAL BIAS ANALYSIS

The Removal Bias Tool consists of a series of static analyses and an interactive tool meant to aid in determining redundant sites and to act as a means of validating a network after sites have been chosen for removal. A positive average bias would mean that if the site being examined was removed, the neighboring sites would indicate that the estimated concentration would be larger than the measured concentration. Likewise, a negative average bias would suggest that the estimated concentration at the location of the site being removed is smaller than the actual measured concentration.

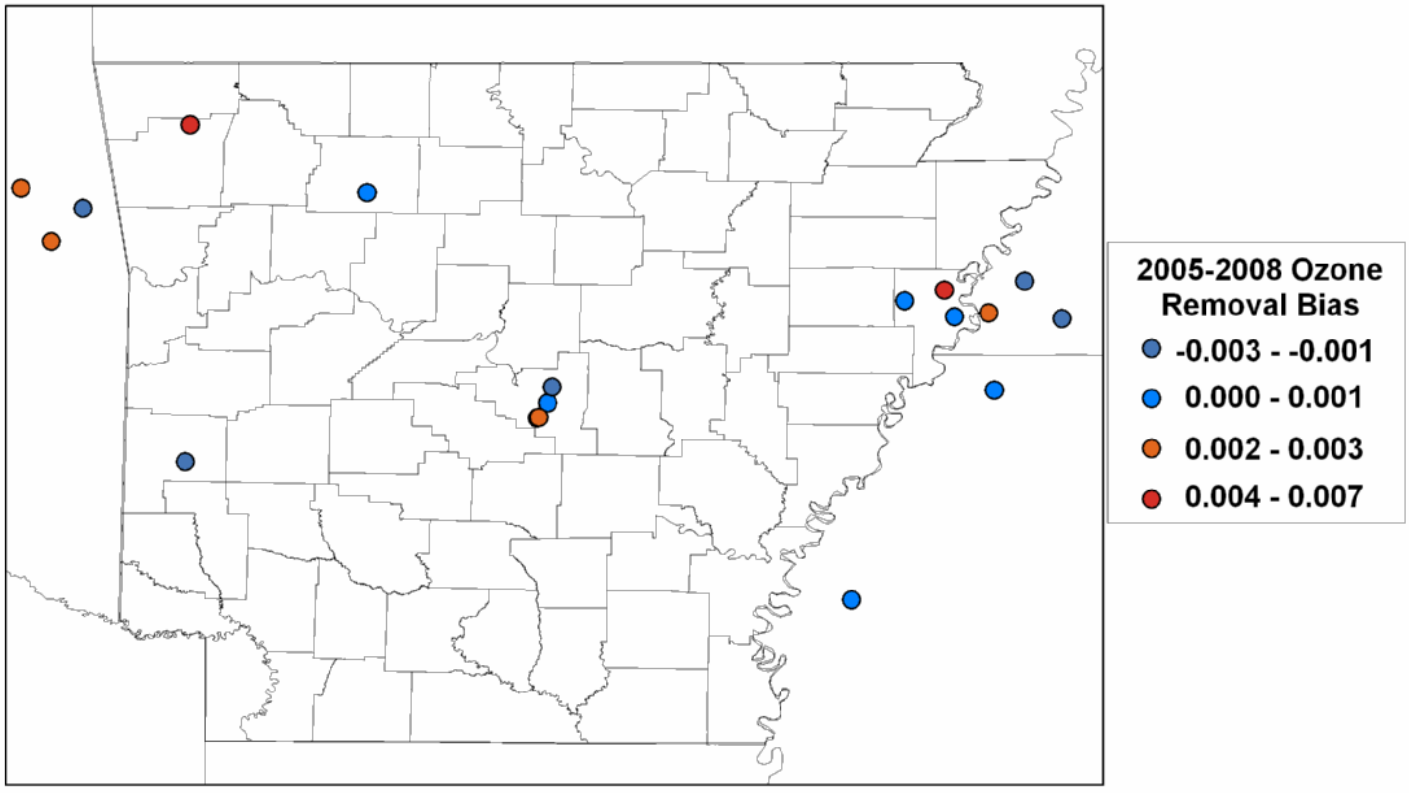


Figure 20

Figure 20 is a depiction showing the degree of bias that would result from having to rely on estimating the concentration of ozone in an area where an existing ozone monitor is located if it was removed from that location. While the map depicts three ozone monitors in Crittenden County, only the dot that is located south of the other two dots reflects the location of the permanent ozone monitor. The other dots represent a project that was in operation for seven months in 2005.

The map demonstrates that removal of any individual monitor would result in either a weak negative or weak positive bias in the estimation of the concentration of ozone using the remaining monitors.

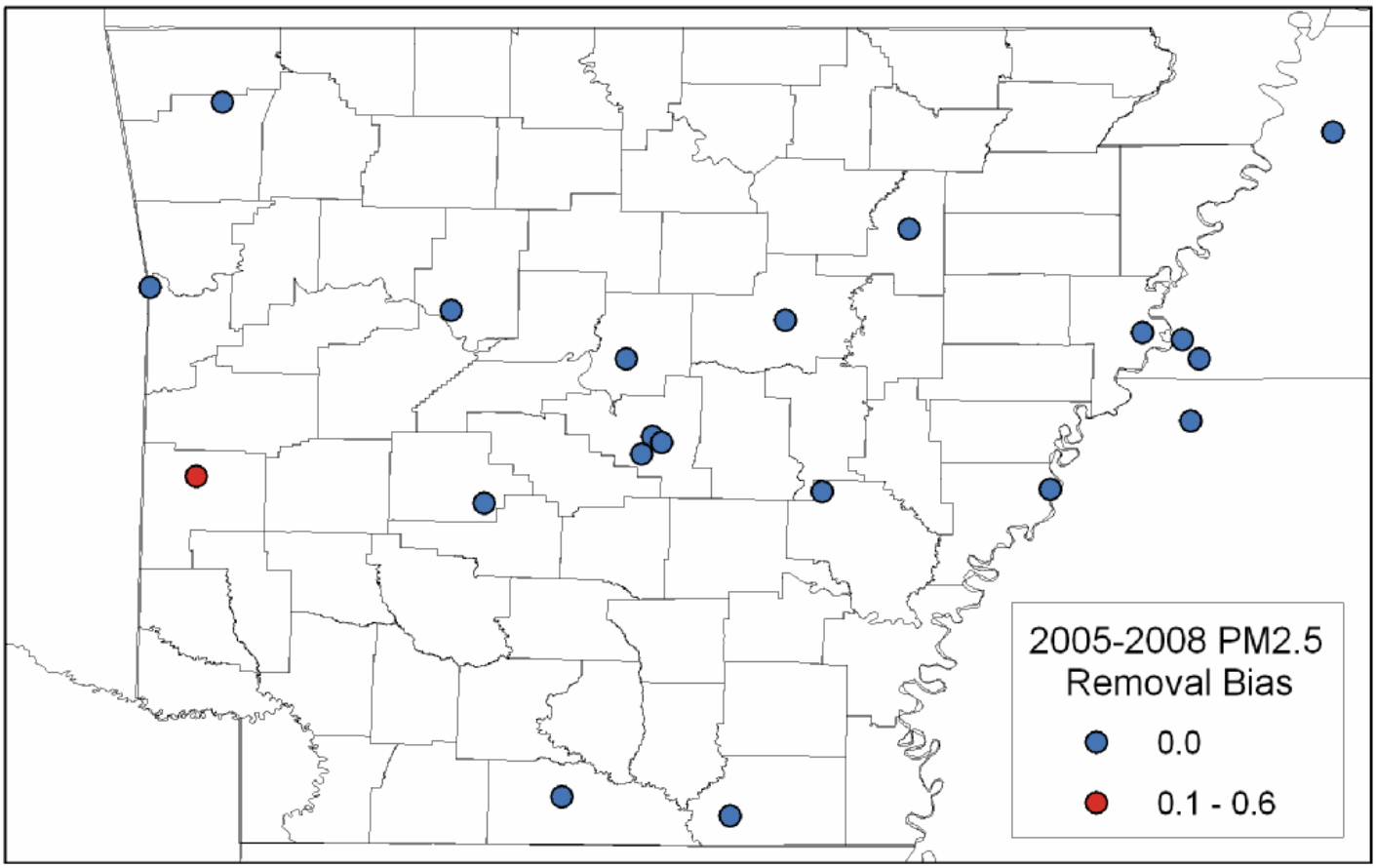


Figure 21

Figure 21 is a depiction showing the degree of bias that would result from having to rely on estimating the concentration of $PM_{2.5}$ in an area where an existing $PM_{2.5}$ monitor is located if it was removed from that location.

With the exception of the $PM_{2.5}$ monitor located in Polk County (depicted as red dot in the map above) the map demonstrates that removal of any individual monitor would result in zero bias in the estimation of the concentration of $PM_{2.5}$ using the remaining monitors.

AREA SERVED ANALYSIS

Analysis of the area served was performed using EPA's Area Served Tool which uses a spatial analysis technique known as Voronoi or Thiessen polygons to show the area represented by the monitoring sites. The size and shape of each polygon is dependent on the proximity of the nearest neighbors to a particular site.

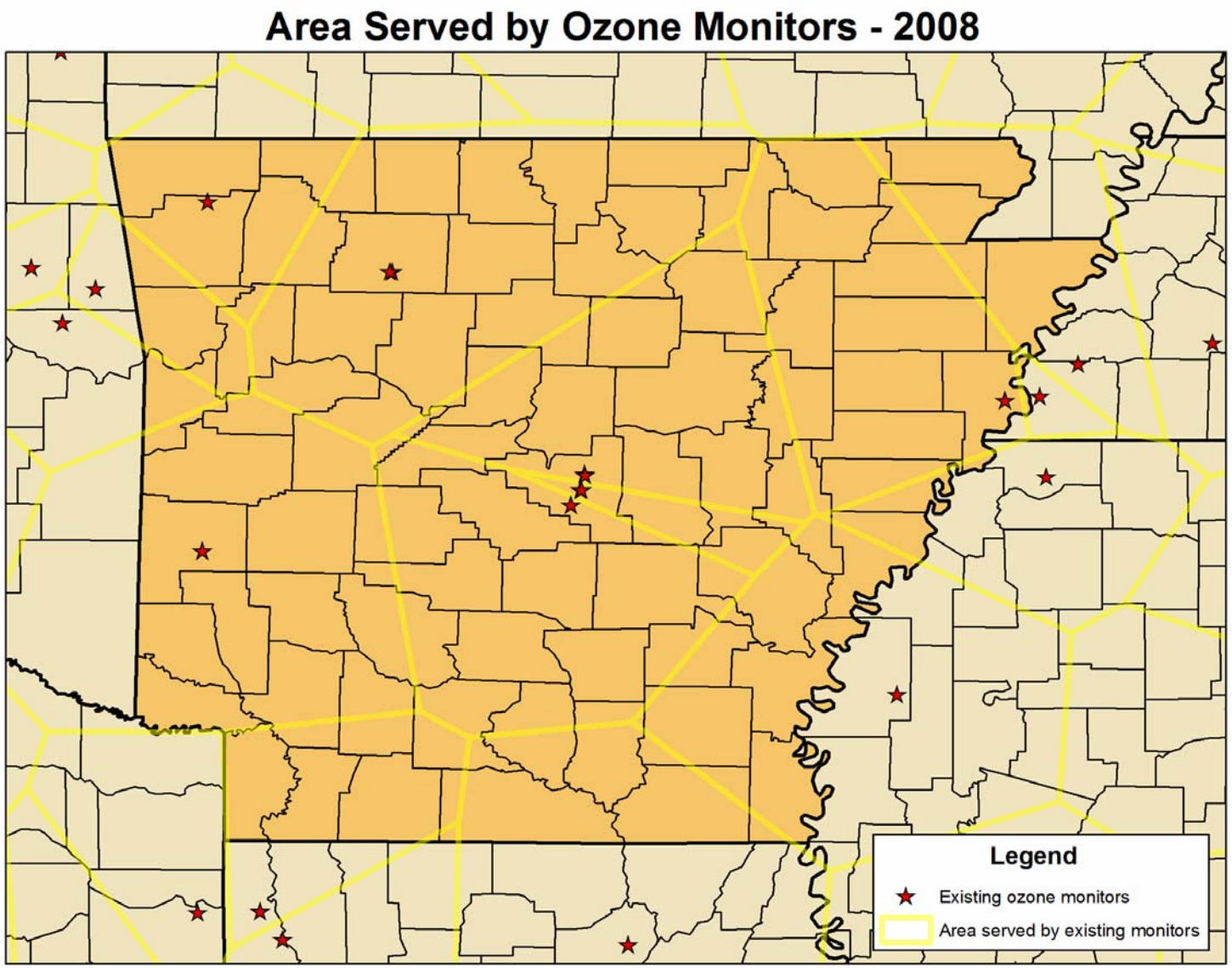


Figure 22

Figure 22 indicates that according to the analysis provided by EPA's Area Served Tool, in order for the entire state to be adequately covered by a network of ozone monitors, incorporation of additional ozone monitors that are located in adjacent states is necessary.

