Indiana Department of Environmental Management

The States' View of the Air

Massachusetts

2016

Keith Baugues
Assistant Commissioner

Indiana Department of Environmental Management
Office of Air Quality
April 6, 2016

EXECUTIVE SUMMARY

Air quality across the nation has improved over the past ten years or more. Unfortunately the message often found in the press, is that the air quality is terrible. This analysis demonstrates the progress made from 2000 through 2014 for ozone and fine particles (PM-2.5).

Figures 1 through 3 show the progress made for ozone, 24-hour PM-2.5 and annual PM-2.5. The bars represent the population of each period (based on the last year in the period). The portion that is green represents the number of people living in counties that measure air quality better than the standard. The portion of the bar that is red represents the number of people living in counties that measure air quality at levels above the standard. The blue portion of the bar represents the number of people that live in counties where air quality is not measured.

These assessments have been based on results of individual monitors. For example, if a county has two ozone monitors and data for one is rated as a C and the other as a D, the population of the county is split in half and half is assigned to each category; meeting the standard and not meeting the standard.

Compliance with standards is determined on a three year basis. In 2000 – 2002 approximately 53 million people lived in counties that measured ozone air quality levels better than the standard. By 2012 – 2014 this had increased to 195 million people.

The situation for fine particles (PM-2.5) is very similar. In 2000 – 2002, 115 million people lived in counties where 24-hour PM-2.5 levels were measured below the standard. By 2012 – 2014 this had increased to 187 million people. Of note, is that monitoring for PM-2.5 is only conducted in counties with a total of 193 million people.

In the 2000 – 2002 period, 138 million people lived in counties where annual PM-2.5 levels were measured below the standard. By 2012 – 2014 this had increased to 186 million people. Approximately 7 million people lived in counties where annual PM-2.5 levels were measured above the standard. Much of this increase is due to the implementation of the new annual PM-2.5 standard.

Even with the improvements made in air quality, there are still areas of the country that need further improvement. Figure 4 shows states that have 8 hour ozone nonattainment areas based on 2012 – 2014 data. Sixteen states are included.

Figure 5 shows those states that violate the 24-hour PM-2.5 standard based on 2012 – 2014 data. Only five states are included.

Figure 6 shows those states that violate the annual PM-2.5 standard based on 2012 – 2014 data. Only Arizona, California, Ohio, and Pennsylvania are included.

The bottom line is that most areas of the country were meeting the PM-2.5 standard at the 2011 – 2013 review. There are still several areas of the country that violate the current ozone standard. Many areas have made considerable progress in lowering ozone levels, but further work remains to be done. During 2012, U.S. EPA lowered the annual PM-2.5 standard. This analysis compares historical air quality levels with this new standard.

