

Emission and Air Quality Trends Review

New Hampshire

May 2013

Project Objective

- 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

- 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

- 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_x, SO₂, and PM_{2.5}
- Project Improvement
 - The Study Team augmented above data with year specific CEM emissions (2002 through 2011)

Emission Changes

- 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

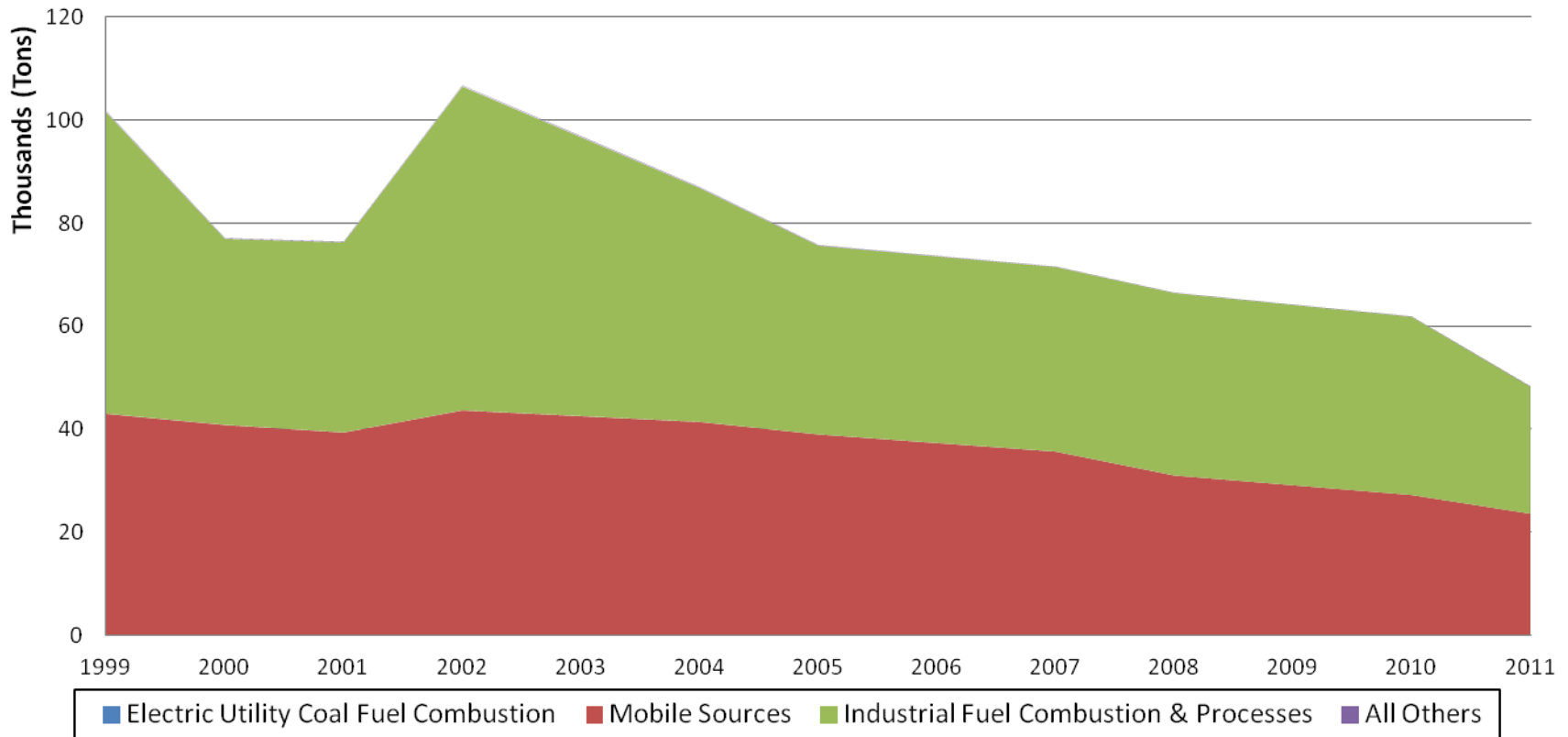
New Hampshire Emission Trends (VOC)

Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	67	73	77	81	81	86	75	63	66	45
Mobile Sources	42,979	39,342	42,512	38,953	37,279	35,605	30,964	29,069	27,174	23,549
Industrial Fuel Combustion & Processes	58,557	36,938	54,179	36,680	36,274	35,868	35,462	35,056	34,650	24,718
All Others	92	78	97	62	40	41	36	38	40	78
Total	101,694	76,432	96,865	75,776	73,674	71,600	66,537	64,226	61,929	48,391