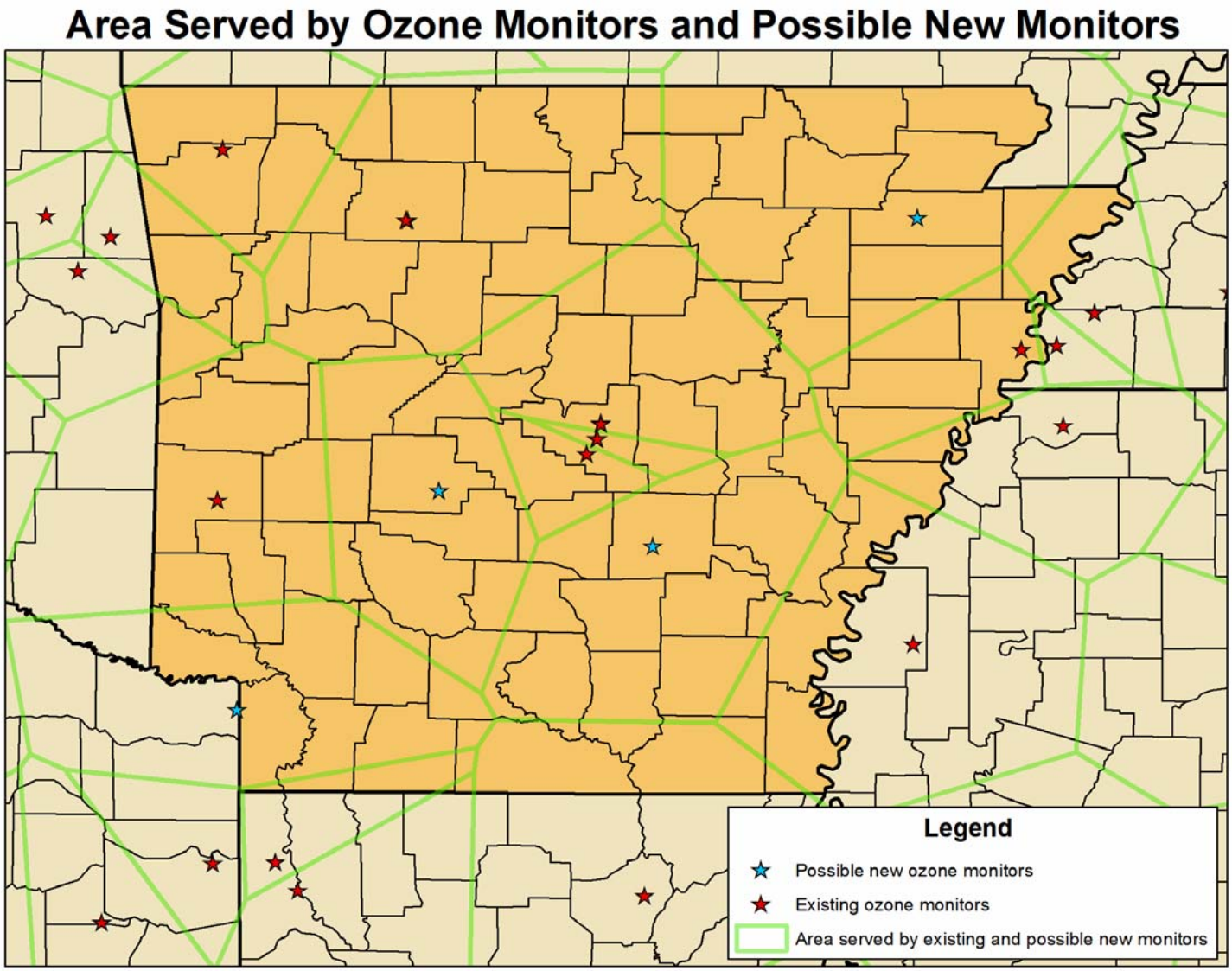


Figure 23

Figure 23 shows the ADEQ monitoring network more adequately covers the state with the addition of new ozone monitors proposed to be sited in Hot Springs, Pine Bluff, and Jonesboro. The exact placement of the monitors may be different from the hypothetical locations shown on the map. The possible new monitor in Texarkana, TX is also shown.

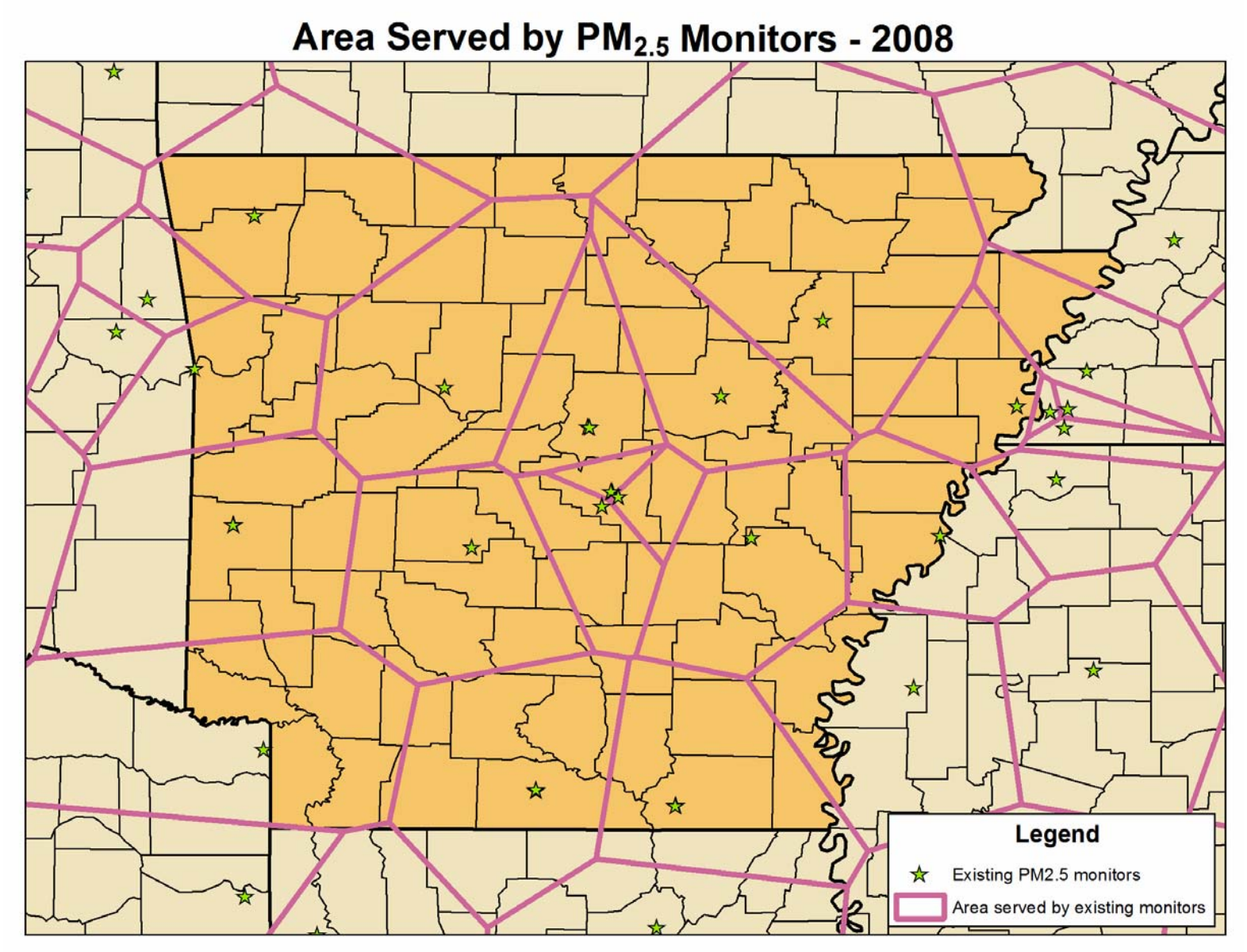


Figure 24

Figure 24 indicates that according to the analysis provided by EPA's Area Served tool, the current network of $PM_{2.5}$ monitors employed by ADEQ approximately covers all of the state.

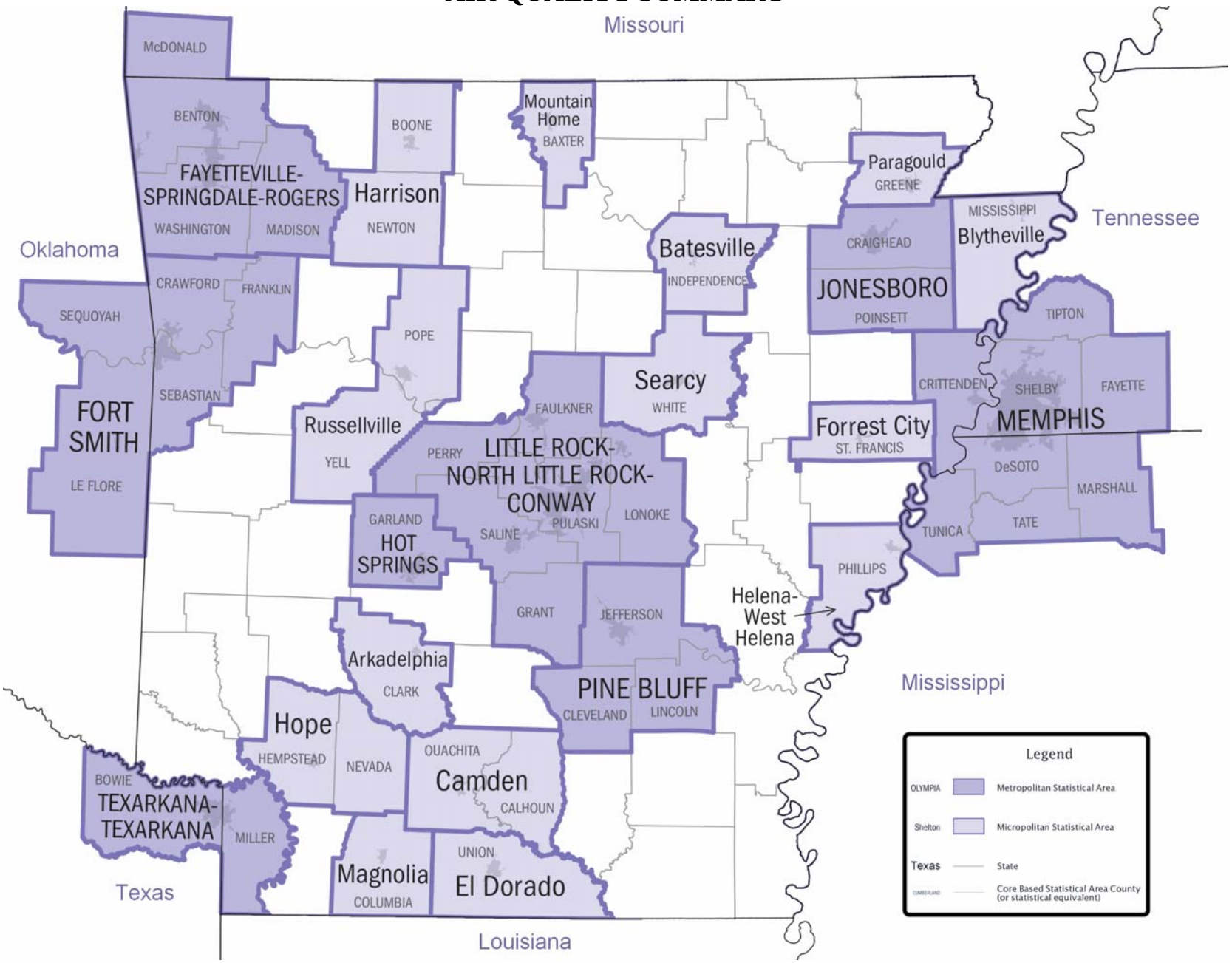

Missouri
McDONALD
BENTON
BOONE
Mountain Home
BAXTER
FAYETTEVILLE-SPRINGDALE-ROGERS
WASHINGTON
MADISON
Harrison
NEWTON
Paragould
GREENE
MISSISSIPPI
Blytheville
Tennessee
Oklahoma
Batesville
INDEPENDENCE
CRAIGHEAD
JONESBORO
POINSETT
CRAWFORD
FRANKLIN
SEQUOYAH
POPE
TIPTON
Searcy
WHITE
CRITTENDEN
SHELBY
FAYETTE
SEBASTIAN
FORT SMITH
LE FLORE
FAULKNER
Russellville
YELL
PERRY
LITTLE ROCK-NORTH LITTLE ROCK-CONWAY
PULASKI
LONOKE
SALINE
Forrest City
ST. FRANCIS
MEMPHIS
DeSOTO
MARSHALL
TUNICA
TATE
GARLAND
HOT SPRINGS
PHILLIPS
Helena-West Helena
GRANT
JEFFERSON
Arkadelphia
CLARK
PINE BLUFF
CLEVELAND
LINCOLN
Mississippi
Hope
HEMPSTEAD
NEVADA
OUACHITA
Camden
CALHOUN
BOWIE
TEXARKANA-TEXARKANA
MILLER
Texas
Magnolia
COLUMBIA
UNION
El Dorado
Louisiana
Legend
OLYMPIA
Metropolitan Statistical Area
Shelton
Micropolitan Statistical Area
Texas
State
Core Based Statistical Area County (or statistical equivalent)