Figure 1

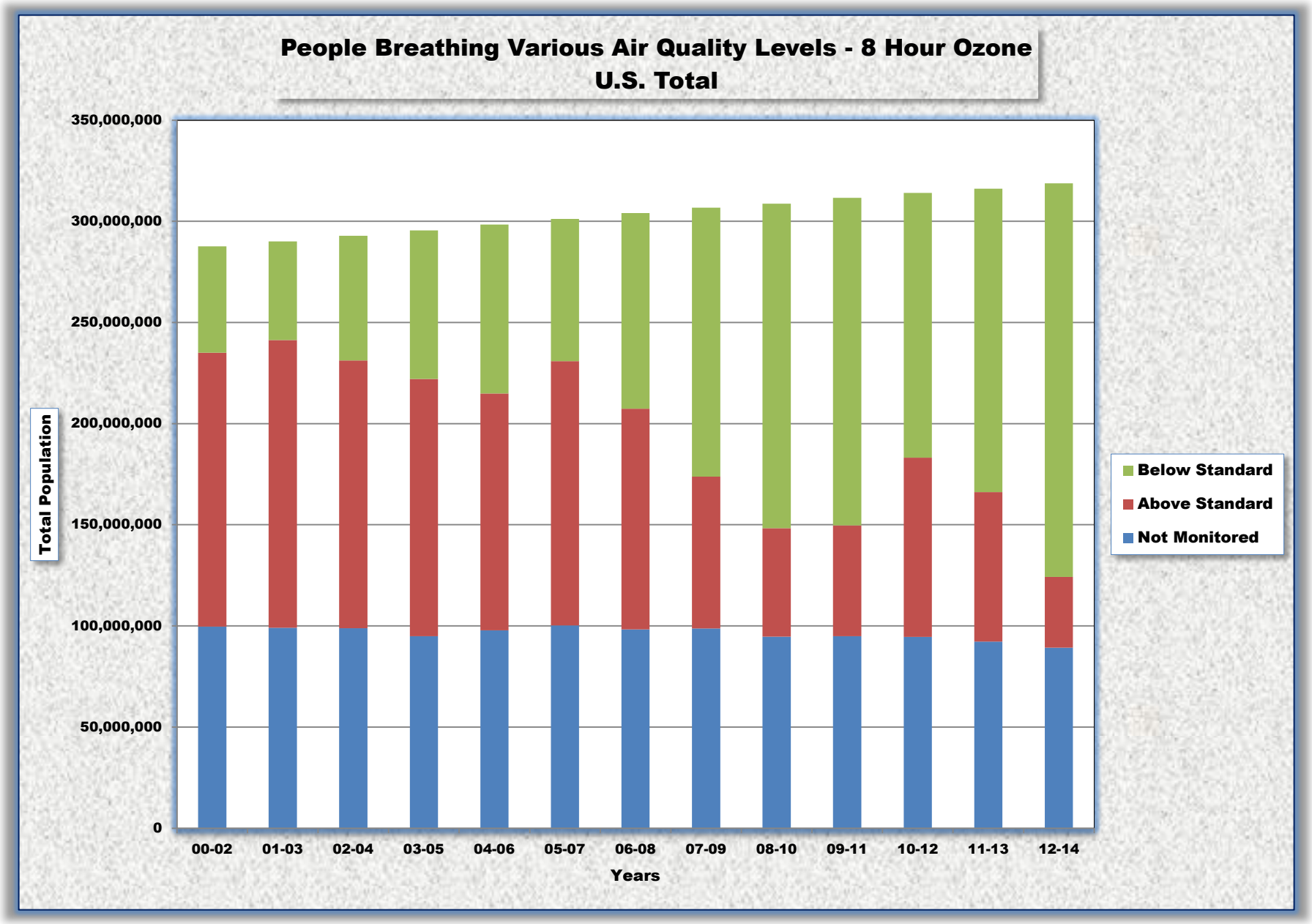

People Breathing Various Air Quality Levels - 8 Hour Ozone
U.S. Total
350,000,000
300,000,000
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
0
Total Population
00-02
01-03
02-04
03-05
04-06
05-07
06-08
07-09
08-10
09-11
10-12
11-13
12-14
Years
Below Standard
Above Standard
Not Monitored

