

# Emission and Air Quality Trends Review

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## Mississippi

May 2013

# Project Objective

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- ❑ To develop and present publicly available information on trends in emissions and ambient air quality in the U.S. since 1999 in easy to understand visual and tabular formats

# Emission Trends

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- Study Team collected and processed U.S. EPA emission inventories for years within the study period of interest (1999-2011)
  
- By pollutant and source category
  - electric generation fuel combustion
  - mobile sources
  - industrial fuel combustion & industrial processes
  - all other

# Emissions Data Summary

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- Data Obtained from EPA National Emission Inventory (NEI) and Trends Websites
  - EPA's Trends reports and emission comparisons include interpolations of all categories between key years (1999, 2002, 2005, 2008, 2011) at county-pollutant level
  - Represented Pollutants: VOC, NO<sub>x</sub>, SO<sub>2</sub>, and PM<sub>2.5</sub>
- Project Improvement
  - The Study Team augmented above data with year specific CEM emissions (2002 through 2011)

# Emission Changes

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- ❑ The following slides also include the tonnage-based emissions change from 1999 to 2011 for each pollutant
- ❑ Negative values indicate decrease in emissions, positive values indicate an increase

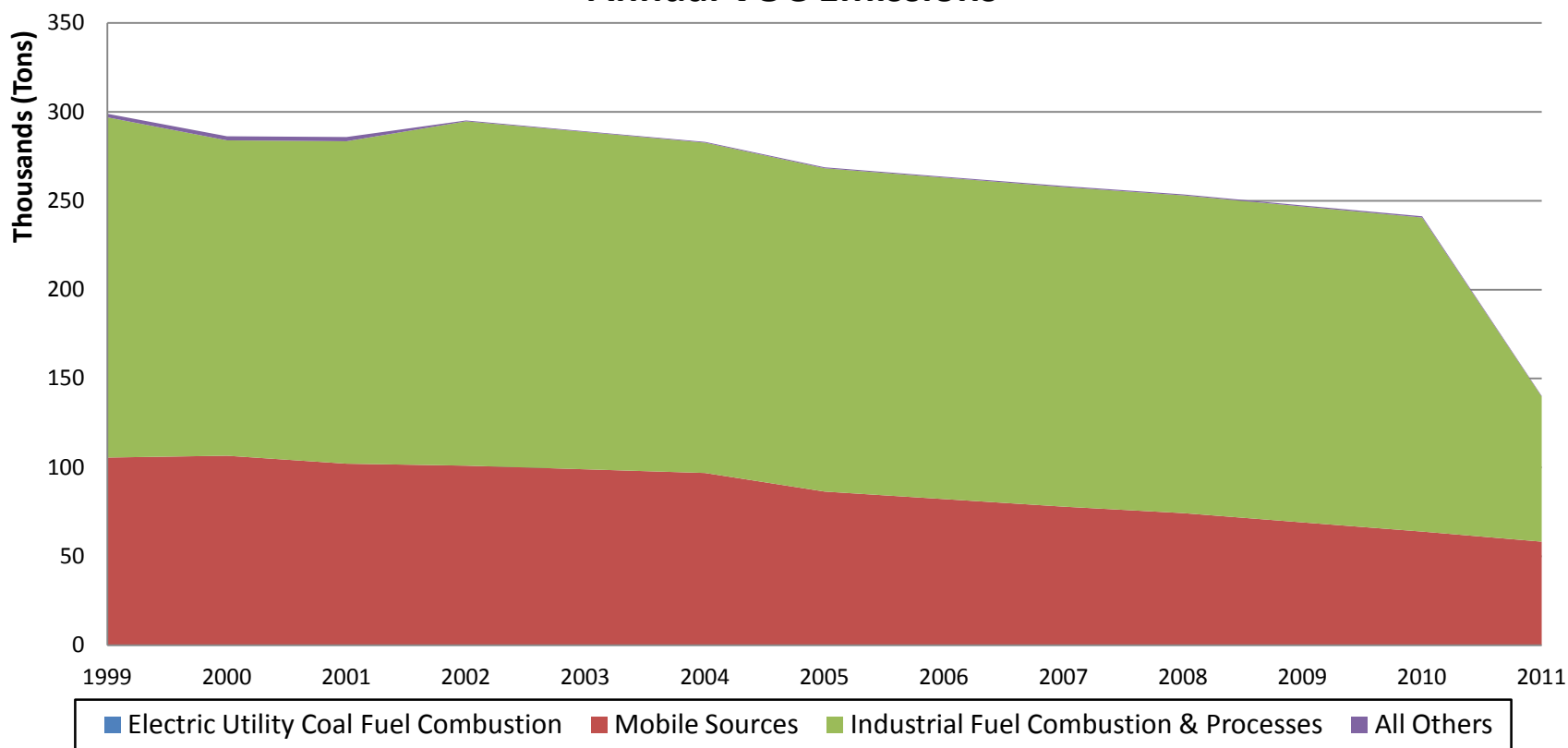
# Mississippi Emission Trends (VOC)

Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	124	83	205	202	220	215	211	152	159	108
Mobile Sources	105,445	102,031	98,743	86,229	81,979	77,729	74,099	68,936	63,772	58,142
Industrial Fuel Combustion & Processes	191,312	181,334	189,709	181,819	180,777	179,736	178,694	177,652	176,611	81,594
All Others	2,010	2,377	376	545	518	595	557	608	701	379
<b>Total</b>	<b>298,891</b>	<b>285,824</b>	<b>289,034</b>	<b>268,795</b>	<b>263,494</b>	<b>258,275</b>	<b>253,561</b>	<b>247,348</b>	<b>241,244</b>	<b>140,224</b>

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	-33%	66%	64%	78%	74%	71%	23%	29%	-13%
Mobile Sources	0%	-3%	-6%	-18%	-22%	-26%	-30%	-35%	-40%	-45%
Industrial Fuel Combustion & Processes	0%	-5%	-1%	-5%	-6%	-6%	-7%	-7%	-8%	-57%
All Others	0%	18%	-81%	-73%	-74%	-70%	-72%	-70%	-65%	-81%
<b>Total</b>	<b>0%</b>	<b>-4%</b>	<b>-3%</b>	<b>-10%</b>	<b>-12%</b>	<b>-14%</b>	<b>-15%</b>	<b>-17%</b>	<b>-19%</b>	<b>-53%</b>

# Mississippi Emission Trends (VOC)

**Major Source Category Summary  
Annual VOC Emissions**



# Mississippi Emission Trends (NO<sub>x</sub>)

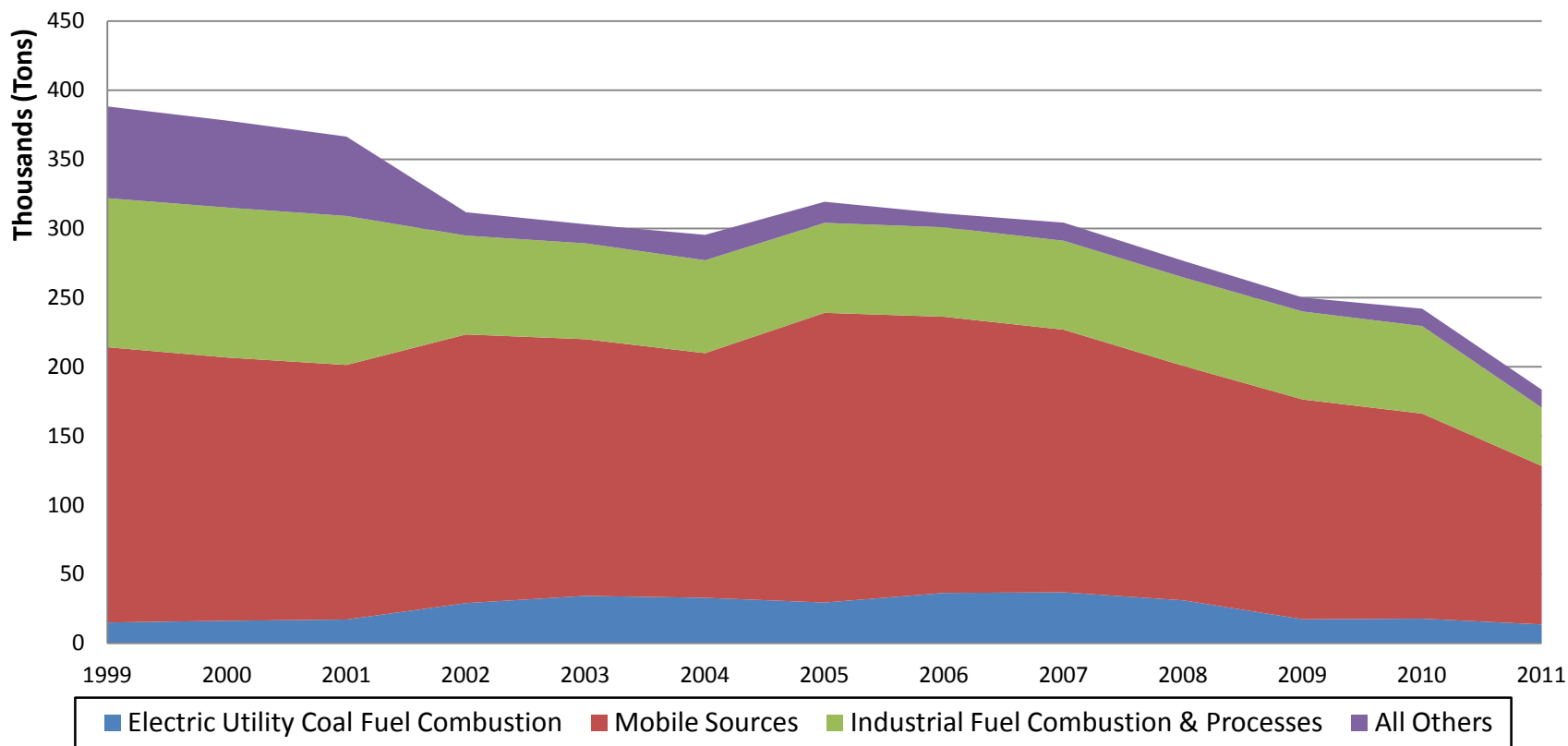
Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	15,049	17,167	34,270	29,455	36,393	36,843	31,063	17,369	17,795	13,640
Mobile Sources	199,089	184,134	185,634	209,543	199,745	189,947	169,586	158,955	148,323	114,585
Industrial Fuel Combustion & Processes	107,778	107,733	69,338	65,054	64,698	64,342	63,986	63,630	63,274	42,239
All Others	66,345	57,409	13,820	15,256	10,007	13,092	12,000	10,106	12,595	12,962
<b>Total</b>	<b>388,261</b>	<b>366,443</b>	<b>303,062</b>	<b>319,309</b>	<b>310,844</b>	<b>304,224</b>	<b>276,636</b>	<b>250,060</b>	<b>241,987</b>	<b>183,426</b>