Figure 25

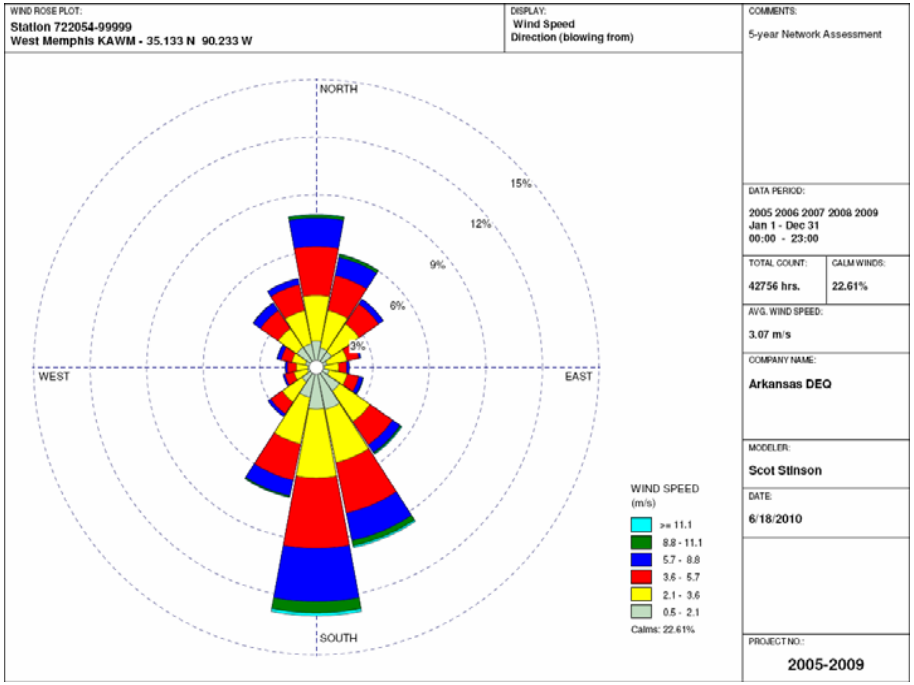
Rank	Name	2009 Population	Counties within CBSA	CBSA only in Arkansas
1	Memphis	1,304,926	AR - Crittenden MS - DeSoto, Marshall, Tate, Tunica TN - Fayette, Shelby, Tipton	No
2	Little Rock-North Little Rock-Conway	685,488	Faulkner, Grant, Lonoke, Perry, Pulaski, Saline	Yes
3	Fayetteville-Springdale-Rogers	464,623	AR - Benton, Madison, Washington MO - McDonald	No
4	Fort Smith	293,063	AR - Crawford, Franklin, Sebastian OK - Le Flore, Sequoyah	No
5	Texarkana	137,486	AR - Miller TX - Bowie	No
6	Jonesboro	120,139	Craighead, Poinsett	Yes
7	Pine Bluff	100,694	Cleveland, Jefferson, Lincoln	Yes
8	Hot Springs	98,479	Garland	Yes

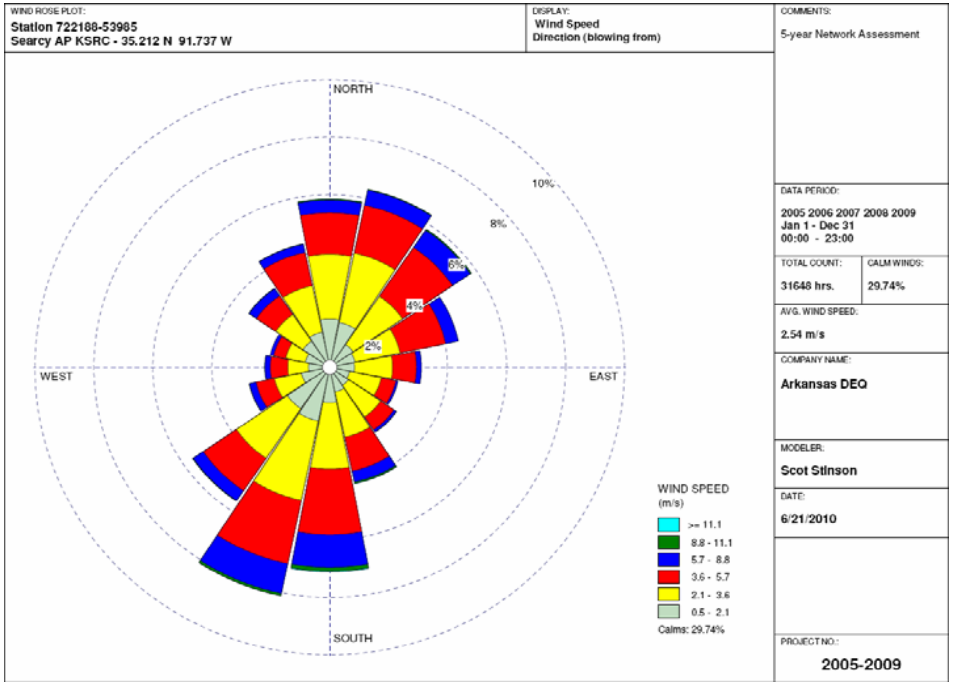
Figure 26

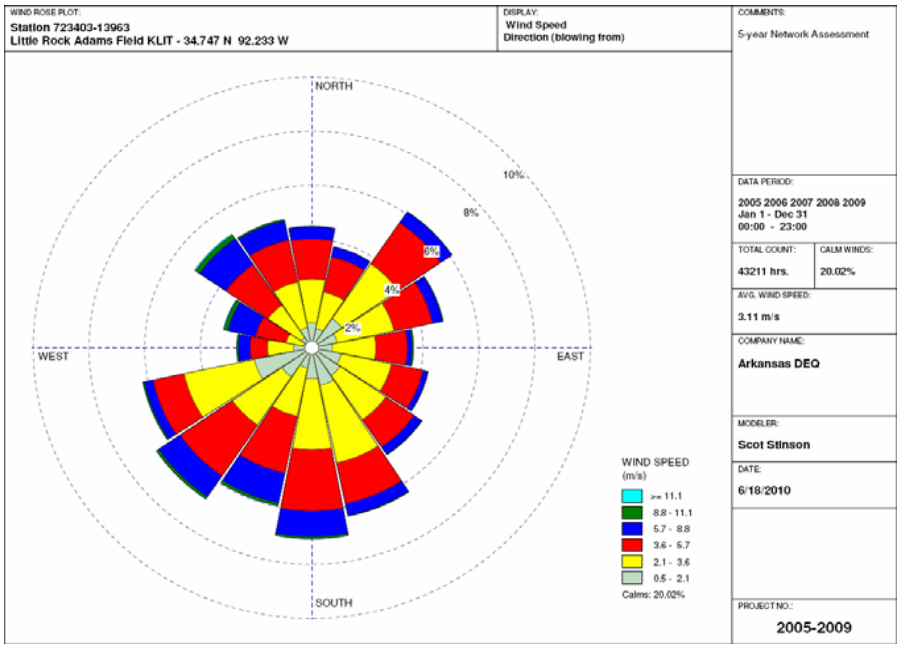
Figure 25 depicts the eight major Core Based Statistical Areas (CBSAs) within Arkansas and those that are also associated with statistical areas in bordering states.

For purposes of this report, the eight major CBSAs are (1) Memphis CSA, (2) Jonesboro, (3) Little Rock – North Little Rock – Conway, (4) Pine Bluff, (5) Hot Springs, (6) Texarkana (AR) – Texarkana (TX), (7) Fort Smith, and (8) Fayetteville – Springdale – Rogers CSA. Size and population information from the U.S. Census Bureau for each of these CBSAs is given in the table above labeled Figure 26.

The two major Combined Statistical Areas that have five years of air quality data are the Memphis and the Little Rock – North Little Rock – Conway CSAs.


WIND ROSE PLOT:
Station 722054-99999
West Memphis KAWM - 35.133 N 90.233 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
15%
12%
9%
6%
3%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 22.61%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
42756 hrs.
CALM WINDS:
22.61%
AVG. WIND SPEED:
3.07 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/18/2010
PROJECT NO.:
2005-2009


WIND ROSE PLOT:
Station 722188-53985
Searcy AP KSRC - 35.212 N 91.737 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
10%
8%
6%
4%
2%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 29.74%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
31648 hrs.
CALM WINDS:
29.74%
AVG. WIND SPEED:
2.54 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/21/2010
PROJECT NO.:
2005-2009


WIND ROSE PLOT:
Station 723403-13963
Little Rock Adams Field KLIT - 34.747 N 92.233 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
10%
8%
6%
4%
2%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 20.02%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
43211 hrs.
CALM WINDS:
20.02%
AVG. WIND SPEED:
3.11 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/18/2010
PROJECT NO.:
2005-2009

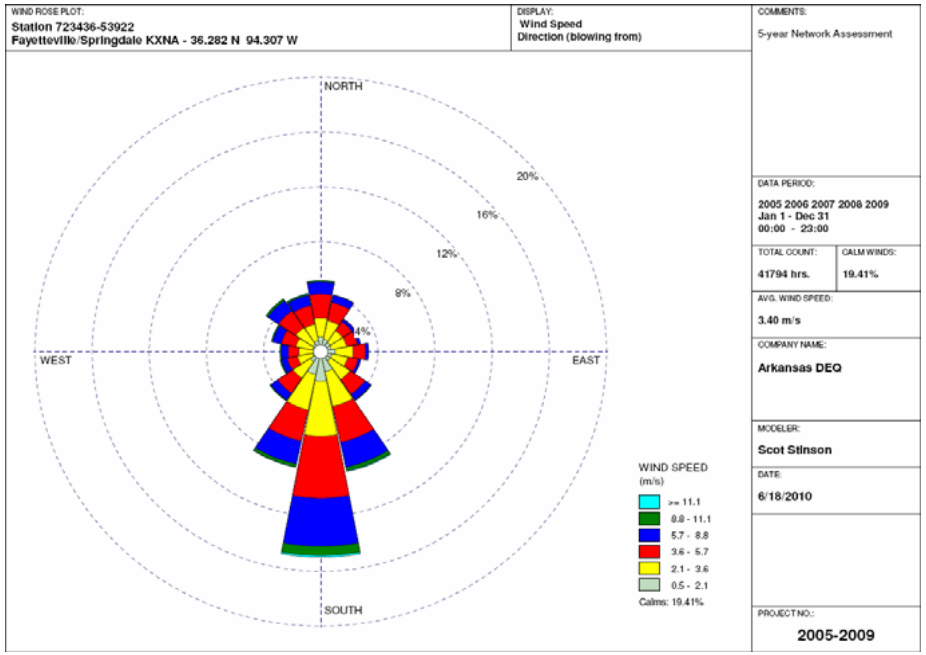

WIND ROSE PLOT:
Station 723436-53922
Fayetteville/Springdale KXNA - 36.282 N 94.307 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
20%
16%
12%
8%
4%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 19.41%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
41794 hrs.
CALM WINDS:
19.41%
AVG. WIND SPEED:
3.40 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/18/2010
PROJECT NO.:
2005-2009