Figure 2

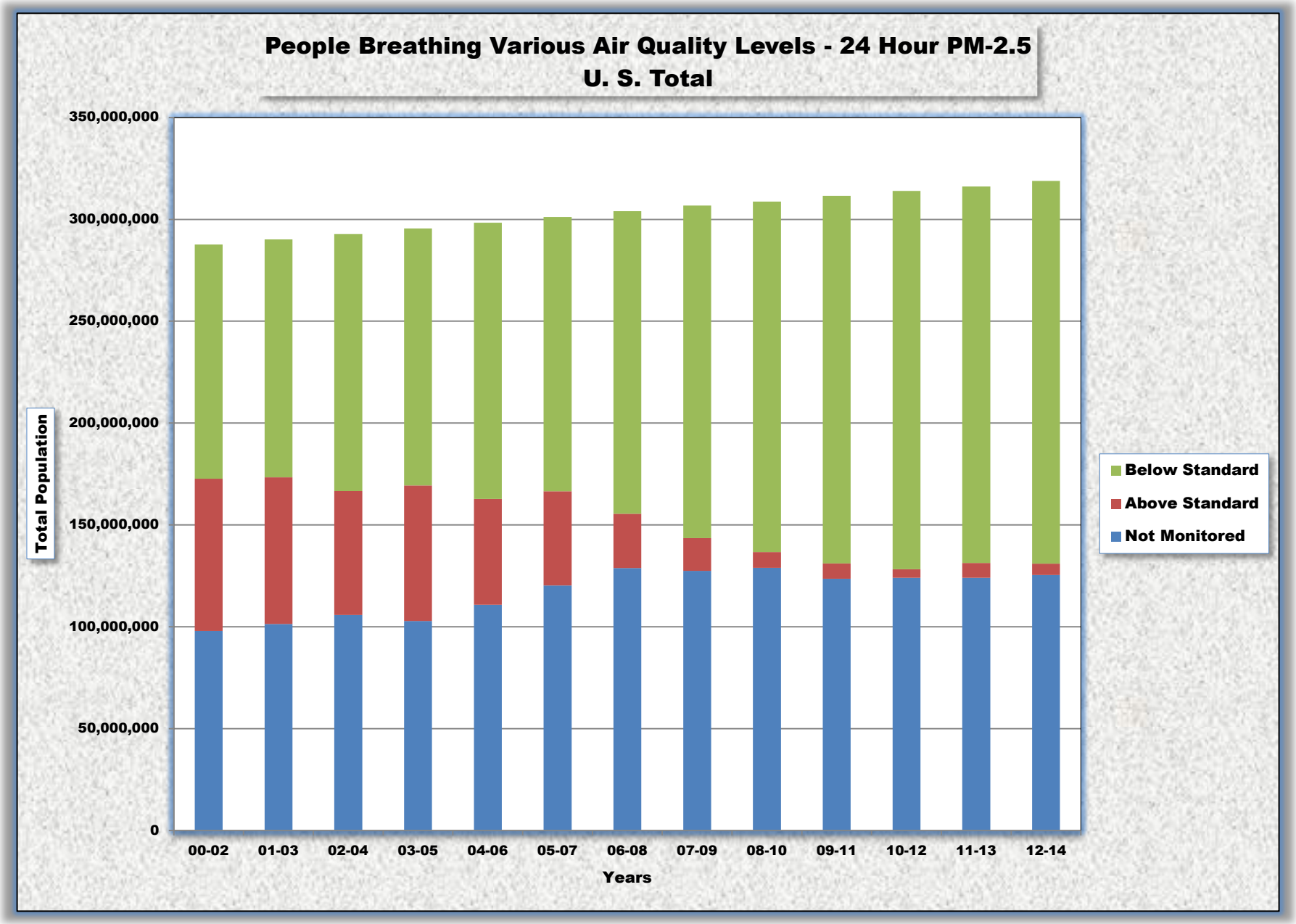

People Breathing Various Air Quality Levels - 24 Hour PM-2.5
U. S. Total
350,000,000
300,000,000
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
0
Total Population
00-02
01-03
02-04
03-05
04-06
05-07
06-08
07-09
08-10
09-11
10-12
11-13
12-14
Years
Below Standard
Above Standard
Not Monitored