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	14%	128%	96%	142%	145%	106%	15%	18%	-9%
Mobile Sources	0%	-8%	-7%	5%	0%	-5%	-15%	-20%	-25%	-42%
Industrial Fuel Combustion & Processes	0%	0%	-36%	-40%	-40%	-40%	-41%	-41%	-41%	-61%
All Others	0%	-13%	-79%	-77%	-85%	-80%	-82%	-85%	-81%	-80%
<b>Total</b>	<b>0%</b>	<b>-6%</b>	<b>-22%</b>	<b>-18%</b>	<b>-20%</b>	<b>-22%</b>	<b>-29%</b>	<b>-36%</b>	<b>-38%</b>	<b>-53%</b>



# Mississippi Emission Trends (NO<sub>x</sub>)

**Major Source Category Summary  
Annual NO<sub>x</sub> Emissions**



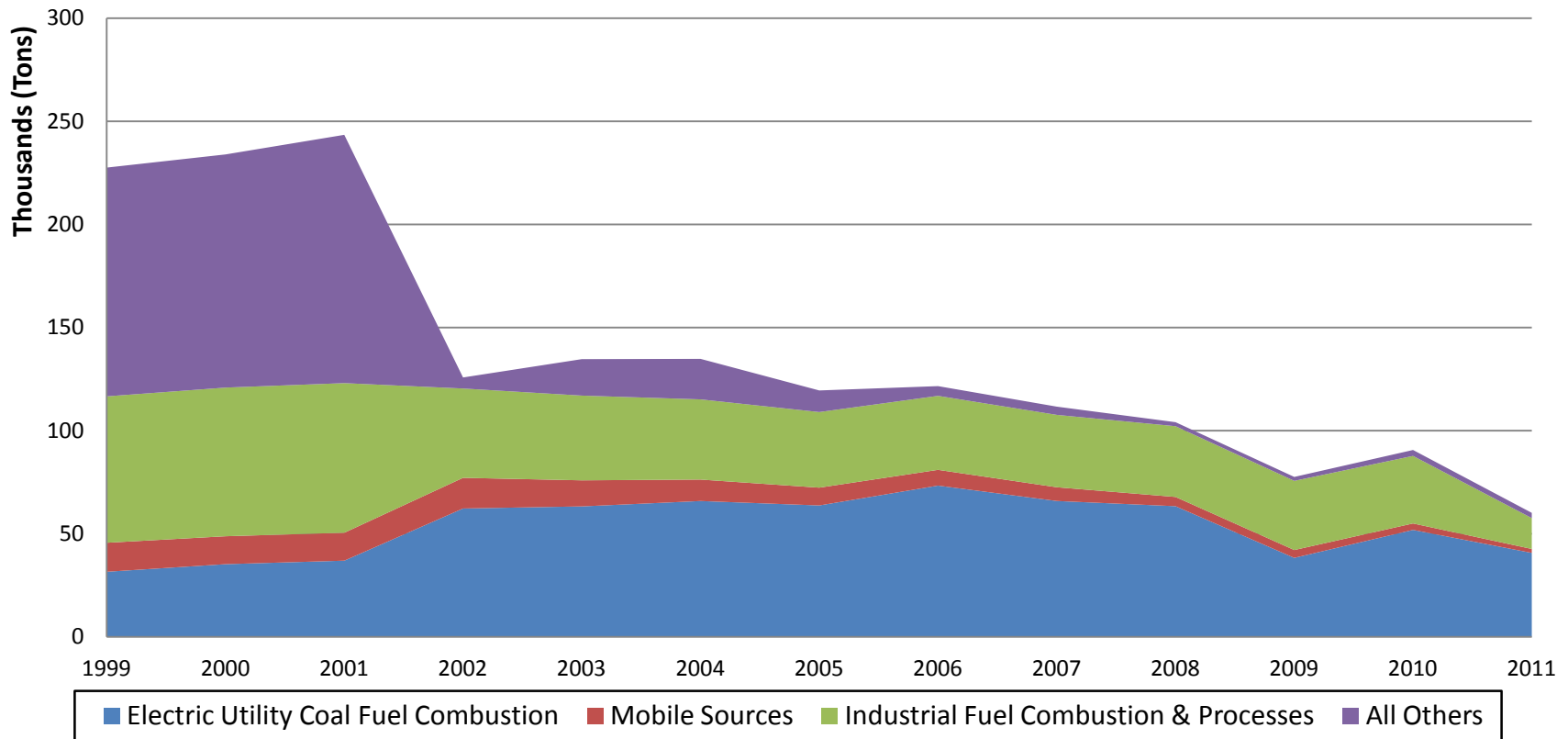
# Mississippi Emission Trends (SO<sub>2</sub>)

Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	31,566	36,943	63,255	63,716	73,339	65,884	63,356	38,296	51,861	40,715
Mobile Sources	14,064	13,536	12,641	8,628	7,645	6,662	4,484	3,806	3,128	1,912
Industrial Fuel Combustion & Processes	70,994	72,558	41,096	36,662	35,880	35,098	34,316	33,534	32,752	14,956
All Others	110,934	120,401	17,674	10,475	4,718	3,985	1,940	1,913	2,870	2,545
<b>Total</b>	<b>227,559</b>	<b>243,439</b>	<b>134,666</b>	<b>119,482</b>	<b>121,582</b>	<b>111,629</b>	<b>104,096</b>	<b>77,548</b>	<b>90,611</b>	<b>60,127</b>

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	17%	100%	102%	132%	109%	101%	21%	64%	29%
Mobile Sources	0%	-4%	-10%	-39%	-46%	-53%	-68%	-73%	-78%	-86%
Industrial Fuel Combustion & Processes	0%	2%	-42%	-48%	-49%	-51%	-52%	-53%	-54%	-79%
All Others	0%	9%	-84%	-91%	-96%	-96%	-98%	-98%	-97%	-98%
<b>Total</b>	<b>0%</b>	<b>7%</b>	<b>-41%</b>	<b>-47%</b>	<b>-47%</b>	<b>-51%</b>	<b>-54%</b>	<b>-66%</b>	<b>-60%</b>	<b>-74%</b>

# Mississippi Emission Trends (SO<sub>2</sub>)

**Major Source Category Summary  
Annual SO<sub>2</sub> Emissions**



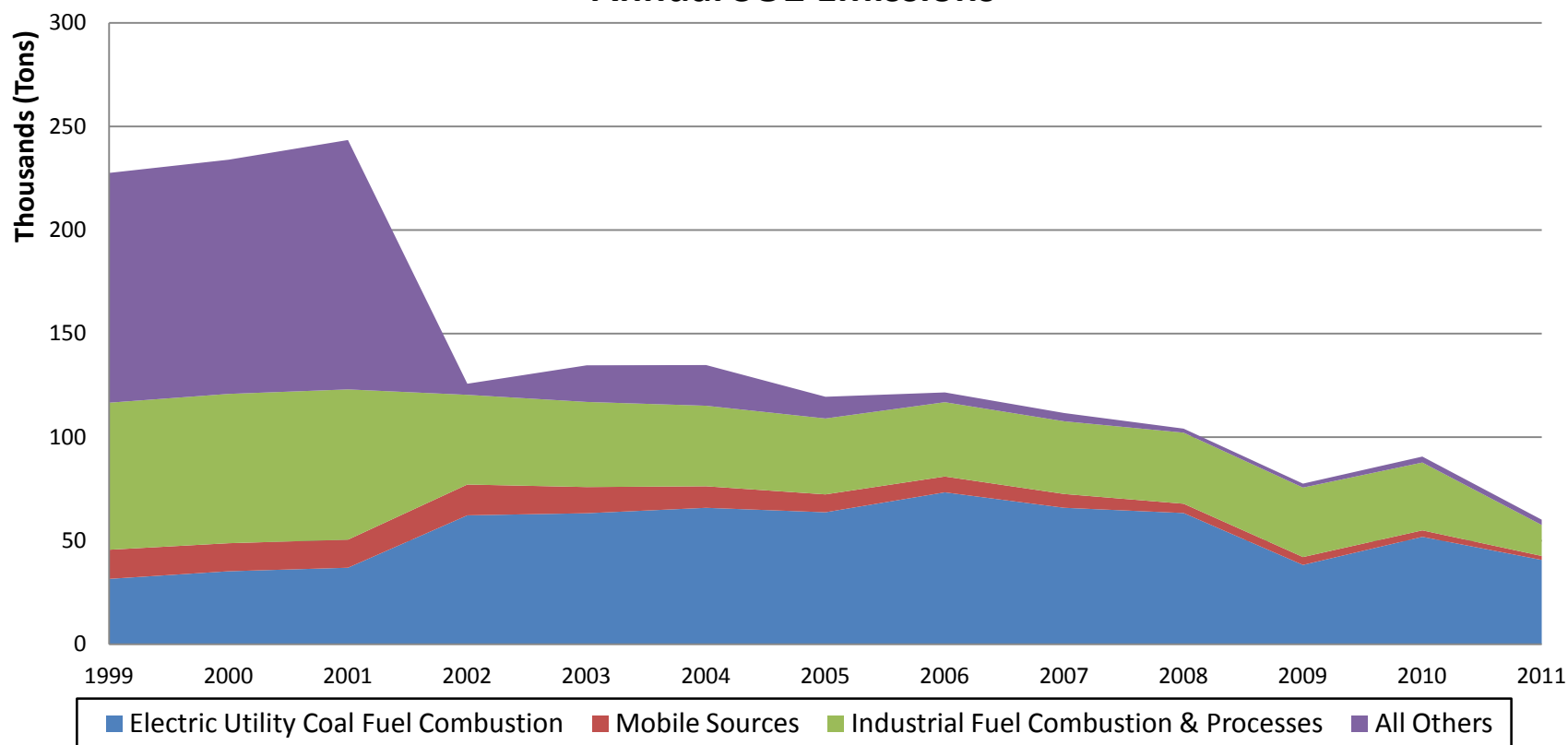
# Mississippi Emission Trends (PM<sub>2.5</sub>)

Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	1,375	1,422	2,082	1,886	2,100	2,093	2,055	1,445	1,464	639
Mobile Sources	7,633	6,789	6,975	8,322	7,939	7,556	6,527	6,299	6,071	5,052
Industrial Fuel Combustion & Processes	36,539	39,878	24,203	24,426	24,304	24,181	24,059	23,936	23,814	19,641
All Others	65,061	62,356	35,819	35,301	35,302	35,319	35,319	35,387	35,386	37,852
<b>Total</b>	<b>110,608</b>	<b>110,445</b>	<b>69,080</b>	<b>69,935</b>	<b>69,645</b>	<b>69,149</b>	<b>67,960</b>	<b>67,067</b>	<b>66,736</b>	<b>63,183</b>

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	3%	51%	37%	53%	52%	50%	5%	7%	-54%
Mobile Sources	0%	-11%	-9%	9%	4%	-1%	-14%	-17%	-20%	-34%
Industrial Fuel Combustion & Processes	0%	9%	-34%	-33%	-33%	-34%	-34%	-34%	-35%	-46%
All Others	0%	-4%	-45%	-46%	-46%	-46%	-46%	-46%	-46%	-42%
<b>Total</b>	<b>0%</b>	<b>0%</b>	<b>-38%</b>	<b>-37%</b>	<b>-37%</b>	<b>-37%</b>	<b>-39%</b>	<b>-39%</b>	<b>-40%</b>	<b>-43%</b>

# Mississippi Emission Trends (PM<sub>2.5</sub>)

**Major Source Category Summary  
Annual SO<sub>2</sub> Emissions**



# Emission Trends Summary

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- ❑ All pollutants have decreased since 1999 in aggregate across Mississippi
- ❑ NO<sub>x</sub> and SO<sub>2</sub> from Electric Utility Fuel Combustion sources show significant decrease over time as a result of Acid Rain Program, NO<sub>x</sub> Budget Trading Program and CAIR control implementation
- ❑ Onroad emission step increase seen between 2004 and 2005 is the result of EPA's method change and MOVES model integration for estimating onroad mobile source emissions

# Air Quality Design Values

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## □ Ozone

- Annual 4<sup>th</sup> highest daily maximum 8-hour average averaged over three consecutive years
- Current standard = 0.075 ppm

## □ PM<sub>2.5</sub> Annual

- Annual arithmetic mean of quarterly means averaged over three consecutive years
- Current standard = 12 ug/m<sup>3</sup>

## □ PM<sub>2.5</sub> 24-Hour

- Annual 98<sup>th</sup> percentile of daily averages averaged over three consecutive years
- Current standard = 35 ug/m<sup>3</sup>

# State-Wide Design Value (DV) Trends

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- Trends in state-wide maximum DV and average DV
  - Max DV: Maximum DVs over all valid trend monitoring sites in the state in each overlapping three year period
  - Average DV: Average of DVs over all valid trend monitoring sites in the state in each overlapping three year period
- Compute linear trend via least-squares regression



# Data Handling Procedures

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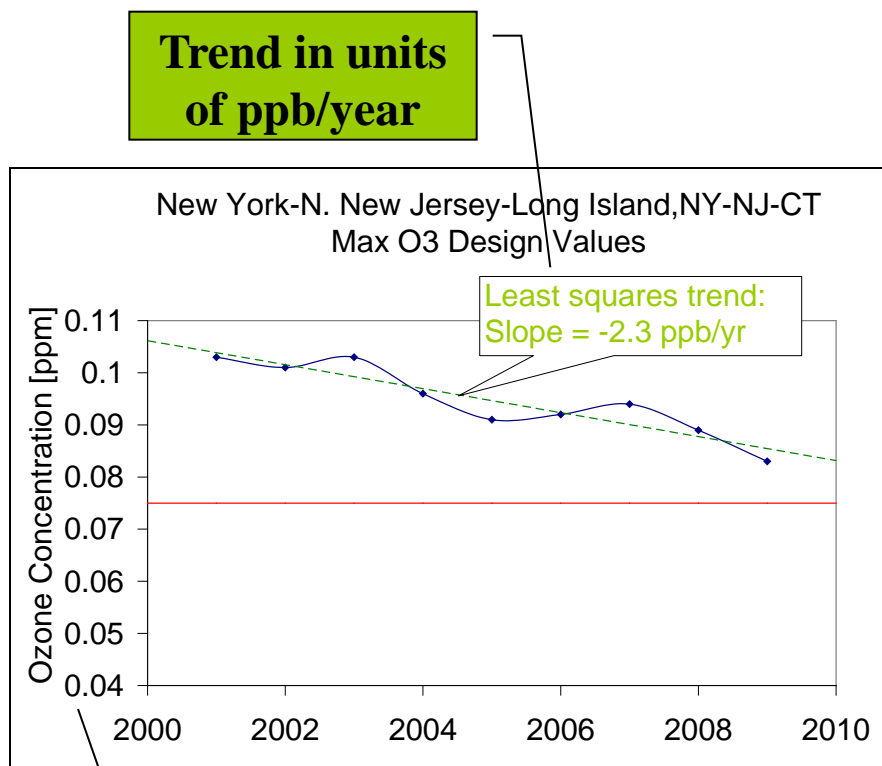
- O<sub>3</sub> design value (DV) for each overlapping three-year period starting with 1999-2001 and ending with 2009-2011
  - DV calculated using annual 4<sup>th</sup> highest daily max 8-hr averages and percent of valid observations, based on EPA data handling conventions
  - Data associated with exceptional events that have received EPA concurrence are omitted
  - Selection of trend sites require valid DV in 9 out of 11 three-year periods between 1999 and 2011
  - Identification of nonattainment areas is with respect to the 2008 8-hour standard only