Figure 27a

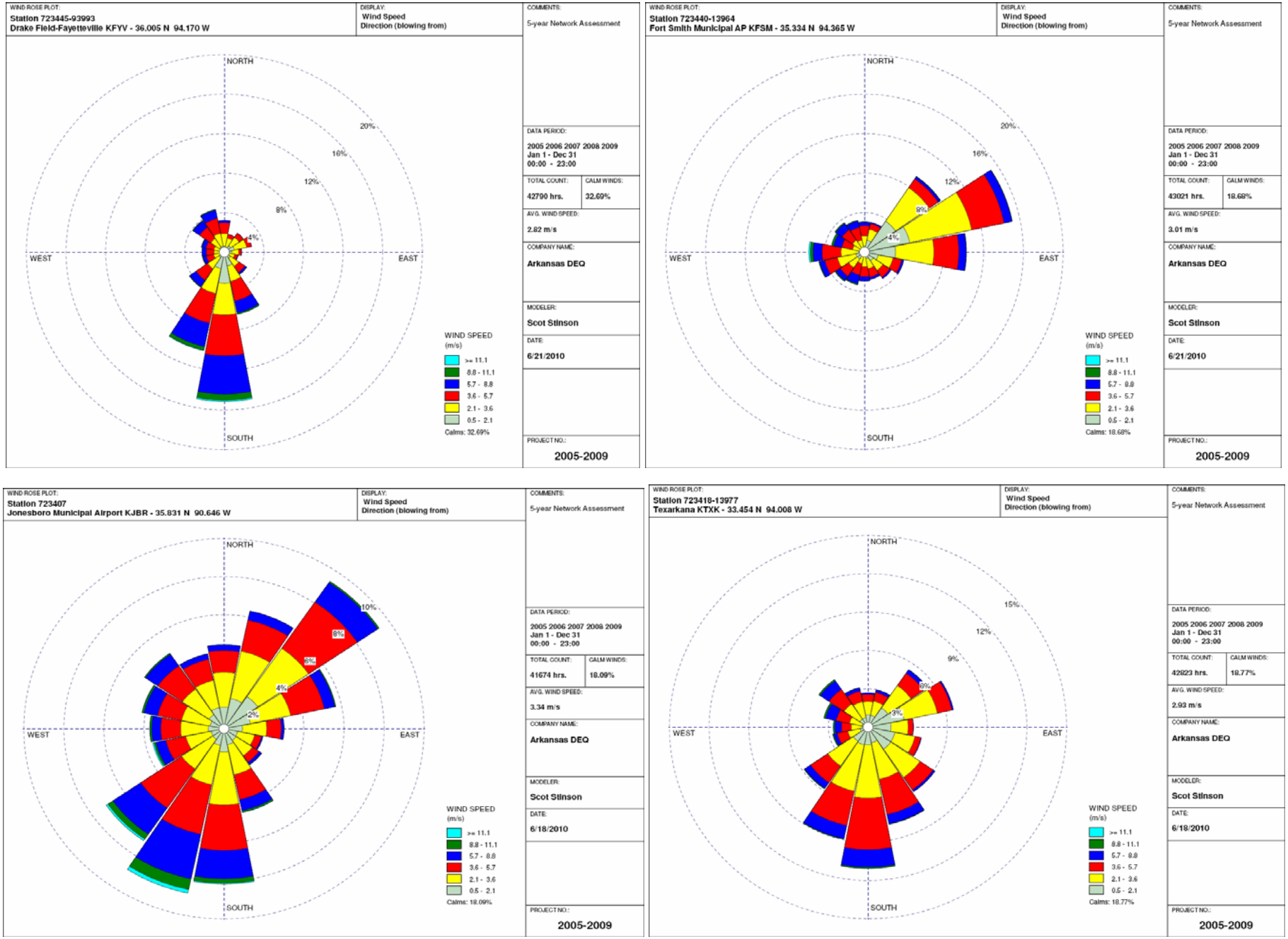

WIND ROSE PLOT:
Station 723445-93993
Drake Field-Fayetteville KFYV - 36.005 N 94.170 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
20%
16%
12%
8%
4%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 32.69%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
42790 hrs.
CALM WINDS:
32.69%
AVG. WIND SPEED:
2.82 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/21/2010
PROJECT NO.:
2005-2009
WIND ROSE PLOT:
Station 723440-13964
Fort Smith Municipal AP KFSM - 35.334 N 94.365 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
20%
16%
12%
8%
4%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 18.68%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
43021 hrs.
CALM WINDS:
18.68%
AVG. WIND SPEED:
3.01 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/21/2010
PROJECT NO.:
2005-2009
WIND ROSE PLOT:
Station 723407
Jonesboro Municipal Airport KJBR - 35.831 N 90.646 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
10%
8%
6%
4%
2%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 18.09%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
41674 hrs.
CALM WINDS:
18.09%
AVG. WIND SPEED:
3.34 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/18/2010
PROJECT NO.:
2005-2009
WIND ROSE PLOT:
Station 723418-13977
Texarkana KTXK - 33.454 N 94.008 W
DISPLAY:
Wind Speed
Direction (blowing from)
COMMENTS:
5-year Network Assessment
NORTH
EAST
SOUTH
WEST
15%
12%
9%
6%
3%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 18.77%
DATA PERIOD:
2005 2006 2007 2008 2009
Jan 1 - Dec 31
00:00 - 23:00
TOTAL COUNT:
42823 hrs.
CALM WINDS:
18.77%
AVG. WIND SPEED:
2.93 m/s
COMPANY NAME:
Arkansas DEQ
MODELER:
Scot Stinson
DATE:
6/18/2010
PROJECT NO.:
2005-2009

Figure 27b

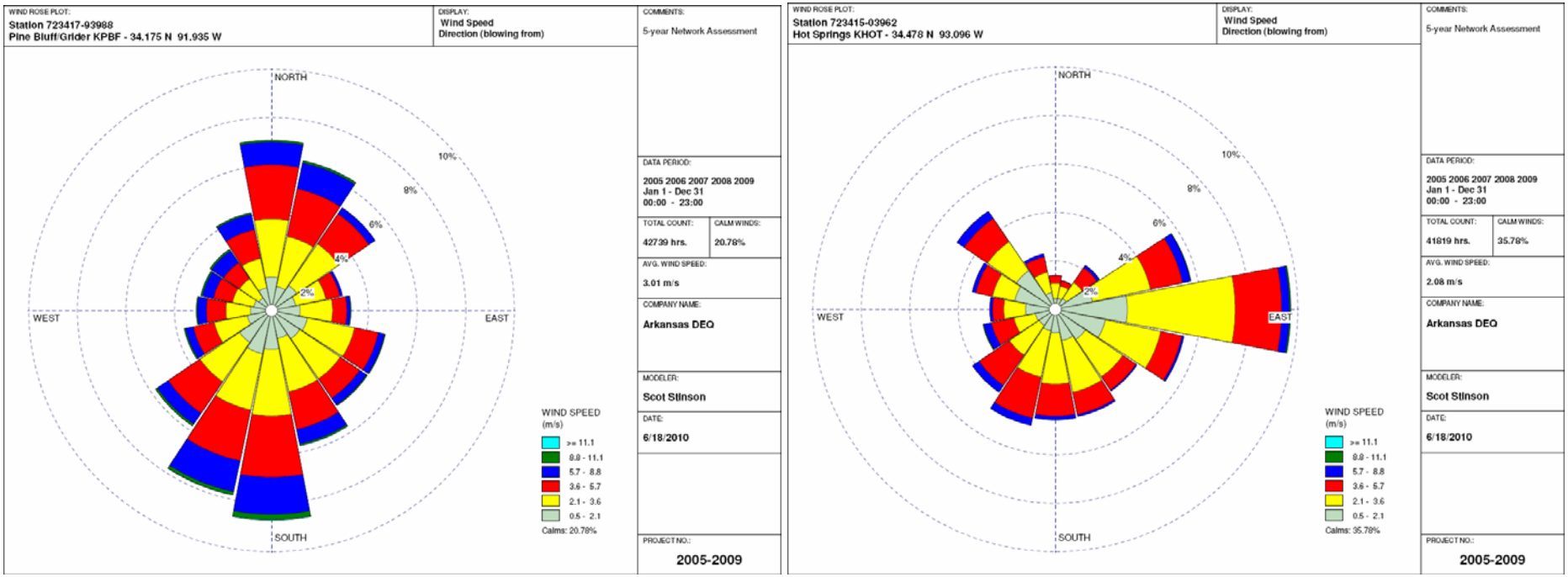


Figure 27c

Figures 27a-c represent wind roses generated from five years of meteorological data recorded at each of the CBSAs noted in Figure 26.

Memphis					
	Pollutant	Status of NAAQS and major Risk Issues in Agencies Network	Extent of NAAQS Violations	Days above 100 on the AQI Index (2005-2009)	Contributions to Downwind Violations
1	Ozone	Non-attainment issues have occurred in the past – likely in the future	2005 - 2007 – 4th High Value 0.089 Marion Monitor	112	NA
2	CO	Attainment for both Values of Primary Standards	None		NA
3	SO_2	Attainment for both Values of Primary Standards	None		NA
4	NO_2	Attainment for Primary Standard	None	3	NA
5	$PM_{2.5}$	Attainment for both Values of Primary Standards	None	10	NA
6	PM_{10}	Attainment for Primary Standard	None		NA

Figure 28

Little Rock - North Little Rock – Pine Bluff					
	Pollutant	Status of NAAQS and major Risk Issues in Agencies Network	Extent of NAAQS Violations	Days above 100 on the AQI Index (2005-2009)	Contributions to Downwind Violations
1	Ozone	Attainment for Primary Standard	None	43	NA
2	CO	Attainment for both Values of Primary Standards	None		NA
3	SO_2	Attainment for both Values of Primary Standards	None		NA
4	NO_2	Attainment for Primary Standard	None		NA
5	$PM_{2.5}$	Attainment for both Values of Primary Standards	None	5	NA
6	PM_{10}	Attainment for Primary Standard	None		NA

Figure 29

Figures 28 and 29 display in tabular form several parameters relating to the air quality in the two MSAs in Arkansas for which AQIs are reported.

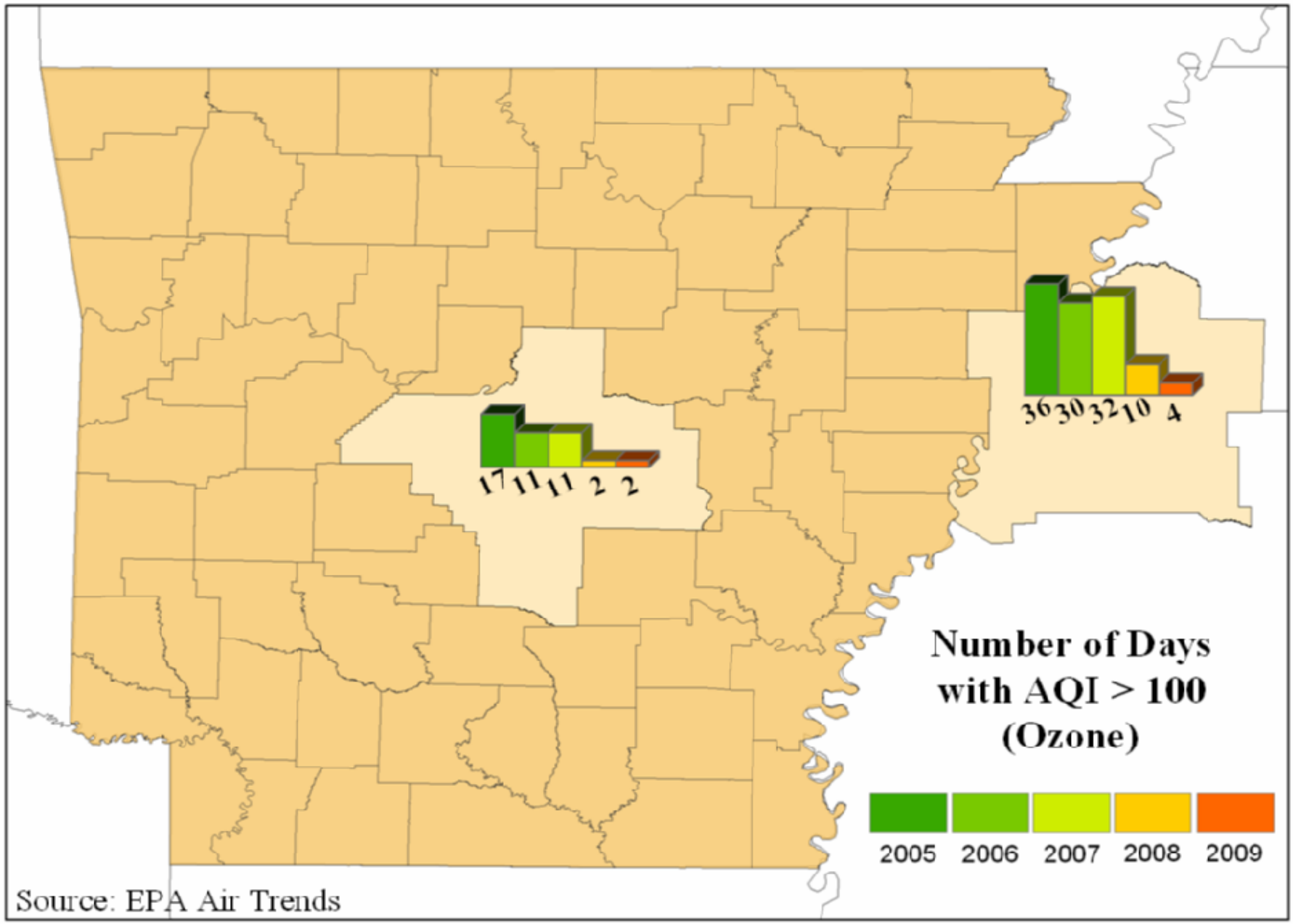

17 11 11 2 2
36 30 32 10 4
Number of Days with AQI > 100 (Ozone)
2005 2006 2007 2008 2009
Source: EPA Air Trends

Figure 30

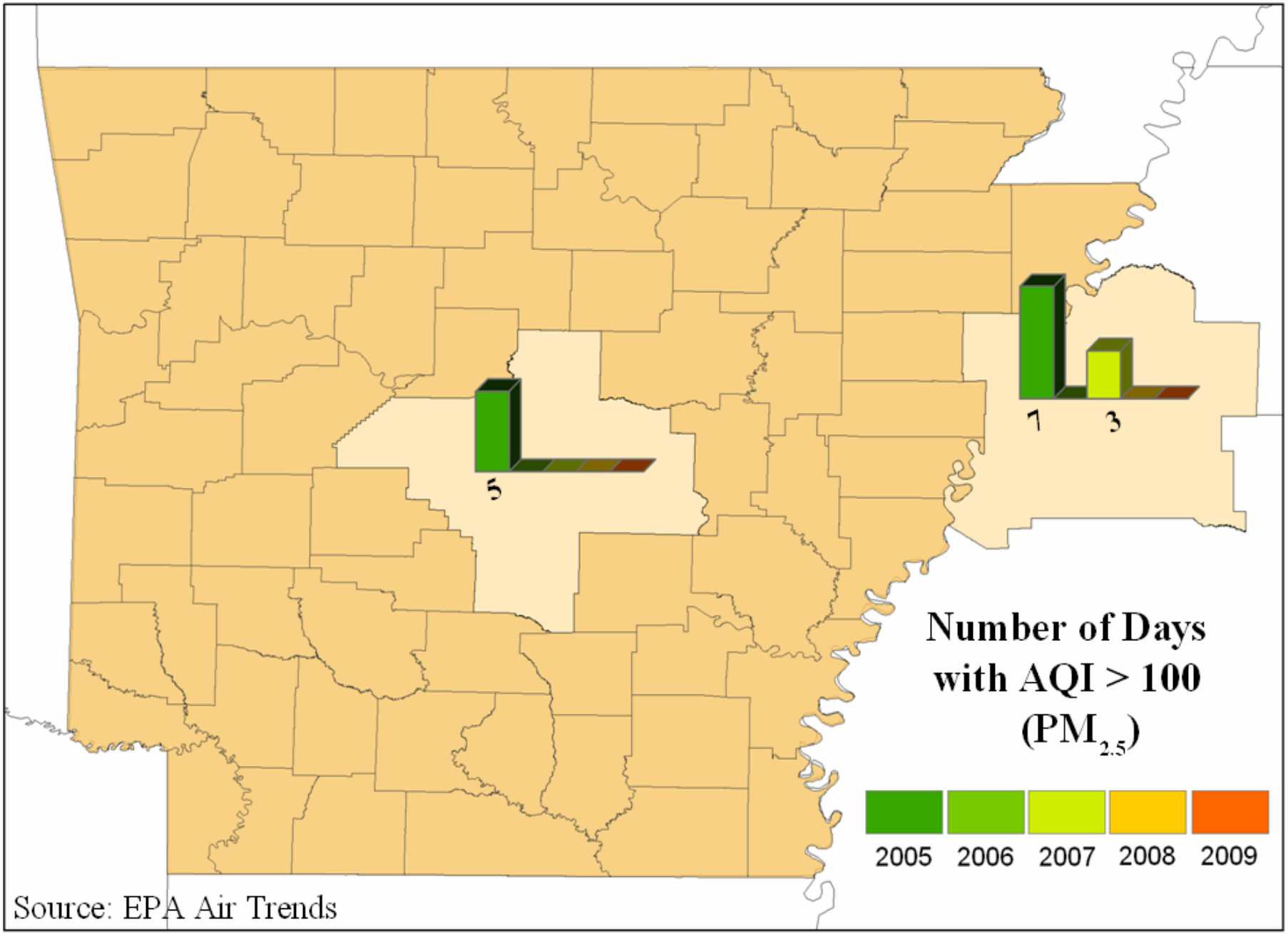

5
7
3
Number of Days with AQI > 100 ($PM_{2.5}$)
2005
2006
2007
2008
2009
Source: EPA Air Trends