Figure 3

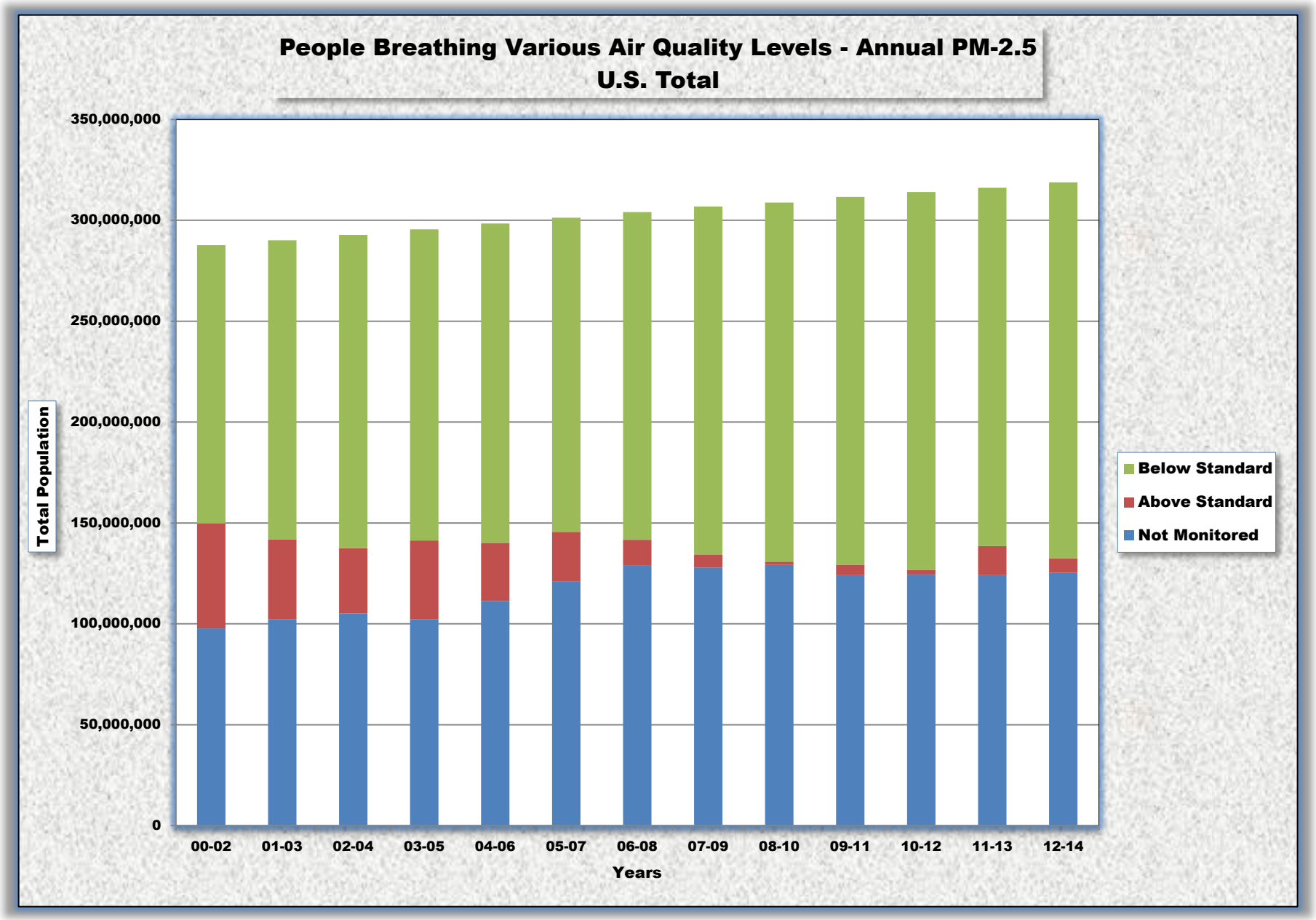

People Breathing Various Air Quality Levels - Annual PM-2.5
U.S. Total
350,000,000
300,000,000
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
0
Total Population
00-02
01-03
02-04
03-05
04-06
05-07
06-08
07-09
08-10
09-11
10-12
11-13
12-14
Years
Below Standard
Above Standard
Not Monitored

Figure 4

Non-Attainment States - 8 Hour Ozone (Map 1)