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	10%	15%	21%	22%	28%	12%	-5%	-1%	-32%
Mobile Sources	0%	-8%	-1%	-9%	-13%	-17%	-28%	-32%	-37%	-45%
Industrial Fuel Combustion & Processes	0%	-37%	-7%	-37%	-38%	-39%	-39%	-40%	-41%	-58%
All Others	0%	-15%	6%	-33%	-57%	-55%	-61%	-58%	-57%	-14%
Total	0%	-25%	-5%	-25%	-28%	-30%	-35%	-37%	-39%	-52%

New Hampshire Emission Trends (VOC)

**Major Source Category Summary
Annual VOC Emissions**



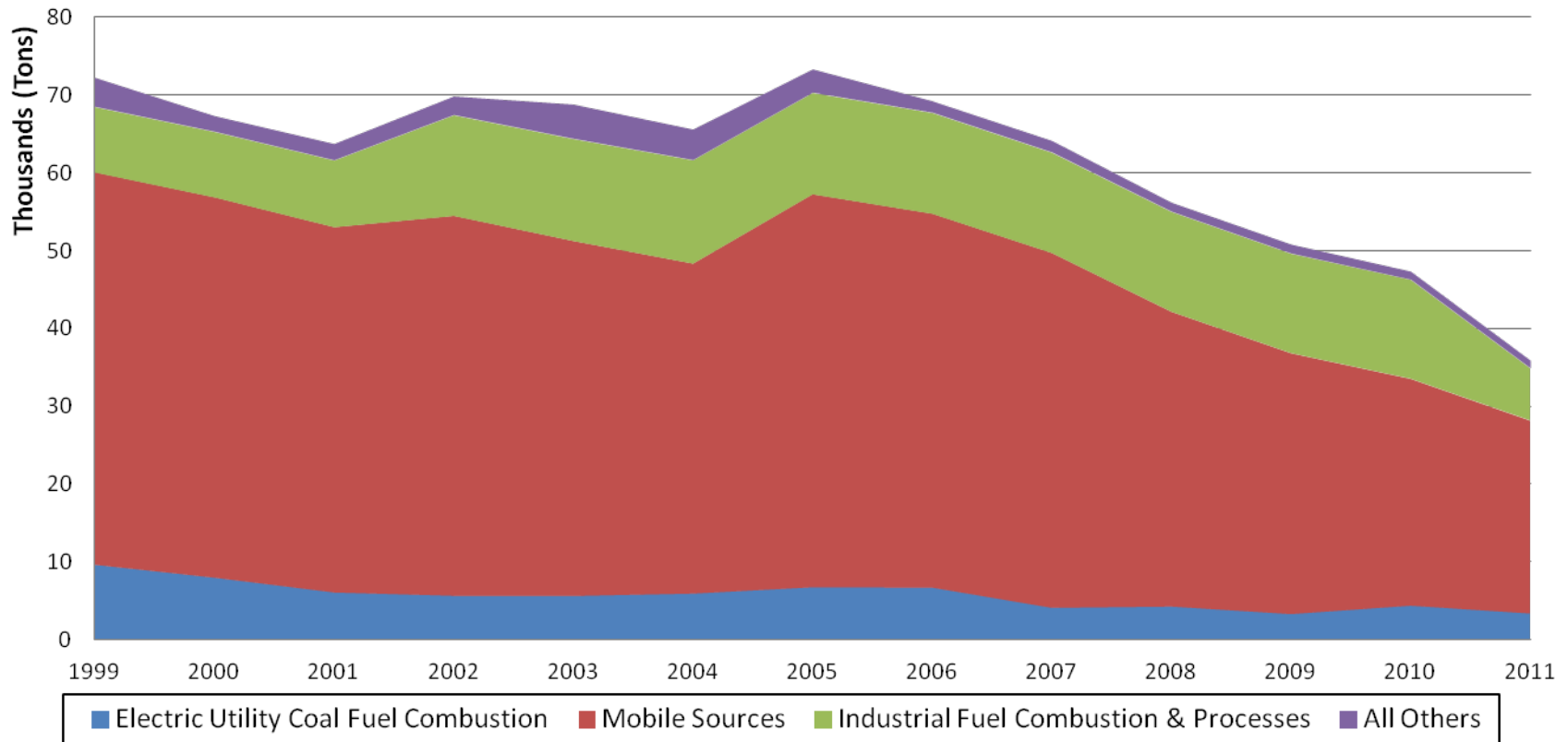
New Hampshire Emission Trends (NO_x)

Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	9,661	6,107	5,661	6,778	6,732	4,134	4,294	3,332	4,405	3,414
Mobile Sources	50,420	46,932	45,600	50,495	48,041	45,587	37,868	33,502	29,135	24,760
Industrial Fuel Combustion & Processes	8,431	8,599	13,136	13,053	12,991	12,929	12,867	12,805	12,743	6,713
All Others	3,722	2,082	4,391	2,987	1,452	1,464	1,138	1,144	1,020	970
Total	72,233	63,720	68,788	73,313	69,216	64,114	56,168	50,783	47,303	35,857