Figure 31

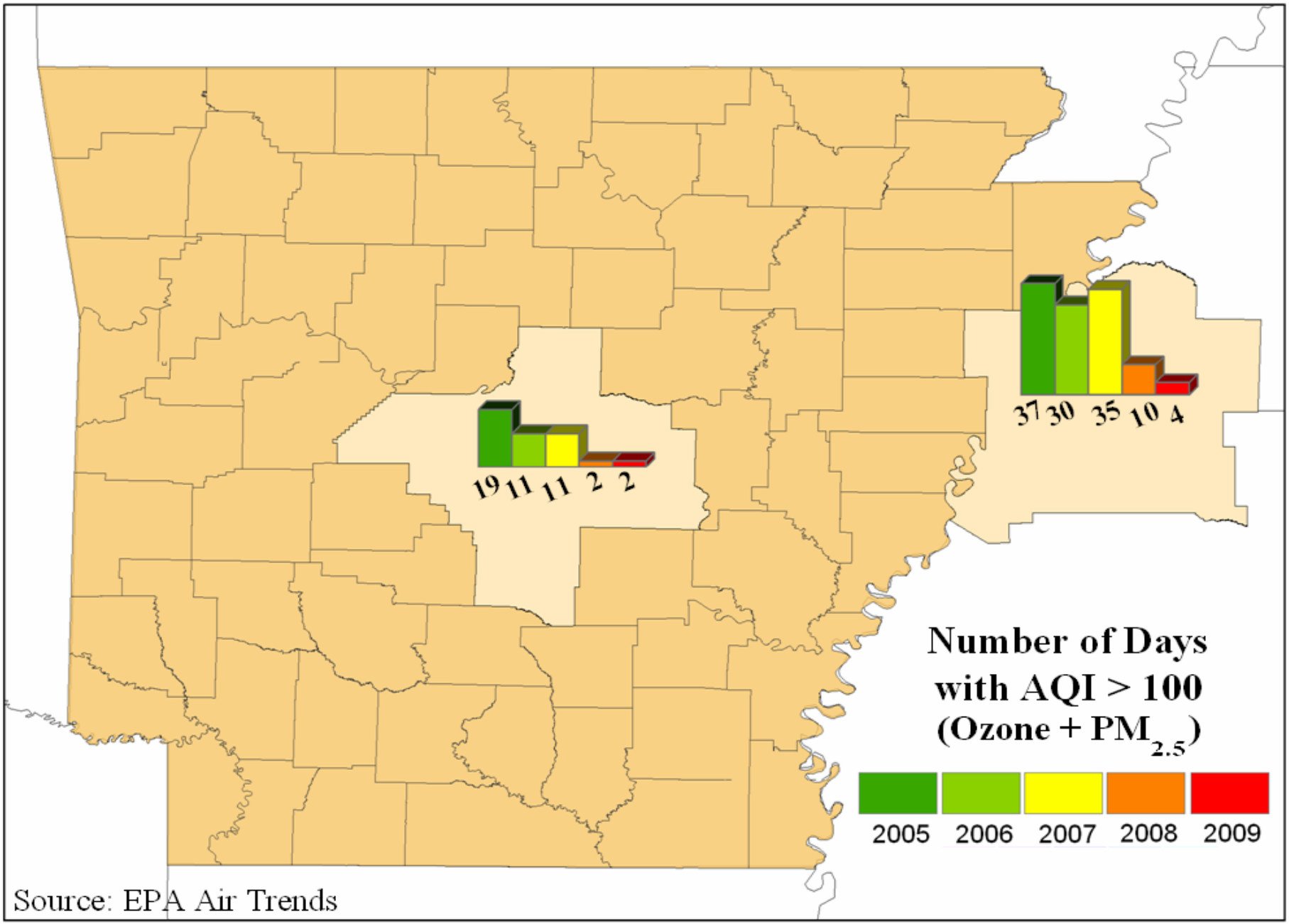

19 11 11 2 2
37 30 35 10 4
Number of Days with AQI > 100 (Ozone + PM2.5)
2005 2006 2007 2008 2009
Source: EPA Air Trends

Figure 32

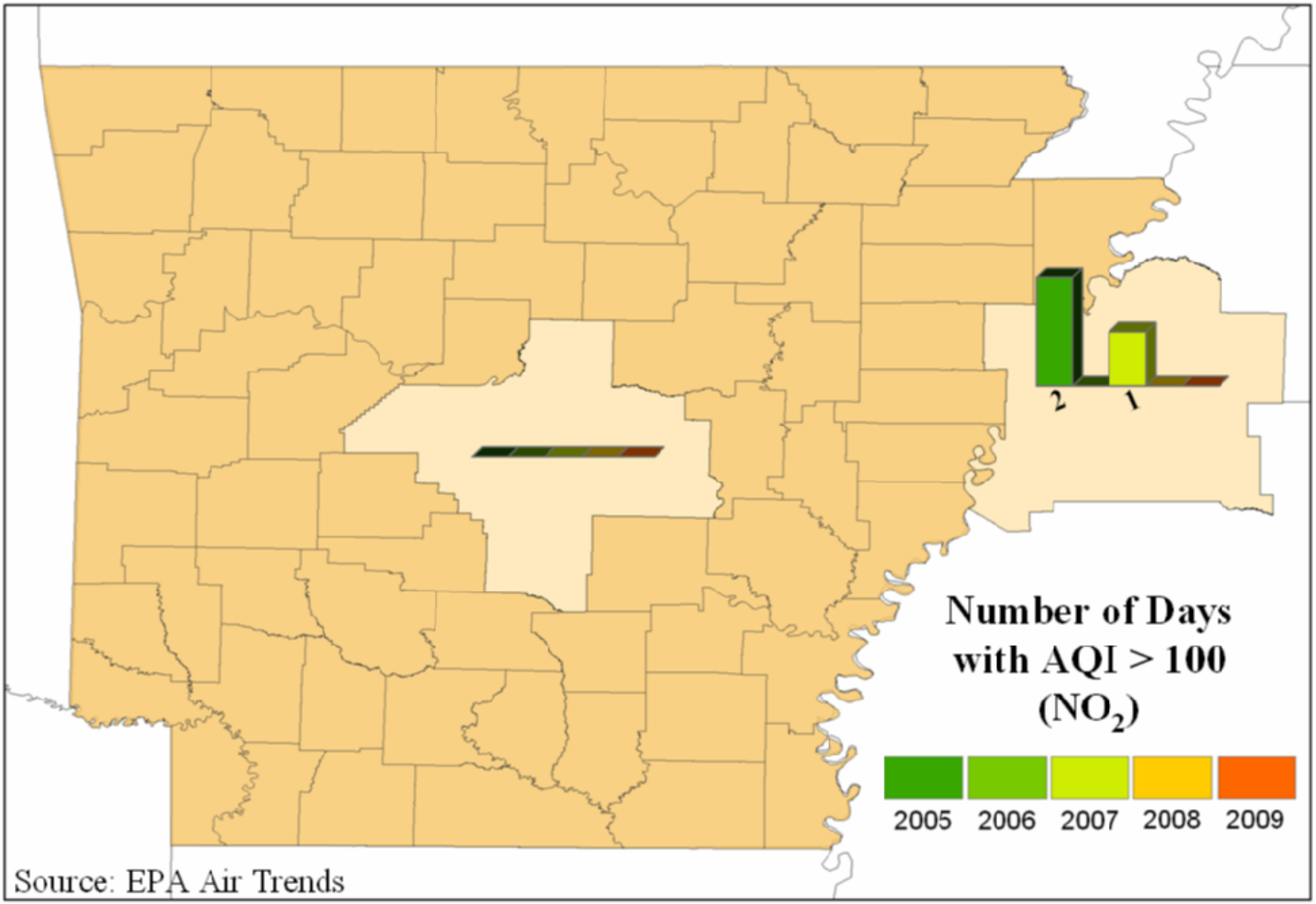


Figure 33

Figures 30 - 33 offer graphic depictions of the number of days where the AQI is above 100 in the Memphis and Little Rock – North Little Rock – Conway MSAs.

THE ADEQ MONITORING NETWORK IN FUTURE YEARS
NEW SITES ANALYSIS

An analysis was performed to determine if there were areas within the state that could serve as locations for new monitors which would enhance the existing network. This analysis was done using the New Sites Tool provided by EPA. Using the distance between the monitors, the tool designates those monitors whose paired locations meet the criteria for the placement of a new monitor as well as those monitor whose paired locations do not meet the criteria for the placement of a new monitor. Additionally, in order to relate the positioning of potentially new sites back to the NAAQS, a final criterion relating to the potential of exceeding 85% of the NAAQS is also addressed.