2012 - 2014

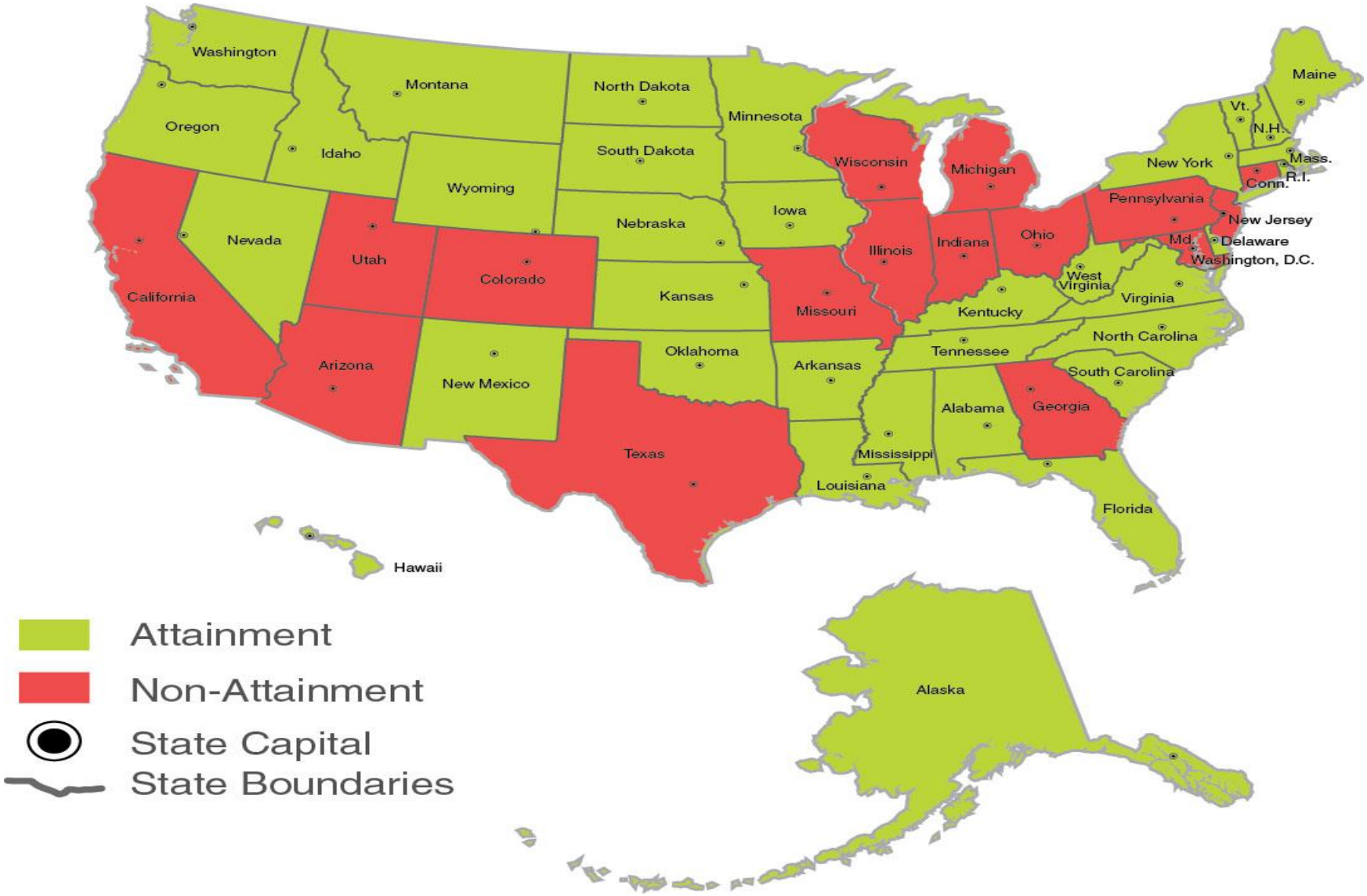


Figure 5

Non-Attainment States – 24 Hour PM-2.5 (Map 2)
2012 - 2014

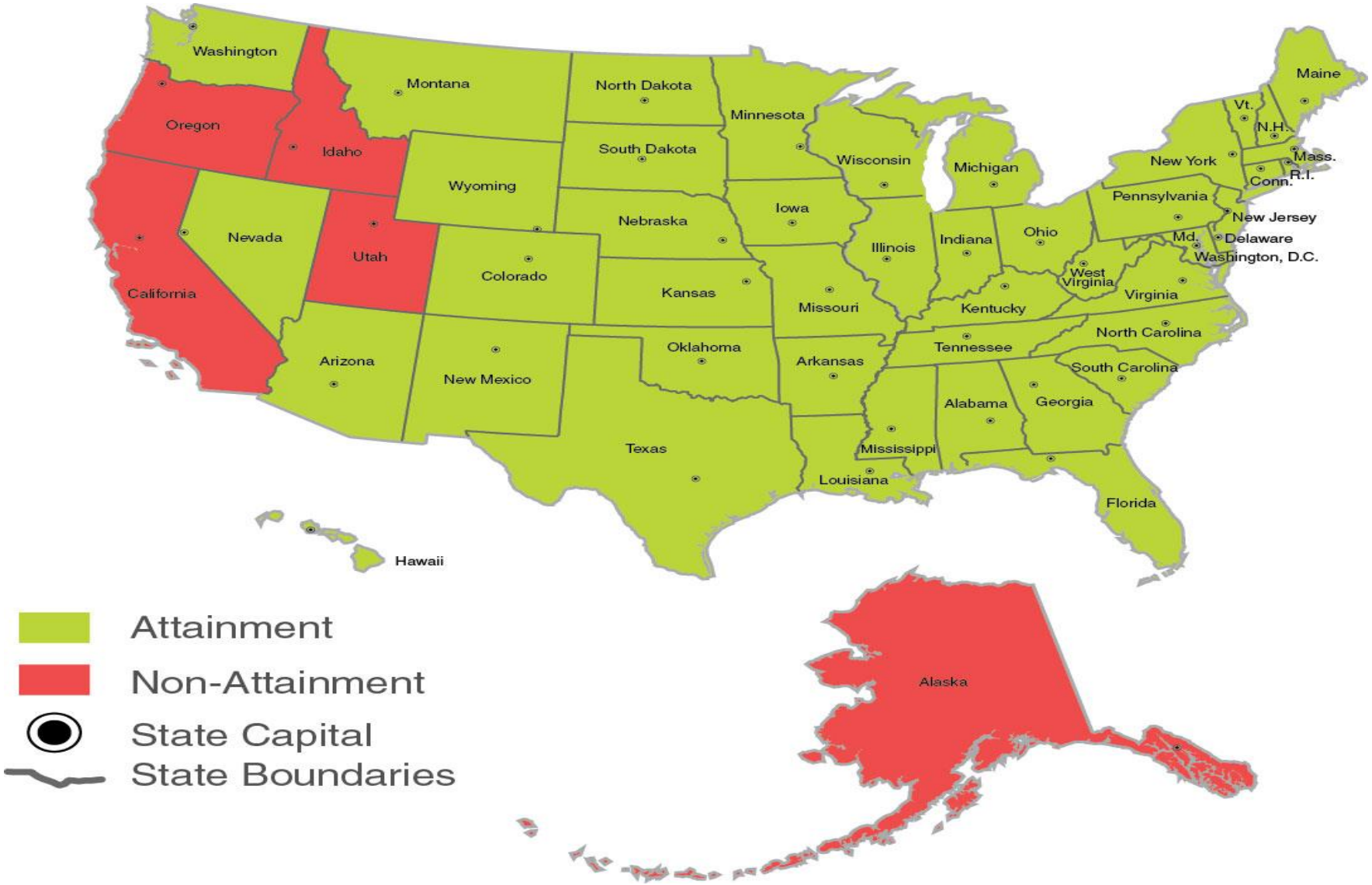
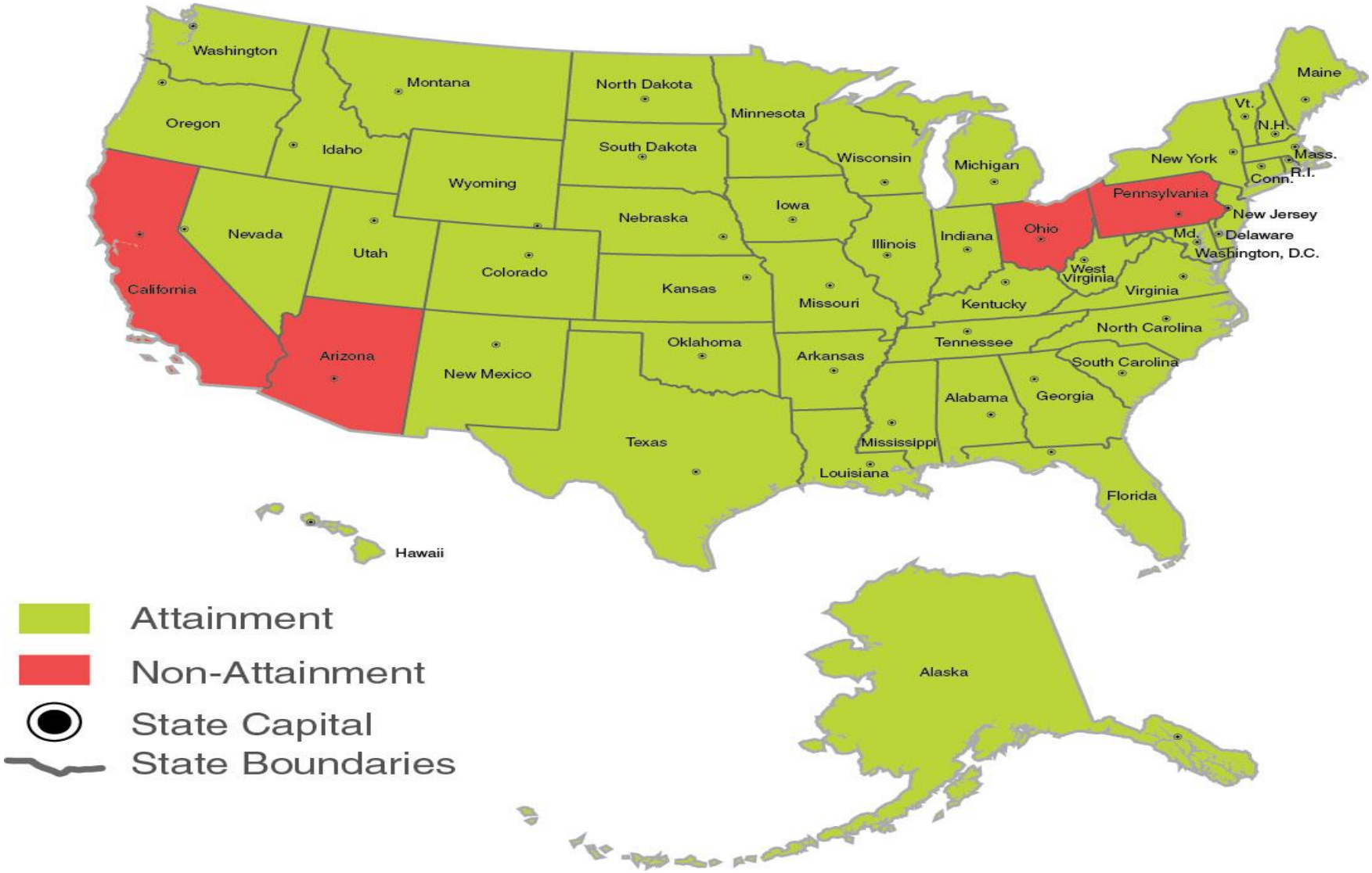


Figure 6

Non-Attainment States - Annual PM-2.5 (Map 3)
2012 - 2014



The States' View of the Air – 2016

This is the fifth year for this report. It was originally intended as a complimentary document to the American Lung Association's (ALA) annual report called "The State of the Air."