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	-37%	-41%	-30%	-30%	-57%	-56%	-66%	-54%	-65%
Mobile Sources	0%	-7%	-10%	0%	-5%	-10%	-25%	-34%	-42%	-51%
Industrial Fuel Combustion & Processes	0%	2%	56%	55%	54%	53%	53%	52%	51%	-20%
All Others	0%	-44%	18%	-20%	-61%	-61%	-69%	-69%	-73%	-74%
Total	0%	-12%	-5%	1%	-4%	-11%	-22%	-30%	-35%	-50%

New Hampshire Emission Trends (NO_x)

**Major Source Category Summary
Annual NO_x Emissions**



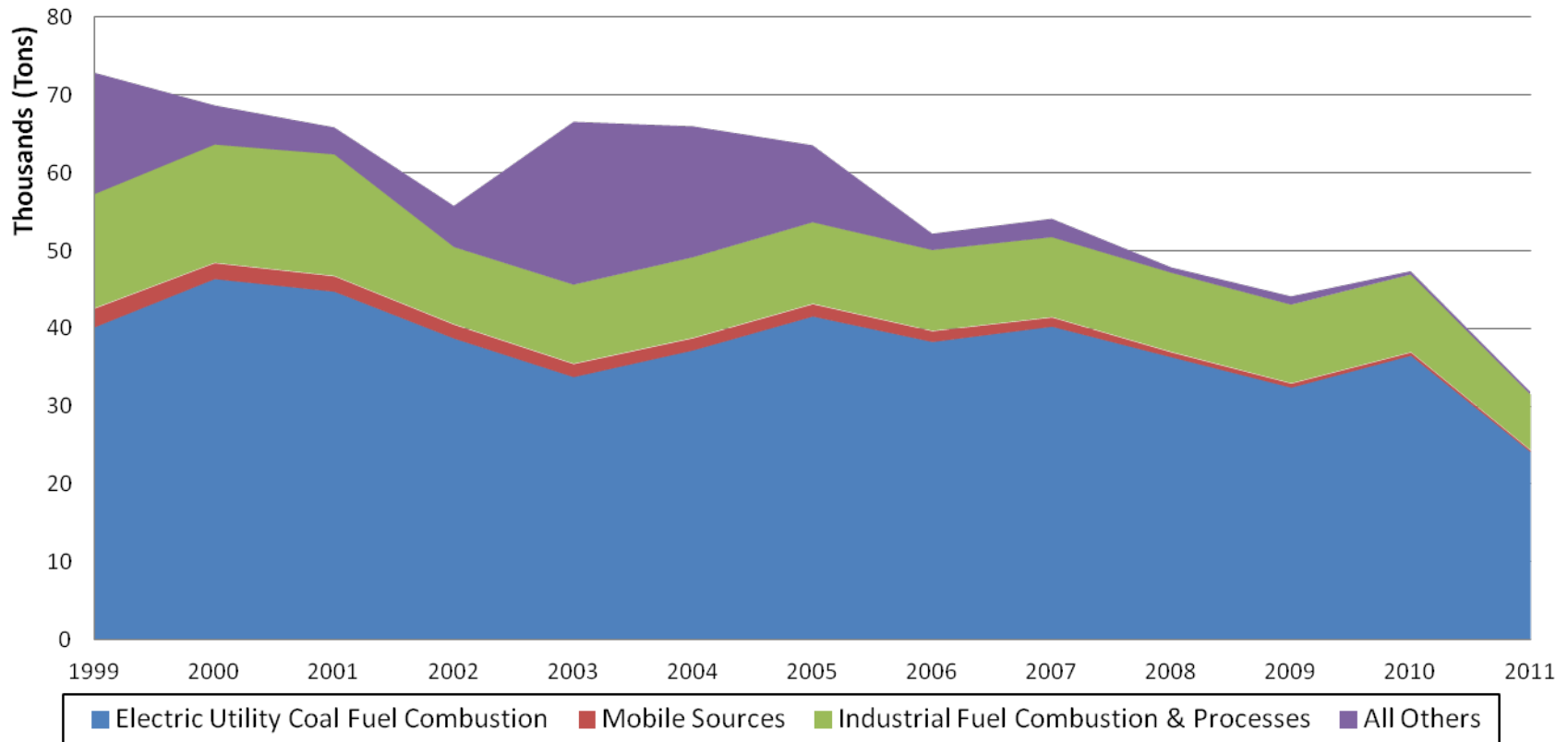
New Hampshire Emission Trends (SO₂)

Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	40,179	44,735	33,751	41,542	38,264	40,231	36,293	32,393	36,504	24,098
Mobile Sources	2,413	1,980	1,678	1,587	1,386	1,185	637	524	411	224
Industrial Fuel Combustion & Processes	14,728	15,697	10,184	10,528	10,424	10,319	10,215	10,110	10,006	7,138
All Others	15,595	3,477	20,997	9,929	2,105	2,370	688	1,070	426	343
Total	72,915	65,888	66,610	63,586	52,179	54,105	47,833	44,097	47,348	31,803

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	11%	-16%	3%	-5%	0%	-10%	-19%	-9%	-40%
Mobile Sources	0%	-18%	-30%	-34%	-43%	-51%	-74%	-78%	-83%	-91%
Industrial Fuel Combustion & Processes	0%	7%	-31%	-29%	-29%	-30%	-31%	-31%	-32%	-52%
All Others	0%	-78%	35%	-36%	-87%	-85%	-96%	-93%	-97%	-98%
Total	0%	-10%	-9%	-13%	-28%	-26%	-34%	-40%	-35%	-56%

New Hampshire Emission Trends (SO₂)

Major Source Category Summary
Annual SO₂ Emissions



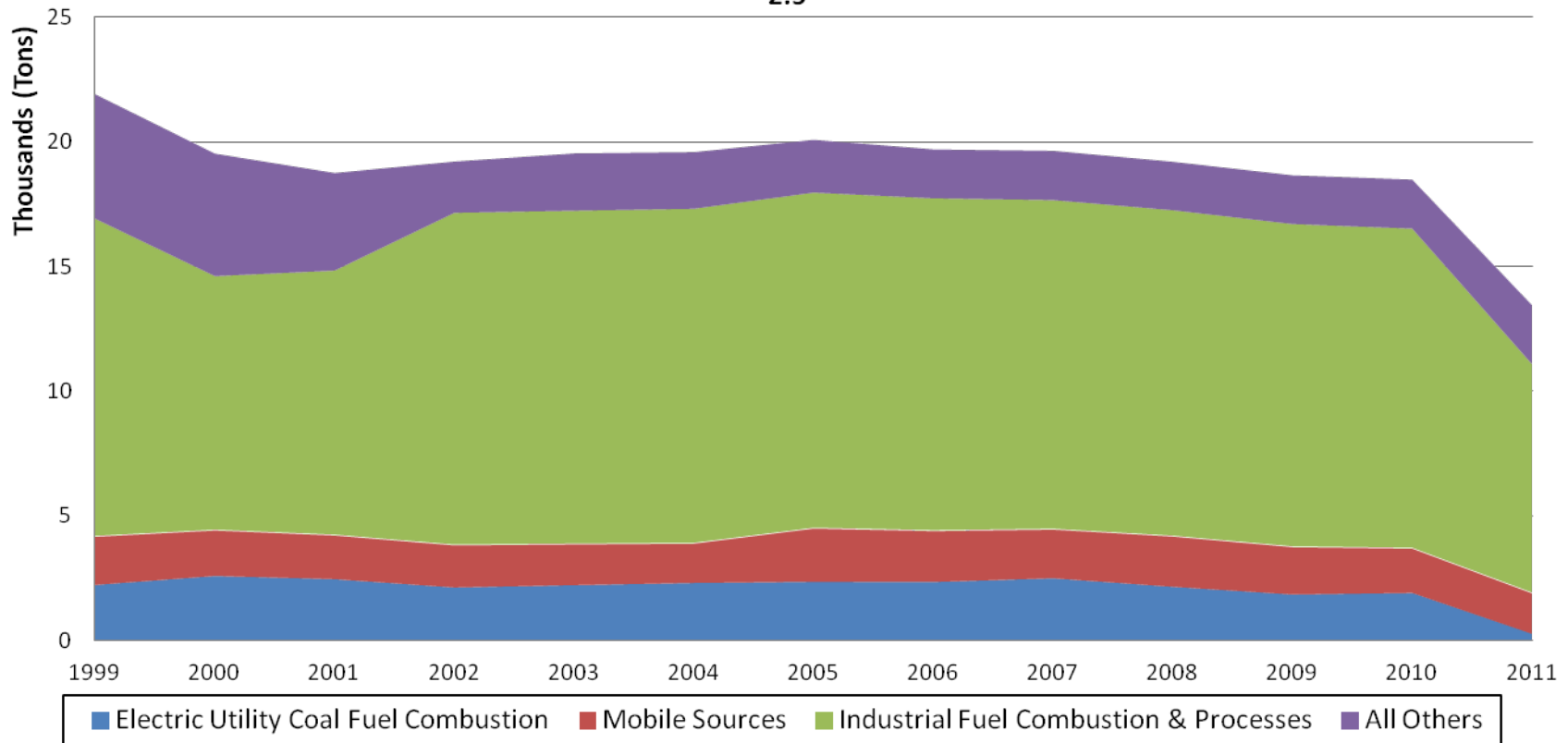
New Hampshire Emission Trends (PM_{2.5})