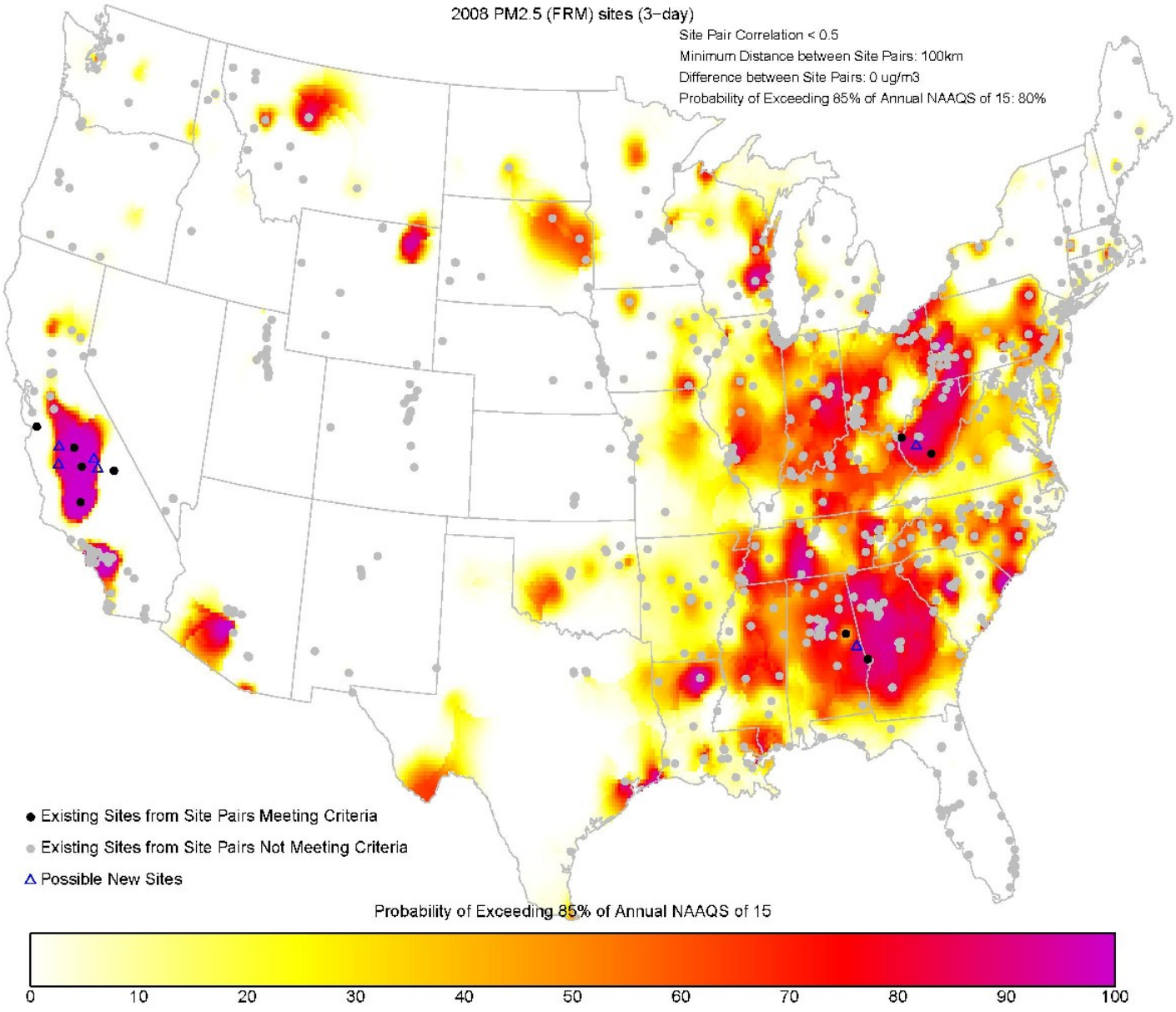


Figure 34

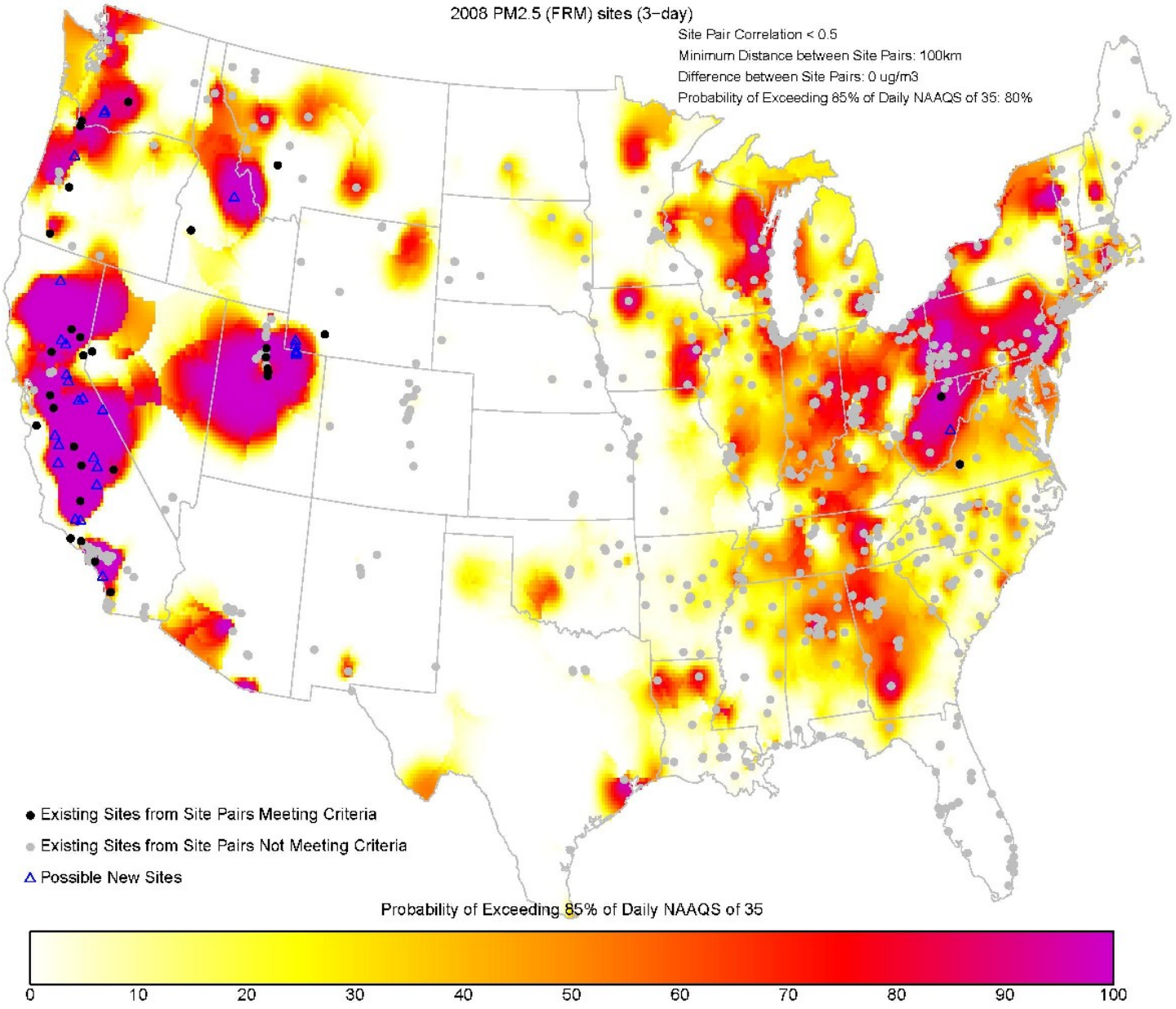


Figure 35

Figures 34 and 35 depict the existing $PM_{2.5}$ monitoring network in Arkansas and denote that no additional $PM_{2.5}$ monitors are required for the network for the immediate future.

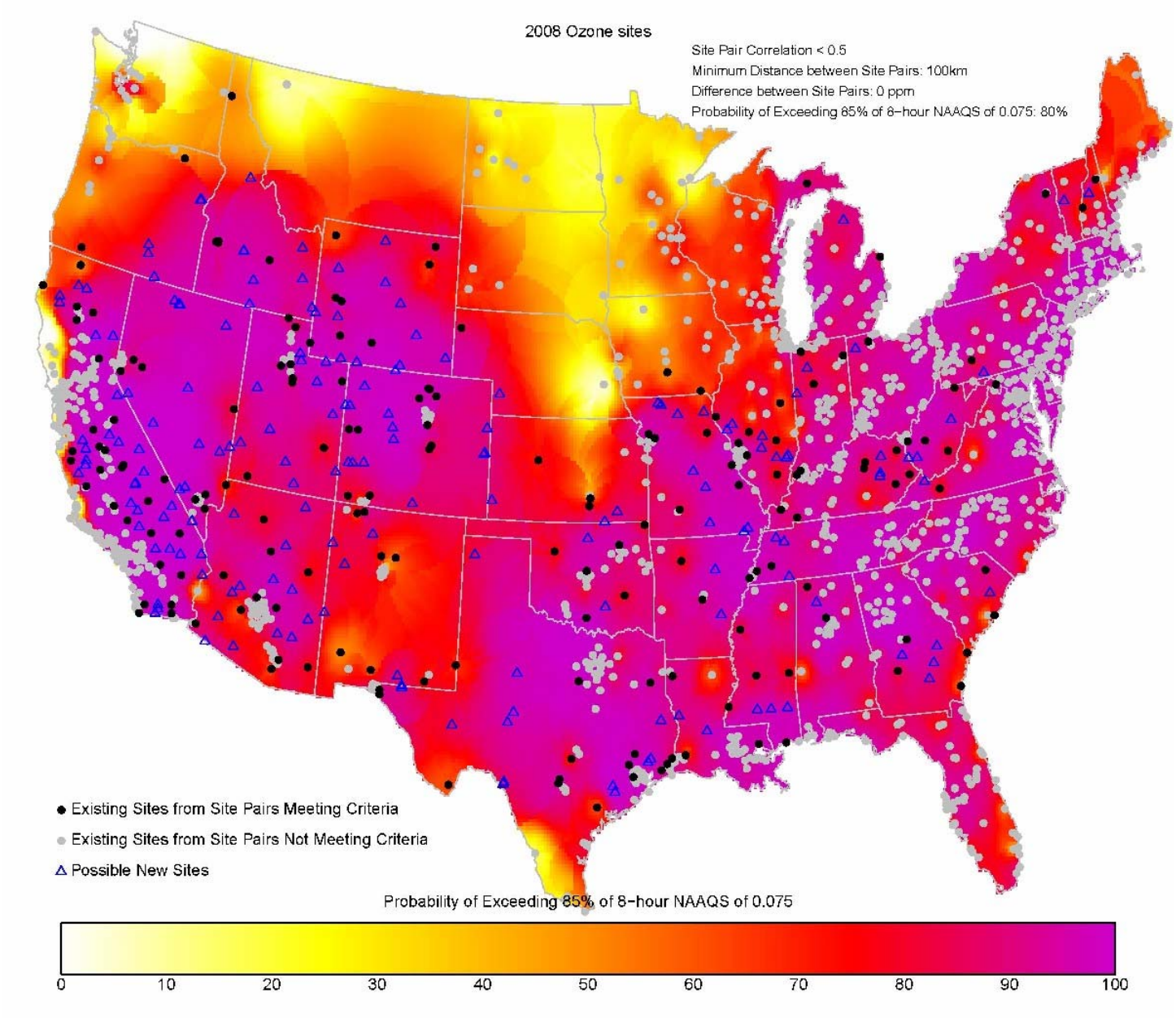
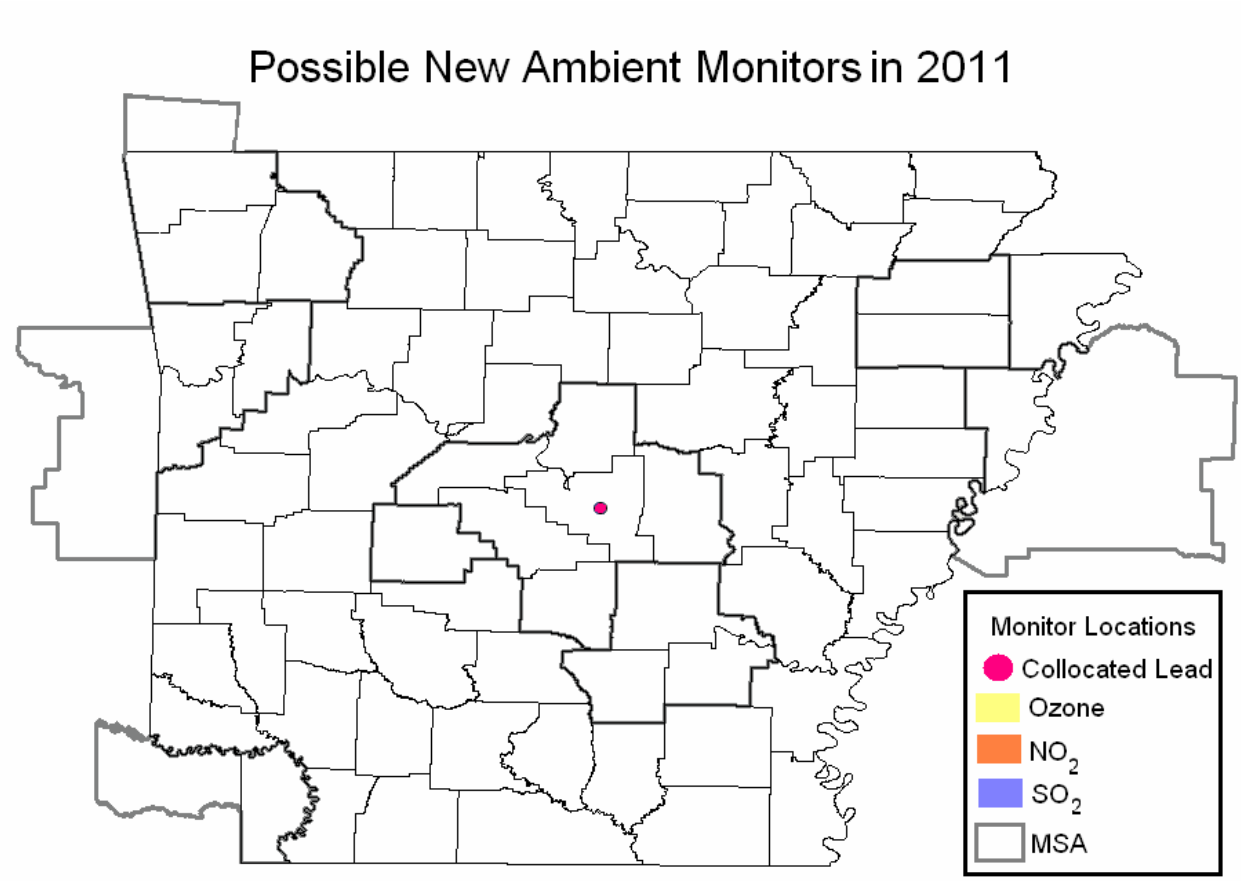


Figure 36

Figure 36 is a map depicting the existing network of ozone monitors within the state. The analysis tool predicts that two additional ozone monitors denoted as blue triangles will be needed in the future.