This report starts with the same air quality data used by the ALA. For this report, it includes data for the period of 2000 – 2014. The review of data in this report differs from the ALA in a few significant ways. First, the design values used for both ozone and PM-2.5 are based on average values for each county. Average values are used to compare between cities or county ratings. However, when determining whether the population is exposed to air quality above or below the standard, the population is split based on values from individual monitors. This is an important distinction. While U.S. EPA's guidance for attainment/nonattainment designation purposes focuses on the worst design value for a county, this is not consistent with what people are breathing. For example, if a county has ten monitors and nine have design values below the standard and one is slightly above the standard, U.S. EPA and ALA would assume that everyone in the county were breathing air at levels above the standard. That is obviously not correct. If you combine counties into metropolitan statistical areas (cities) consisting of several counties, the entire area would be assumed to be above the standard based on the one monitor described above. This report averages design values for all monitors in a county to determine the average level that is breathed by the residents of that county. This is not to say that some individuals could not be exposed to higher levels. However, not all residents in a county are exposed to levels associated with the highest monitor. This average design value is used only to compare between different states.

A second difference is that when design values for a number of counties are being grouped to determine the overall value for a metropolitan statistical area, the individual design values for each county are weighted by the population of that county to determine a population weighted average value. This value is more consistent with what the population is being exposed to and is in line with what health research professionals use in their analyses.

A grading system has been established for ozone and PM-2.5 in this report. Any grading system is arbitrary in nature. The key to this grading system is that any area meeting the national ambient air quality standards should not be rated lower than a "C". In essence, we have set the standard as a "C". Any level between 90 and 100% of the standard is rated a "C". Any level between 80 and 90% of the standard is rated as "B". Any level below 80% is set as an "A". Any level between 101 and 110% of the standard is set as a "D". Any level above 110% of the standard is rated as an "F". This translates into the following ranges.

Table 1
Grading Scheme

Grade	Ozone (ppm)	24-hr PM-2.5 (µg/m3)	Annual PM-2.5 (µg/m3)
A	< 0.060	< 28.0	< 9.6
B	0.060 – 0.067	28.0 – 31.4	9.6 – 10.7
C	0.068 – 0.075	31.5 – 35.0	10.8 – 12.0
D	0.076 – 0.082	35.1 – 38.5	12.1 – 13.2
F	➢ 0.082	➢ 38.5	➢ 13.2

This grading scale has been revised since last year because the national ambient air quality standard for annual PM-2.5 was revised. These are the appropriate levels for the standards that were in place during the time period (2012 – 2014).

This report does not report population groups by county or state (those less than 18 or 65 and older, diabetics, etc.). It is very difficult to obtain this data for each state. Also, the methodology which apportions state totals to individual counties is questionable. It is based solely upon a comparison of age distribution of the state versus the county. In many cases other variables, may be important in making these allocations more accurately.

Information on health effects is not included in this report. Instead we provide links to U.S. EPA websites that contain this information.

Ozone: http://epa.gov/airquality/ozonepollution/health.html

PM-2.5: http://epa.gov/airquality/particlepollution/health.html

The remainder of this report contains tables that are similar to those that are in the ALA report. The ALA report focuses solely on a three year block of data and does not provide any perspective. Our report looks at three year blocks of data from 2000 through 2014 so that the reader can see how the air quality is changing over time.

Ozone

In the 2000 – 2002 period approximately 53 million people (18.3% of the U.S. population) lived in counties that met the ozone standard. During the same time period approximately 100 million people (34.6%) lived in counties where ozone was not monitored. By the 2012 – 2014 period 195 million people (61.0%) lived in counties that met the ozone standard. During the same time period over 89 million people (28.0%) lived in counties where ozone was not monitored. Figure 1 shows the distribution of people by year.

24 – Hour PM-2.5

In the 2000 – 2002 period approximately 115 million people (40.0% of the U.S. population) lived in counties that met the 24-hour PM-2.5 standard. During this same time period approximately 98 million people (34.1%) lived in counties where PM-2.5 was not monitored. By the 2012 – 2014 period over 187 million people (58.9%) lived in counties that met the 24-hour PM-2.5 standard. During the same time period nearly 125 million people (39.3%) lived in counties where PM-2.5 was not monitored. Figure 2 shows the distribution of people by year.

Annual PM-2.5

In the 2000 – 2002 period approximately 138 million people (47.9% of the U.S. population) lived in counties that met the annual PM-2.5 standard. During the same time period approximately 98 million people (34.1%) lived in counties where PM-2.5 was not monitored. By the 2012 - 2014 period nearly 186 million people (58.5%) lived in counties that met the annual PM-2.5 standard. During the same time period nearly 125 million people (39.3%) lived in counties where PM-2.5 was not monitored. Figure 3 shows the distribution of people by year.

Note:

For the state summaries, the first table shows monitoring totals at the bottom that include county totals for areas that measure either Ozone or PM-2.5. The second set of tables includes totals monitored by pollutant.