Source Category	Annual Emissions (Tons)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	2,236	2,469	2,230	2,363	2,355	2,504	2,163	1,852	1,914	270
Mobile Sources	1,937	1,756	1,636	2,141	2,049	1,958	2,020	1,903	1,786	1,630
Industrial Fuel Combustion & Processes	12,746	10,610	13,377	13,464	13,335	13,207	13,079	12,950	12,822	9,175
All Others	4,997	3,919	2,299	2,122	1,965	1,975	1,943	1,956	1,968	2,367
Total	21,917	18,754	19,541	20,089	19,705	19,644	19,205	18,662	18,490	13,442

Source Category	Annual Emissions Change (Percent since 1999)									
	1999	2001	2003	2005	2006	2007	2008	2009	2010	2011
Electric Utility Coal Fuel Combustion	0%	10%	0%	6%	5%	12%	-3%	-17%	-14%	-88%
Mobile Sources	0%	-9%	-16%	10%	6%	1%	4%	-2%	-8%	-16%
Industrial Fuel Combustion & Processes	0%	-17%	5%	6%	5%	4%	3%	2%	1%	-28%
All Others	0%	-22%	-54%	-58%	-61%	-60%	-61%	-61%	-61%	-53%
Total	0%	-14%	-11%	-8%	-10%	-10%	-12%	-15%	-16%	-39%

New Hampshire Emission Trends (PM_{2.5})

Major Source Category Summary
Annual PM_{2.5} Emissions



Emission Trends Summary

- ❑ All pollutants have decreased since 1999 in aggregate across New Hampshire
- ❑ NO_x and SO₂ from Electric Utility Fuel Combustion sources show significant decrease over time as a result of Acid Rain Program, NO_x 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

□ Ozone

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

□ PM_{2.5} Annual

- Annual arithmetic mean of quarterly means averaged over three consecutive years
- Current standard = 12 ug/m³

□ PM_{2.5} 24-Hour

- Annual 98th percentile of daily averages averaged over three consecutive years
- Current standard = 35 ug/m³

State-Wide Design Value (DV) Trends

- 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

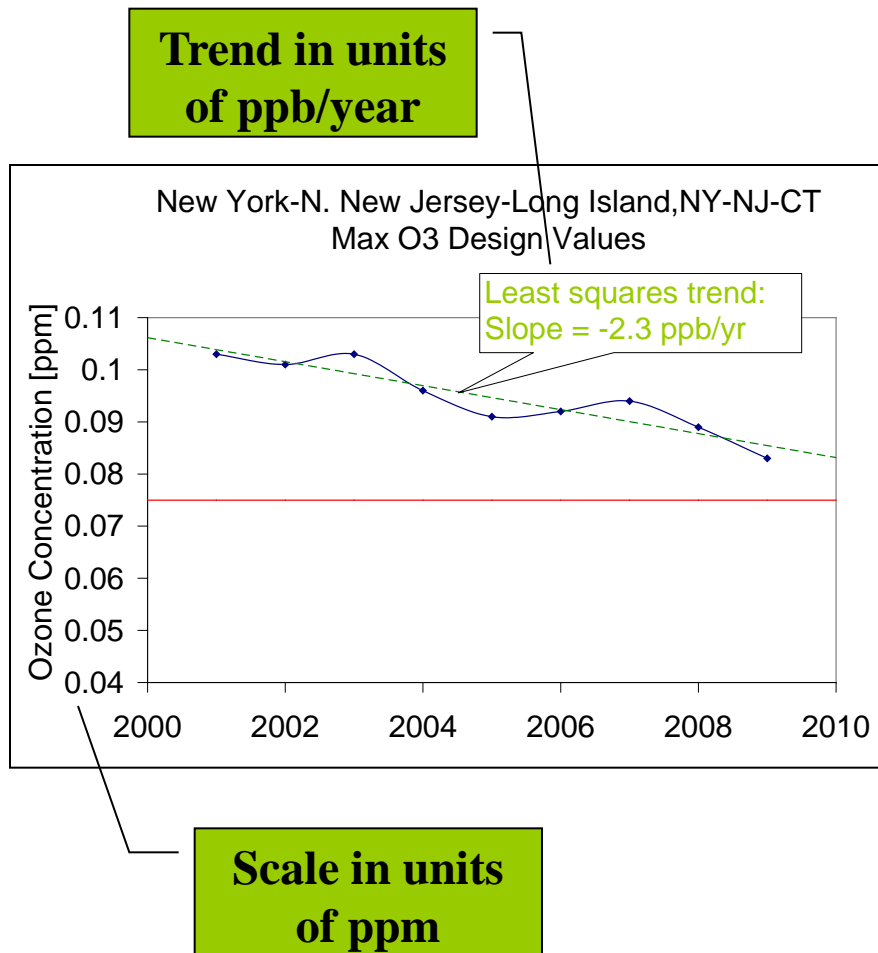
Data Handling Procedures

- O₃ design value (DV) for each overlapping three-year period starting with 1999-2001 and ending with 2009-2011
 - DV calculated using annual 4th 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