Possible New Ambient Monitors in 2011
Monitor Locations
Collocated Lead
Ozone
NO2
SO2
MSA

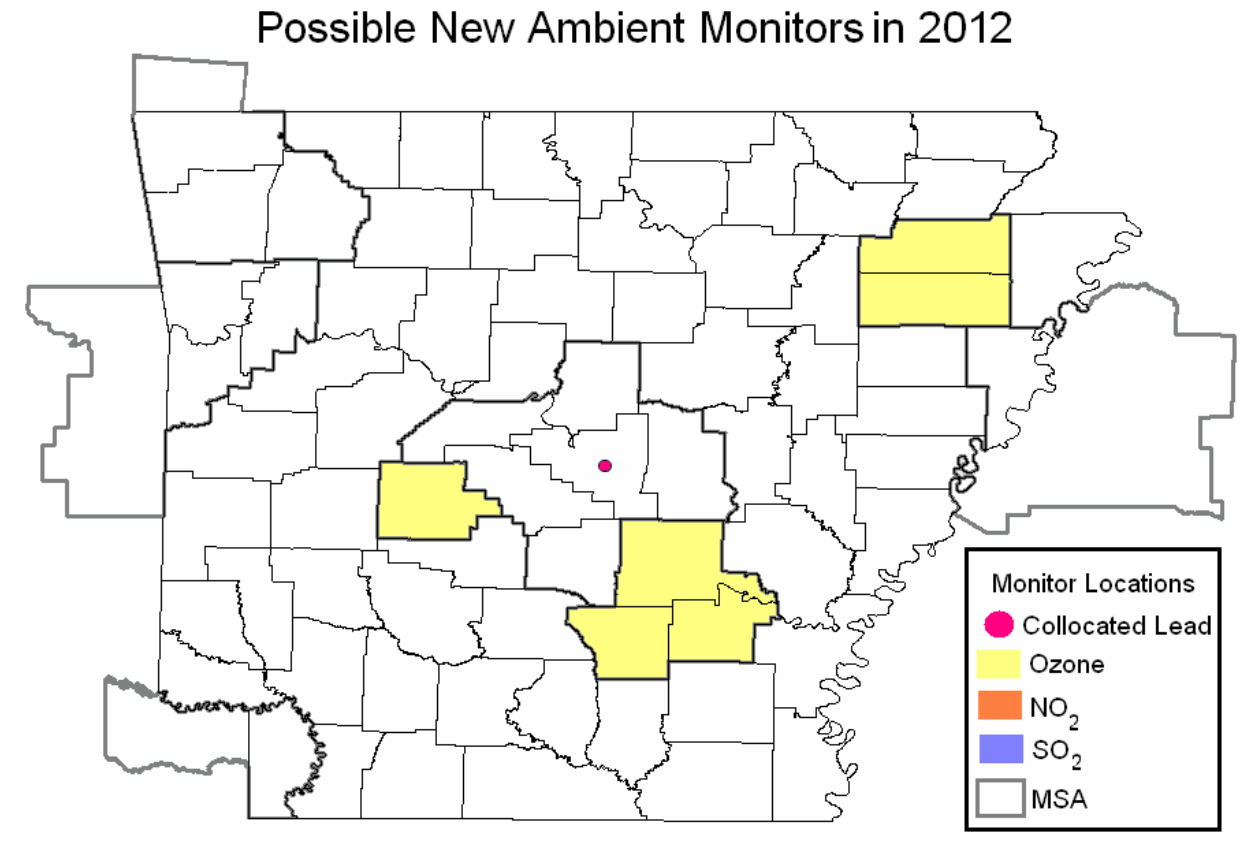

Possible New Ambient Monitors in 2012
Monitor Locations
Collocated Lead
Ozone
NO2
SO2
MSA

Figure 37

Figure 37 displays two maps that show the locations where new monitors will be added to the monitoring network. In 2011, two non-source oriented lead monitors will be placed at the NCORE site. The counties in yellow in figure 37 represent those CBSAs that EPA region 6 has recommended as new locations for ozone monitors.

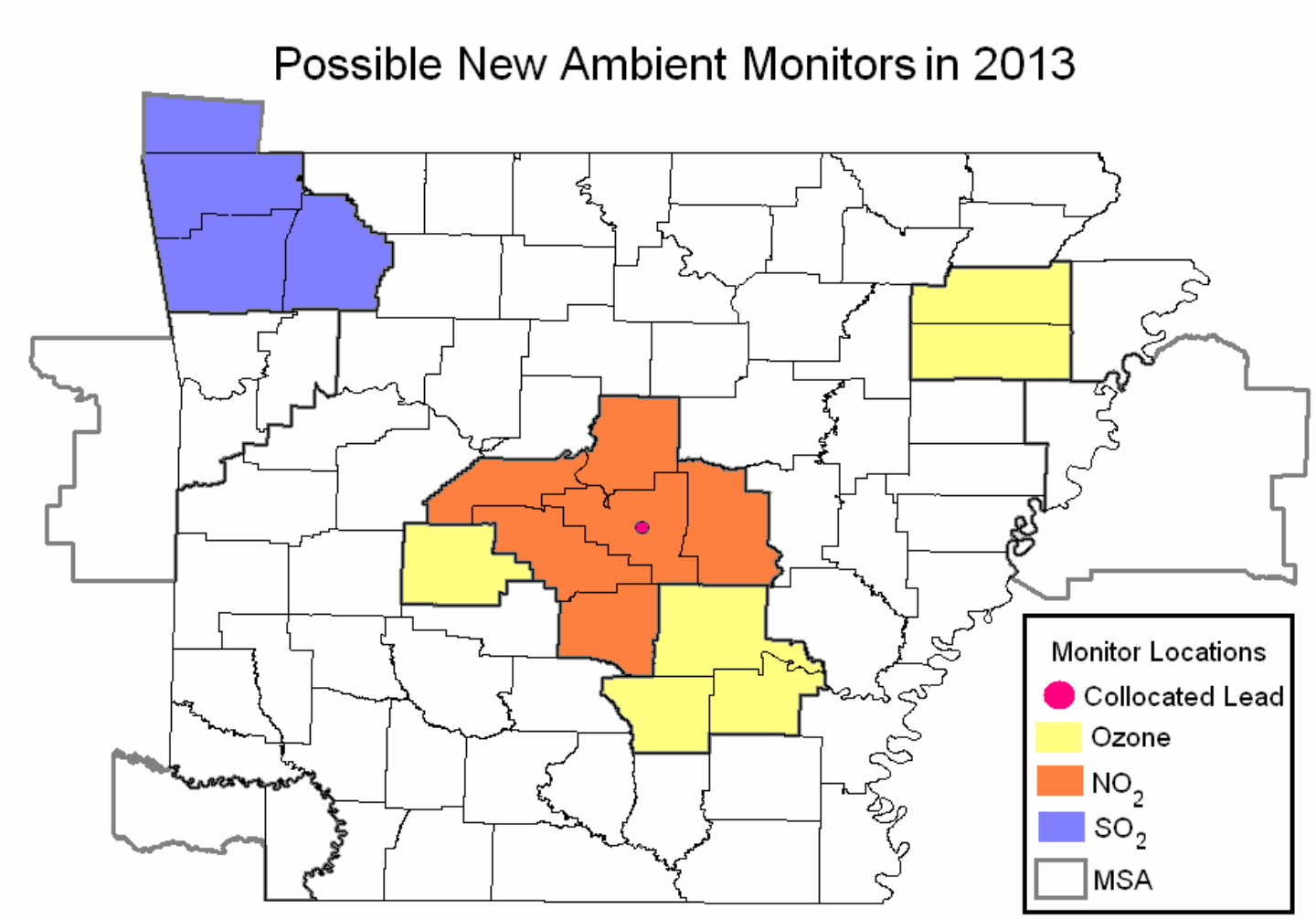


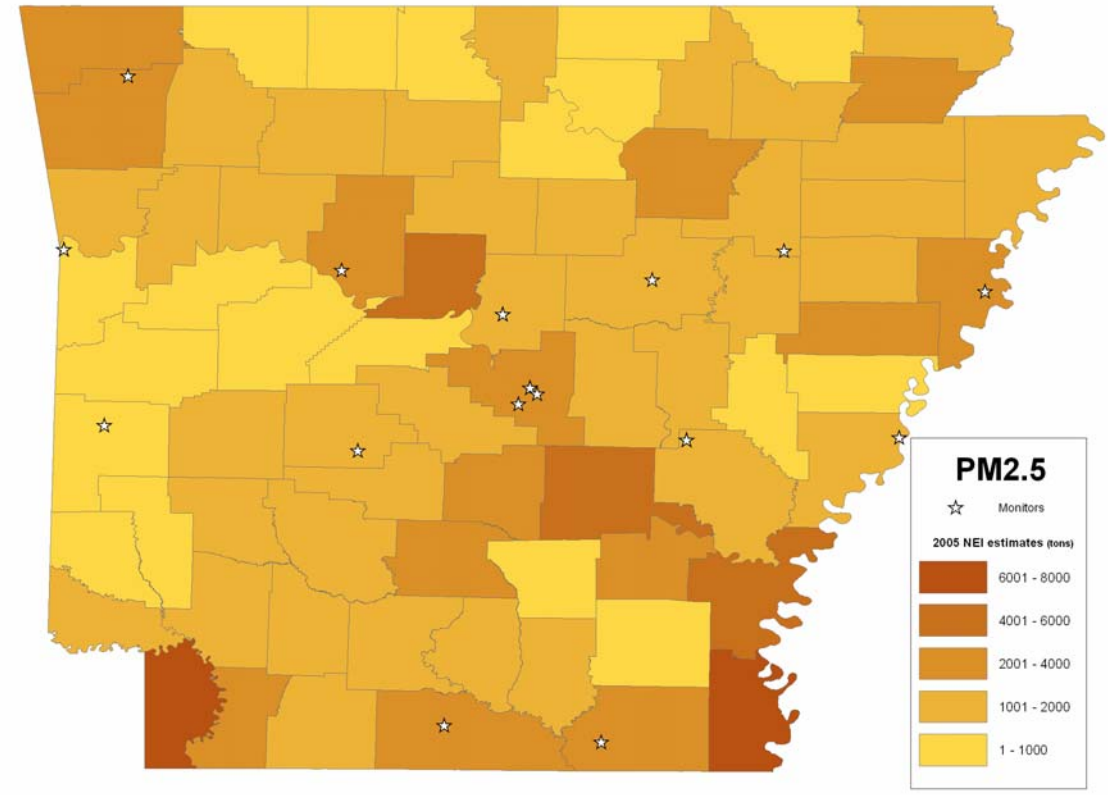
Figure 38

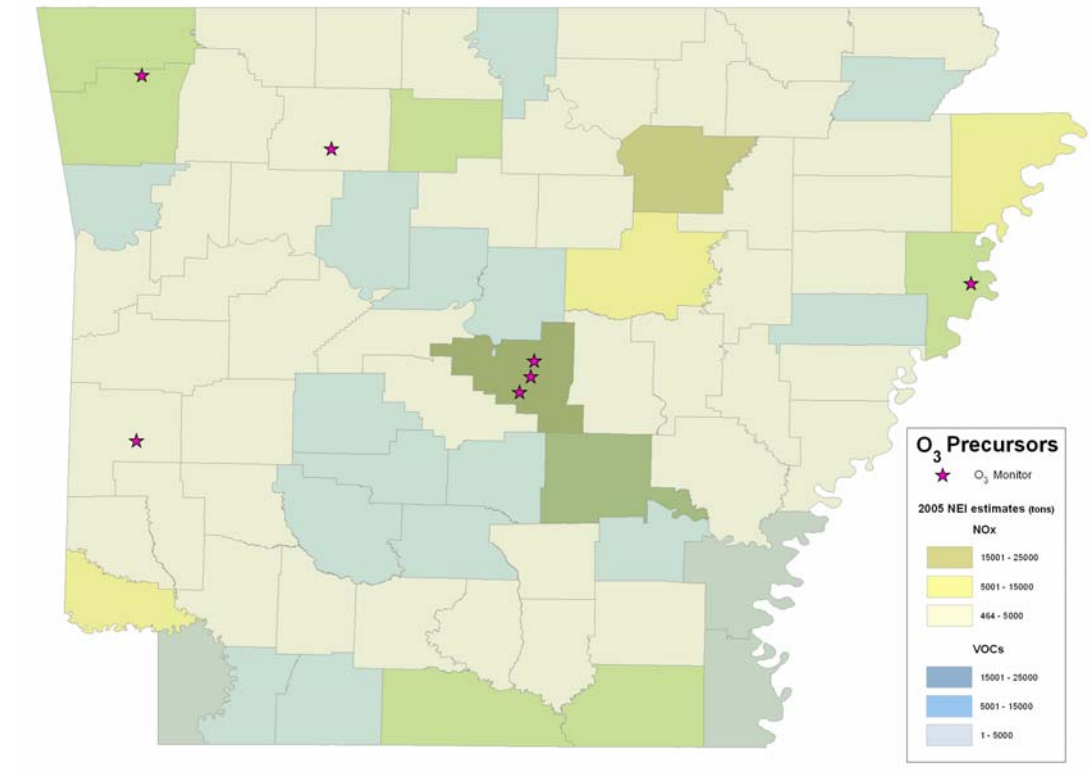
Figure 38 displays the possible location of additional monitors to the network. It also includes the monitors that were mandated or proposed in the two previous years. The counties colored in orange denote the central Arkansas CSA that will require a near-road NO_2 monitor and the counties colored in blue represent the CBSA where a SO_2 monitor will be required.