# Data Handling Procedures

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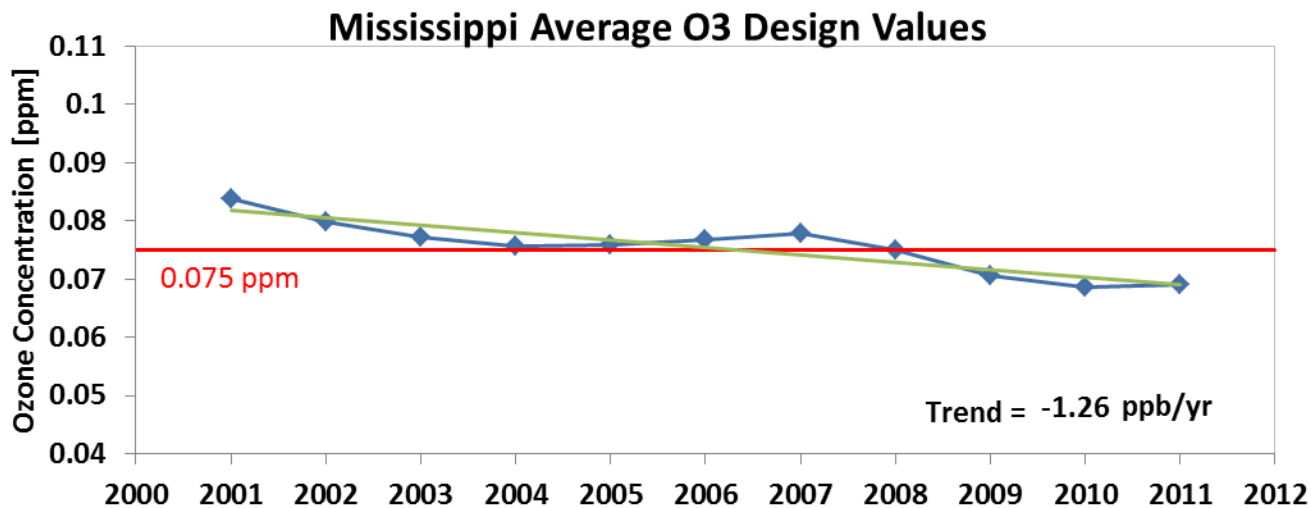
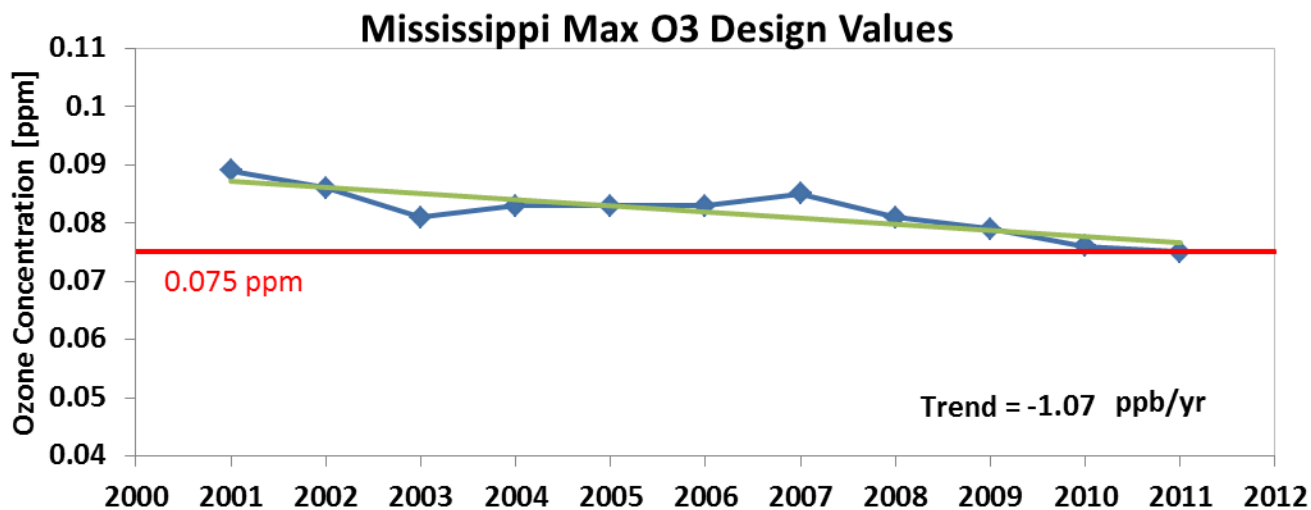
- Annual  $PM_{2.5}$  DV and 24-hr  $PM_{2.5}$  DV for each overlapping three-year period starting with 1999-2001 and ending with 2009-2011
  - DV calculations based on EPA data handling conventions
  - Data extracted from monitors that have a non-regulatory monitoring type are omitted
  - Selection of trend sites require valid DV in 9 out of 11 three-year periods between 1999 and 2011