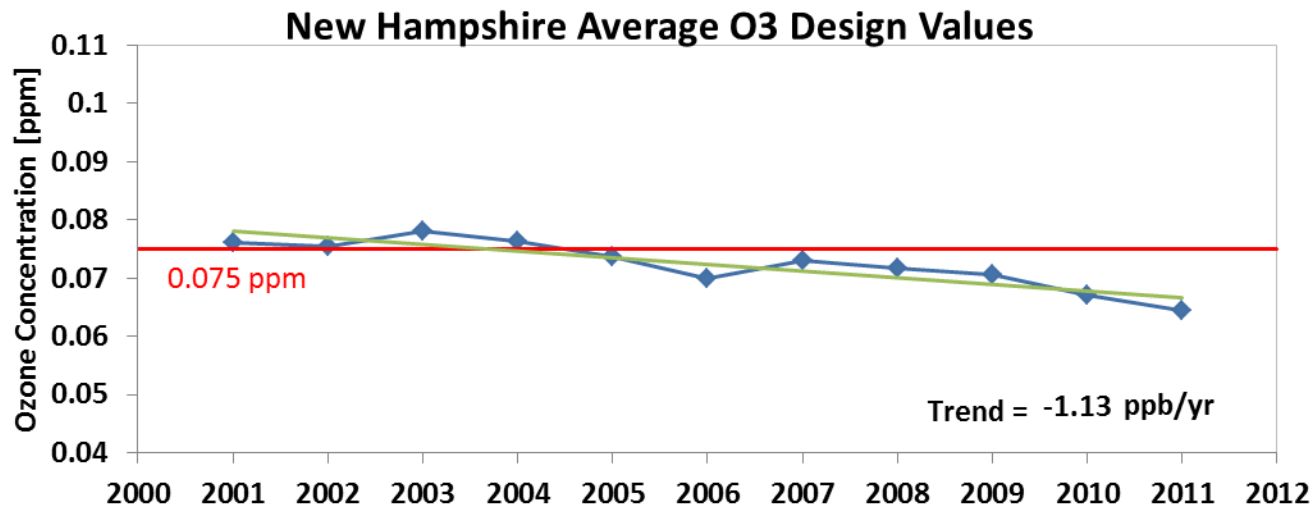
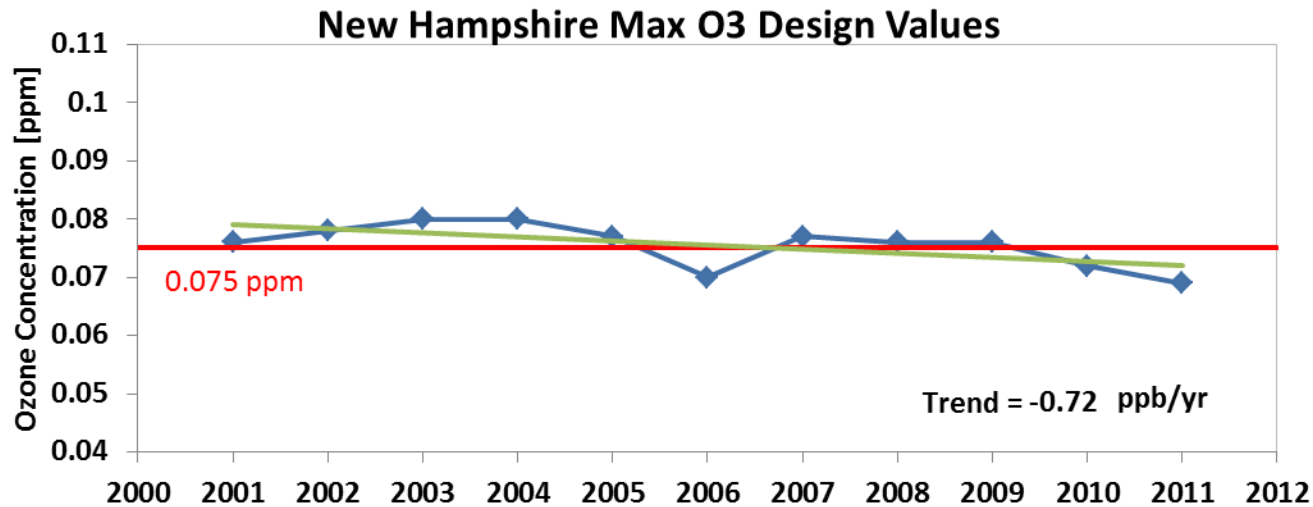
- Annual PM_{2.5} DV and 24-hr PM_{2.5} DV for each overlapping three-year period starting with 1999-2001 and ending with 2009-2011
 - DV calculations based on EPA data handling conventions
 - Data extracted from monitors that have a non-regulatory monitoring type are omitted
 - Selection of trend sites 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 O₃ DVs and Trend