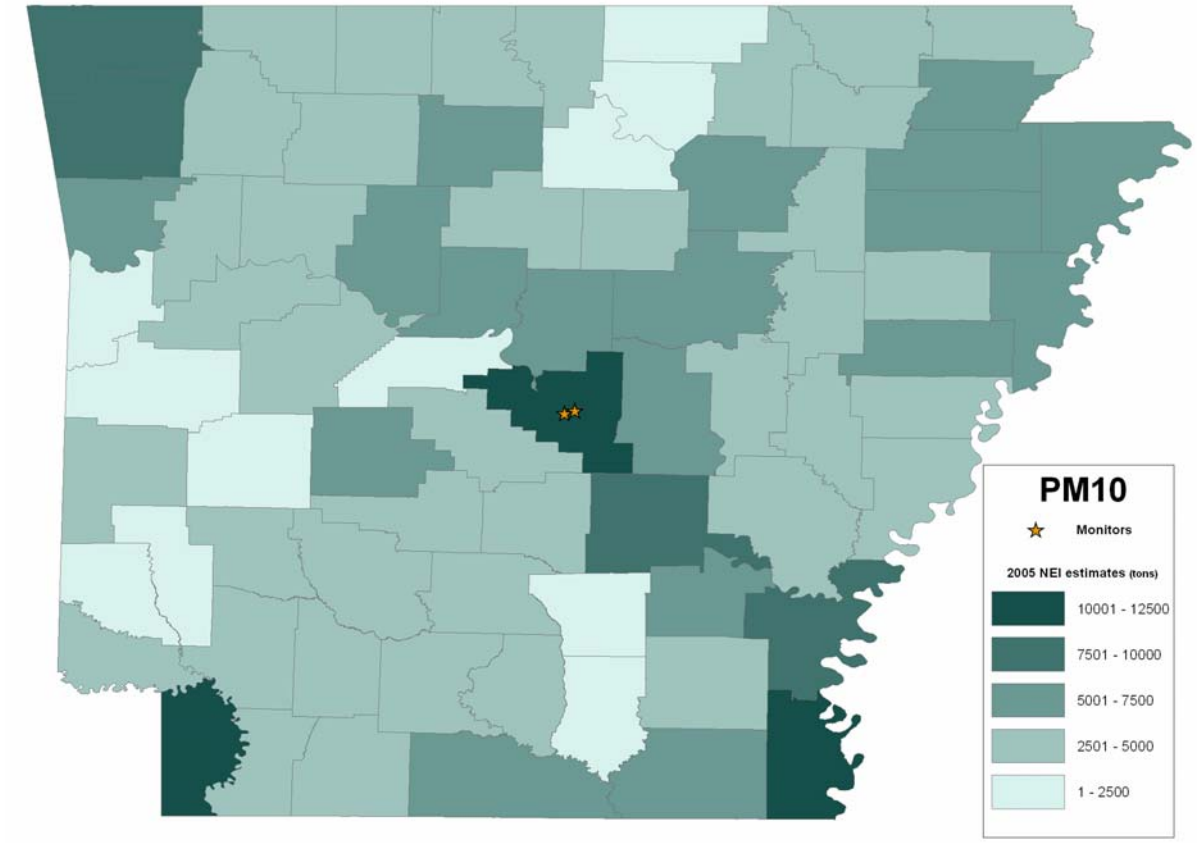
APPENDIX

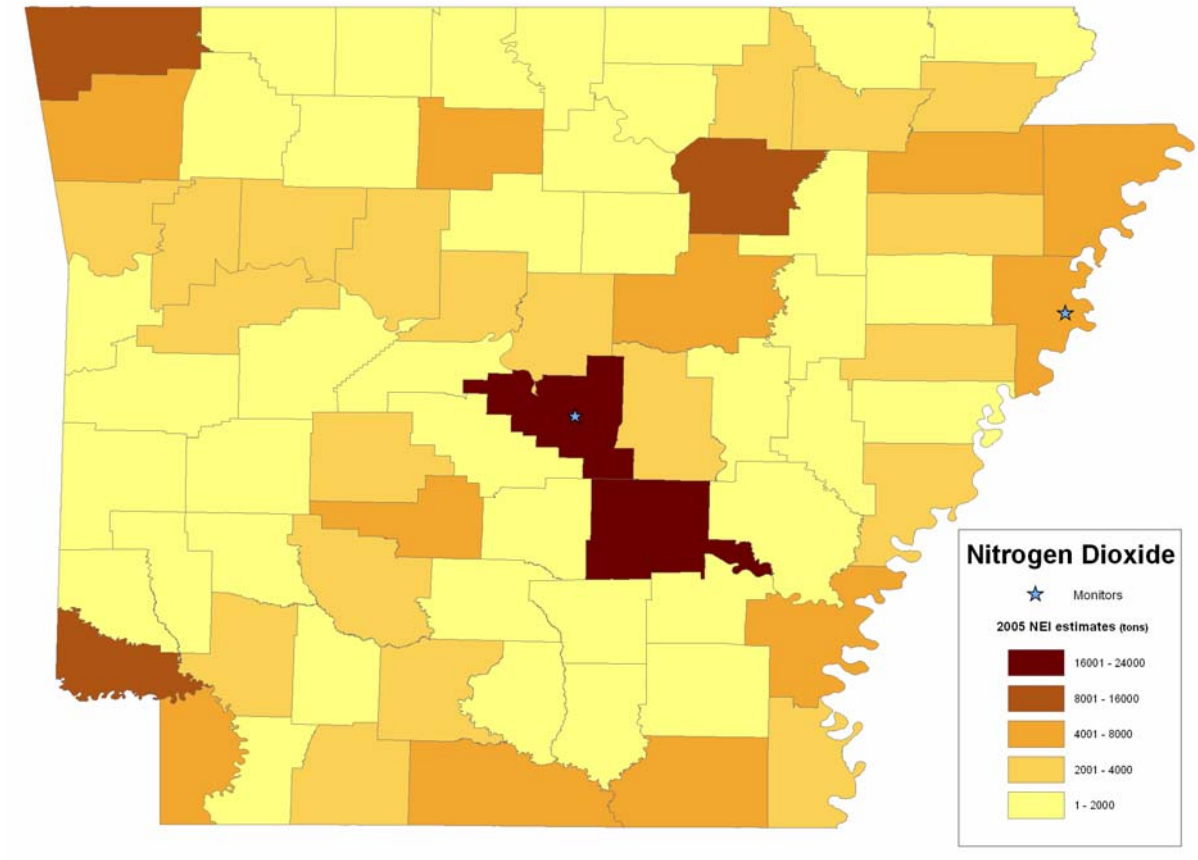
2005 NATIONAL EMISSIONS INVENTORY (NEI) ESTIMATES

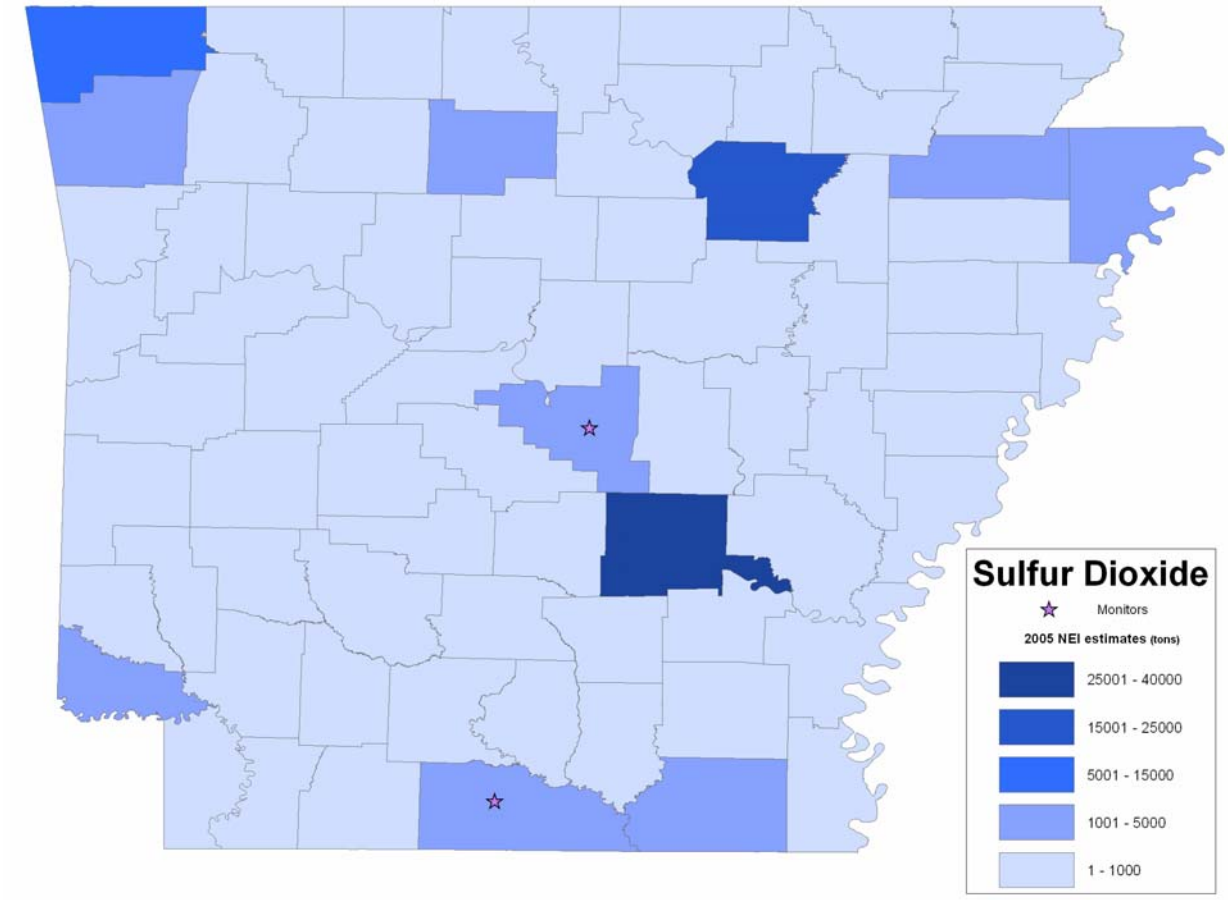
Each map below displays the 2005 NEI estimates for one criteria pollutant and its corresponding monitor sites.

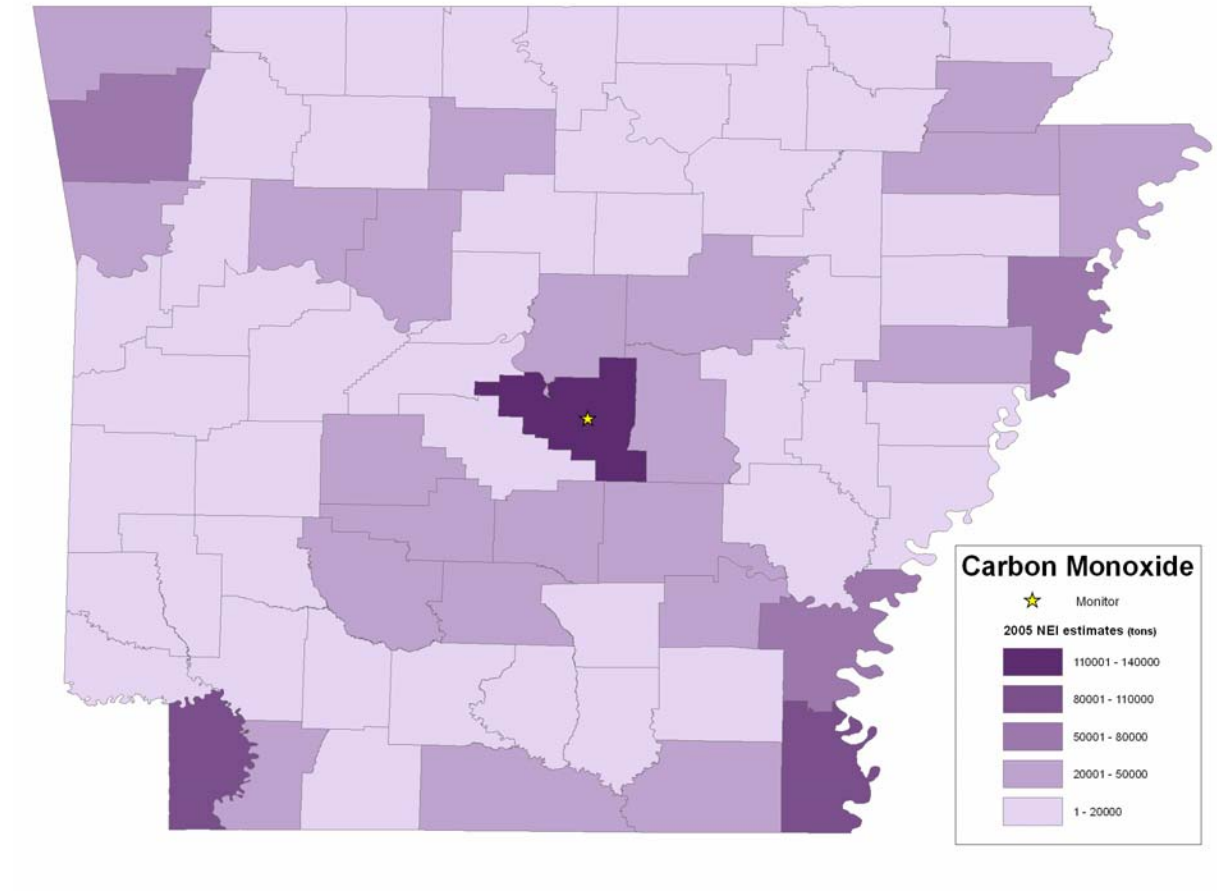





PM10
Monitors
2005 NEI estimates (tons)
10001 - 12500
7501 - 10000
5001 - 7500
2501 - 5000
1 - 2500


Nitrogen Dioxide
Monitors
2005 NEI estimates (tons)
16001 - 24000
8001 - 16000
4001 - 8000
2001 - 4000
1 - 2000


Sulfur Dioxide
Monitors
2005 NEI estimates (tons)
25001 - 40000
15001 - 25000
5001 - 15000
1001 - 5000
1 - 1000


Carbon Monoxide
Monitor
2005 NEI estimates (tons)
110001 - 140000
80001 - 110000
50001 - 80000
20001 - 50000
1 - 20000