# Trend Calculation



- Trends based on linear least squares fit to rolling three year design values (DVs)
- Negative trend indicates improving air quality
- DVs based on each 3-year period: 1999-2001, 2000-2002, ... 2009-2011
- Notes
  - On plots, DVs are for three year period ending in year shown (i.e., 2009-2011 DV plotted as 2011 value)
  - Ozone trend values expressed as ppb/year (1,000 ppb = 1 ppm); DVs are plotted as ppm

# Max/Ave O<sub>3</sub> DVs and Trend



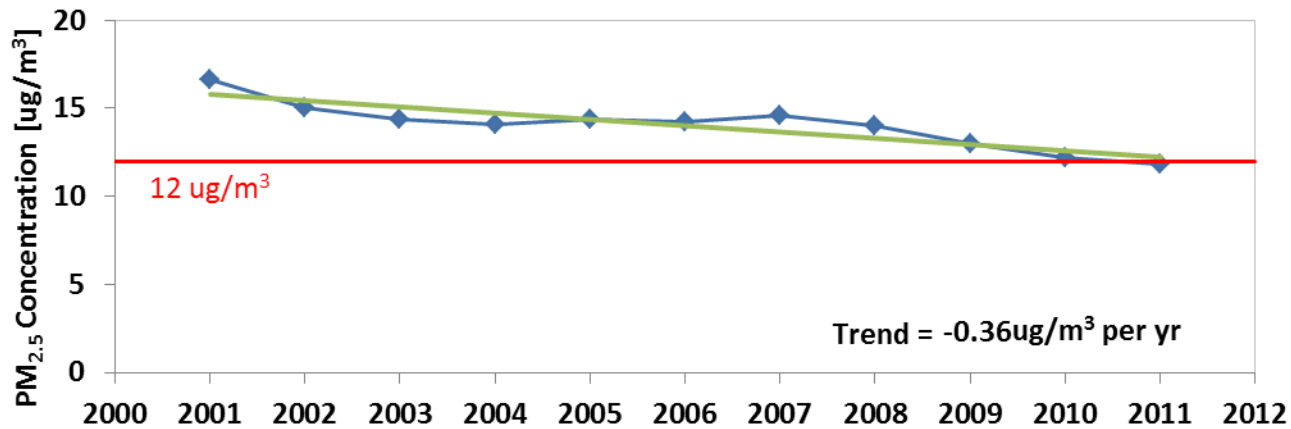
# Ozone Trends by Site in Mississippi

Monitoring Sites	County	2009-2011 DV [ppm]	Trend [ppm/yr]
2800100044420101	Adams, MS	N/A	-1.62
2801100014420101	Bolivar, MS	N/A	-1.10
2803300024420101	DeSoto, MS	0.073	-1.19
2804700084420101	Harrison, MS	0.075	-0.83
2804900104420101	Hinds, MS	0.067	-1.09
2805900064420101	Jackson, MS	0.072	-1.12
2807500034420101	Lauderdale, MS	0.062	-1.53
2808100054420101	Lee, MS	0.065	-1.84

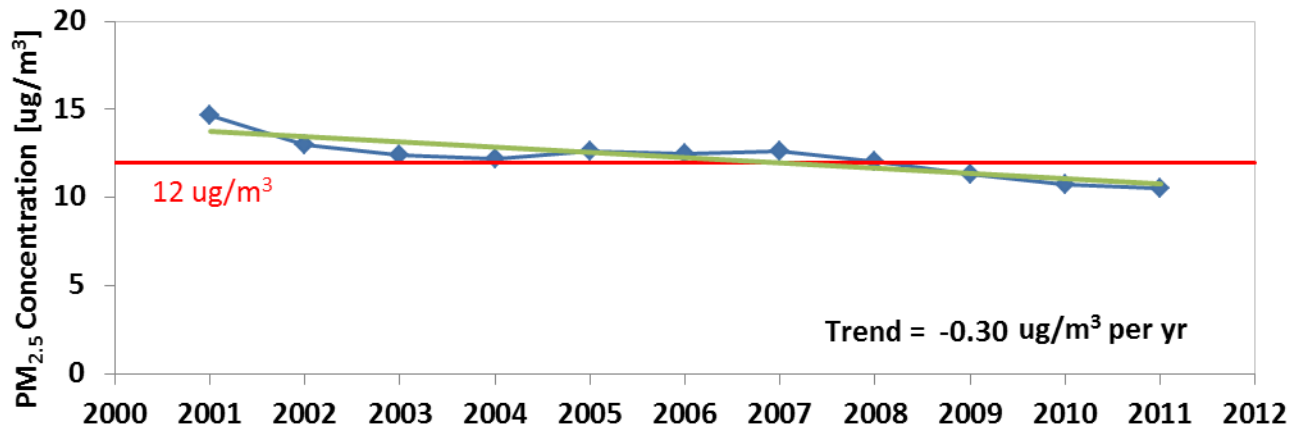
Note: Only monitoring sites meeting data completeness criteria listed