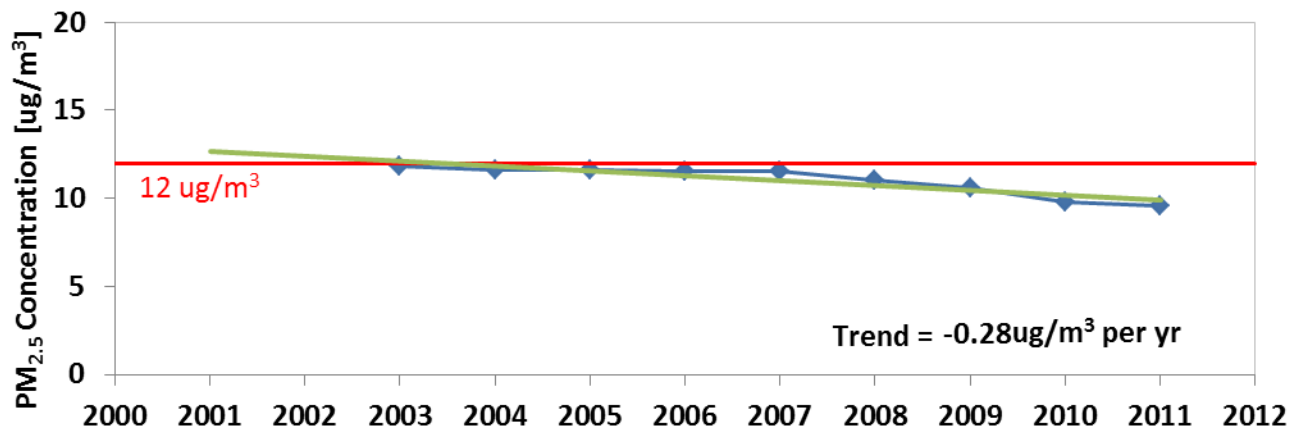
Ozone Trends by Site in New Hampshire

Monitoring Sites	County	2009-2011 DV [ppm]	Trend [ppm/yr]
3300120044420101	Belknap, NH	0.062	-1.70
3300500074420101	Cheshire, NH	0.062	-1.35
3300740014420101	Coos, NH	0.069	-0.72

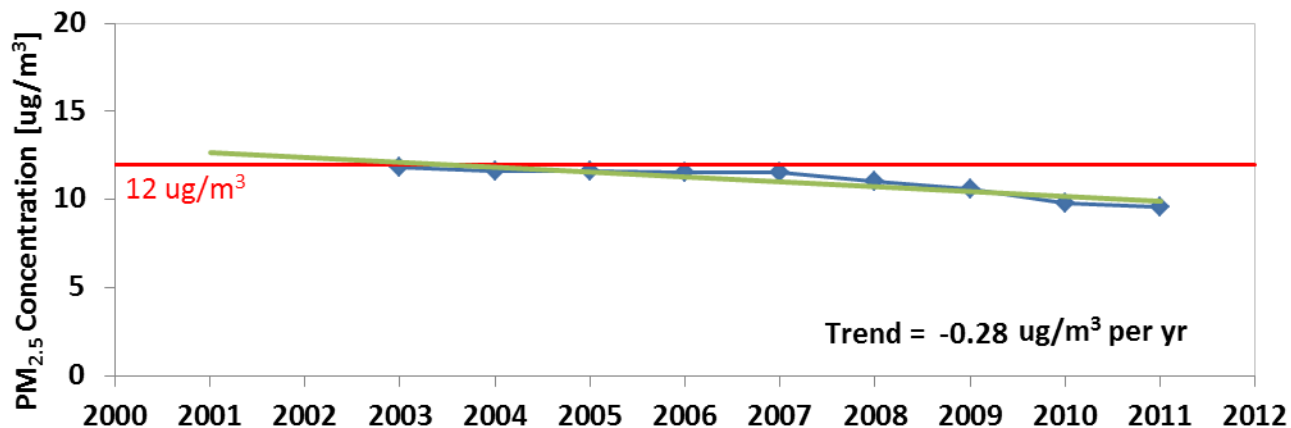
Note: Only monitoring sites meeting data completeness criteria listed