# Max/Ave PM<sub>2.5</sub> Annual DVs and Trend

Mississippi Max PM<sub>2.5</sub> Annual Design Values

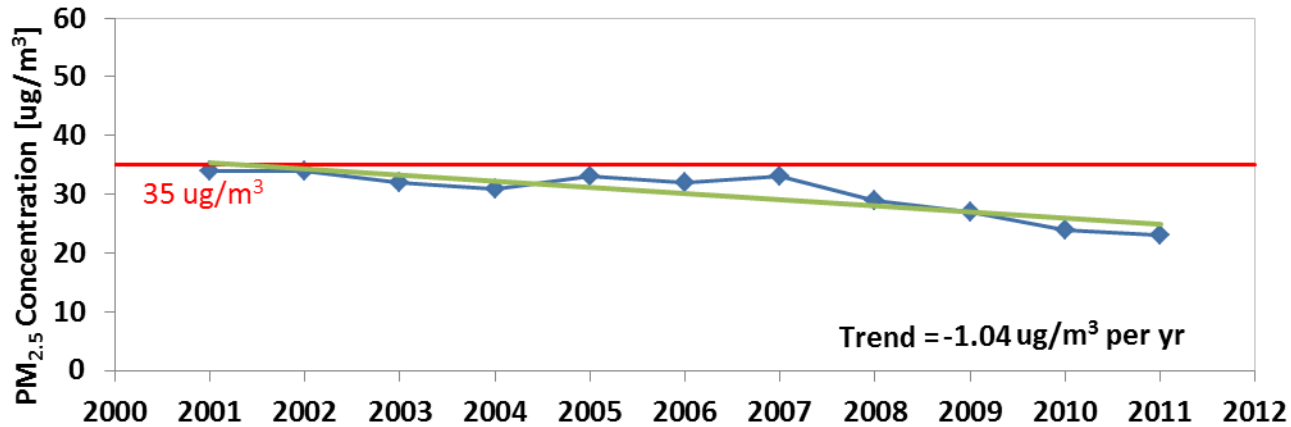


Mississippi Average PM<sub>2.5</sub> Annual Design Values

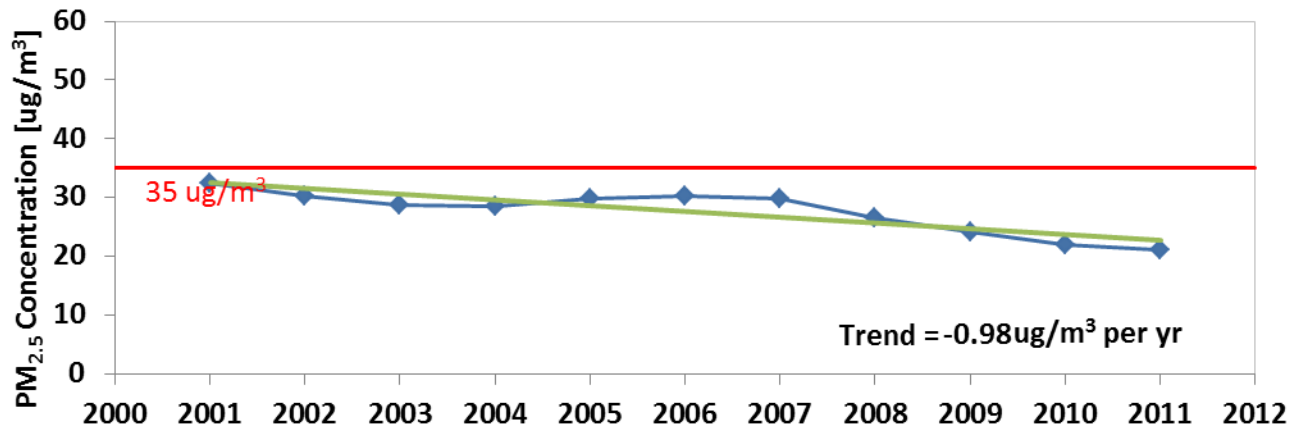


# Max/Ave PM<sub>2.5</sub> 24-Hour DVs and Trend

Mississippi Max PM<sub>2.5</sub> 24-Hour Design Values



Mississippi Average PM<sub>2.5</sub> 24-Hour Design Values



# PM<sub>2.5</sub> Trends by Site in Mississippi

Monitoring Site	County	2009-2011 DV [ug/m <sup>3</sup> ]		Trend [ug/m <sup>3</sup> per year]	
		Annual	24-Hr	Annual DV	24-Hr DV
280010004	Adams	N/A	N/A	-0.14	-1.30
280110001	Bolivar	N/A	N/A	-0.24	-1.20
280330002	DeSoto	9.9	20	-0.32	-1.07
280350004	Forrest	11.6	22	-0.17	-0.85
280470008	Harrison	9.6	18	-0.27	-0.88
280590006	Jackson	9.5	21	-0.35	-0.69
280670002	Jones	11.8	23	-0.36	-1.02
280810005	Lee	10.9	22	-0.22	-0.52
280870001	Lowndes	N/A	N/A	N/A	-0.88

Note: Only monitoring sites meeting data completeness criteria listed



# Air Quality Trends Summary

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- Average O<sub>3</sub> and PM<sub>2.5</sub> design values have decreased since 1999 in Mississippi.
- O<sub>3</sub> design values have decreased in Memphis, TN-MS-AR, the only currently designated O<sub>3</sub> non-attainment area in Mississippi. There are no currently designated PM<sub>2.5</sub> non-attainment areas in Mississippi.