Max/Ave PM_{2.5} Annual DVs and Trend

New Hampshire Max PM2.5 Annual Design Values

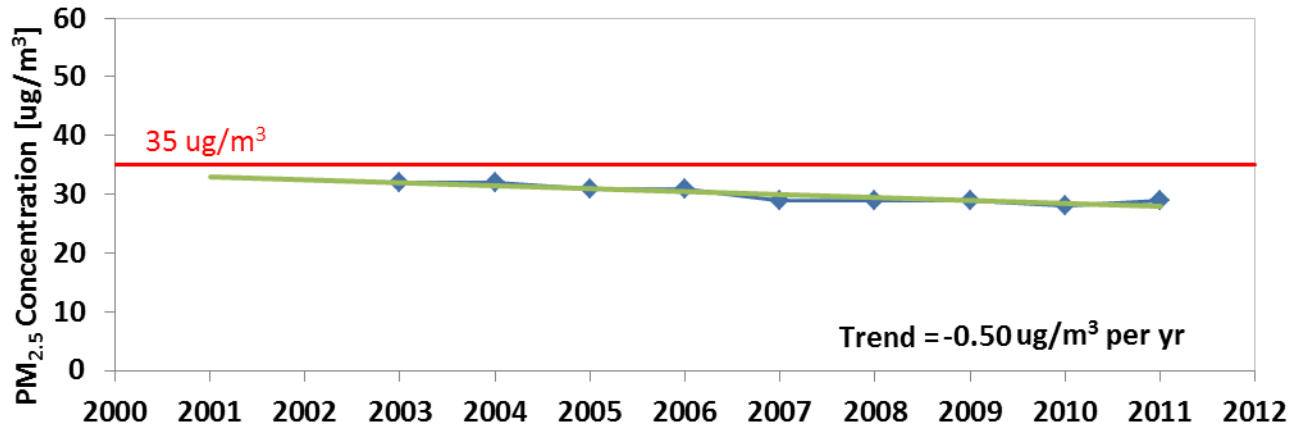


New Hampshire Average PM2.5 Annual Design Values

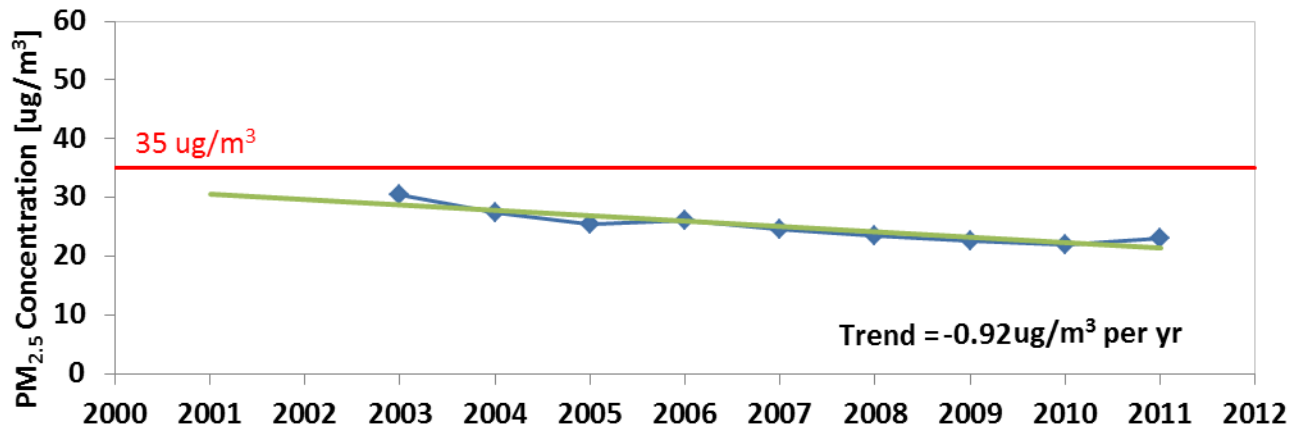


Max/Ave PM_{2.5} 24-Hour DVs and Trend

New Hampshire Max PM_{2.5} 24-Hour Design Values



New Hampshire Average PM_{2.5} 24-Hour Design Values



PM_{2.5} Trends by Site in New Hampshire

Monitoring Site	County	2009-2011 DV [ug/m ³]		Trend [ug/m ³ per year]	
		Annual	24-Hr	Annual DV	24-Hr DV
330012004	Belknap	N/A	17	N/A	-1.33
330050007	Cheshire	9.6	29	-0.28	-0.50

Note: Only monitoring sites meeting data completeness criteria listed

Air Quality Trends Summary

- Average O₃ design values have decreased since 1999 in New Hampshire. Average annual and 24-hour PM_{2.5} design values, based on data from one and two monitors, respectively, have decreased since 2001 (incomplete data in 1999 and 2000) in New Hampshire
- There are no currently designated O₃ or PM_{2.5} non-attainment areas in New Hampshire