Table 2

People Breathing Ozone

Grades	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
A	10,131,523	6,376,588	6,564,989	7,179,887	7,438,778	9,108,266	9,329,550	11,697,719	12,873,435	17,116,889	17,577,711	17,588,417	19,659,698
B	10,934,876	10,379,229	15,360,917	14,281,887	16,738,616	17,327,984	26,008,122	38,548,375	51,404,139	50,594,617	34,461,410	45,163,198	68,630,097
C	31,457,264	32,021,777	39,633,626	51,990,459	59,279,810	43,946,615	61,381,814	82,753,537	96,126,505	94,200,993	78,782,851	87,192,869	106,296,788
D	39,798,643	42,296,781	44,910,528	64,018,708	61,416,817	64,353,908	64,816,984	52,256,925	37,600,509	40,633,207	64,379,495	56,190,199	23,391,272
F	95,662,347	99,999,209	87,448,733	63,070,320	55,634,742	66,212,862	44,238,249	22,829,013	16,042,793	14,155,462	24,254,213	17,728,174	11,605,705
Subtotals	187,984,653	191,073,584	193,918,793	200,541,261	200,508,763	200,949,635	205,774,719	208,085,569	214,047,381	216,712,168	219,455,680	223,862,857	229,592,558
NM	99,640,540	99,034,349	98,886,505	94,975,338	97,871,149	100,281,572	98,319,247	98,685,960	94,698,157	94,879,749	94,548,360	92,265,982	89,273,476
Totals	287,625,193	290,107,933	292,805,298	295,516,599	298,379,912	301,231,207	304,093,966	306,771,529	308,745,538	311,591,917	314,004,040	316,128,839	318,857,036

Table 3

People Breathing Short-term Particle Pollution (24-hour PM-2.5)

Grades	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
A	39,881,763	47,887,689	49,231,738	45,397,201	52,283,496	56,454,021	73,299,289	100,515,234	123,740,873	140,662,435	158,596,598	164,160,356	170,684,569
B	36,431,942	30,082,632	34,646,612	35,162,480	36,377,810	36,503,487	45,877,264	42,834,521	37,211,482	27,743,252	23,728,800	14,120,383	11,472,530
C	38,677,918	38,809,795	42,267,519	45,596,607	46,980,855	41,705,298	29,459,586	19,860,604	11,157,556	12,113,406	3,468,212	6,524,086	5,705,918
D	26,102,105	24,031,712	25,444,744	28,827,340	21,462,979	21,559,722	13,086,958	4,857,812	4,478,582	1,242,344	1,072,537	1,254,409	1,134,946
F	48,603,338	47,902,446	35,461,117	37,701,675	30,439,705	24,695,846	13,462,714	11,217,210	3,182,497	6,292,520	3,122,749	6,007,513	4,509,547
Subtotals	189,697,066	188,714,274	187,051,725	192,685,303	187,544,845	180,918,374	175,285,811	179,285,481	179,770,990	188,053,957	189,988,896	192,066,747	193,507,510
NM	97,928,127	101,393,659	105,753,573	102,831,296	110,835,067	120,312,833	128,808,155	127,486,148	128,974,548	123,537,960	124,015,144	124,062,092	125,349,526
Totals	287,625,193	290,107,933	292,805,298	295,516,599	298,379,912	301,231,207	304,093,966	306,771,629	308,745,538	311,591,917	314,004,040	316,128,839	318,857,036

Table 4

People Breathing Year Round Particle Pollution (Annual PM-2.5)

Grades	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
A	65,326,851	70,127,621	80,452,773	60,204,962	82,674,701	87,498,801	96,640,186	121,852,039	151,225,649	164,746,645	170,012,770	113,784,047	126,244,562
B	34,521,401	36,264,896	36,541,564	39,483,688	39,249,507	32,830,328	38,732,333	36,788,172	19,844,125	13,048,977	15,087,987	39,133,366	40,724,323
C	38,049,342	41,868,373	38,353,168	34,474,313	36,334,814	35,279,983	27,076,409	13,762,659	6,813,460	4,517,511	2,105,166	24,659,204	19,517,172
D	23,184,888	19,155,969	14,856,077	21,734,832	16,037,478	14,515,489	7,880,525	4,785,715	1,146,913	1,986,357	1,906,695	8,208,984	4,488,456
F	28,786,860	20,471,466	17,349,069	17,383,298	12,734,577	10,201,029	4,669,777	1,709,042	503,779	3,165,892	530,349	6,281,149	2,532,998
Subtotals	189,869,342	187,888,325	187,552,651	193,281,093	187,031,077	180,325,630	174,999,230	178,897,727	179,534,926	187,465,382	189,642,967	192,066,750	193,507,560
NM	97,755,851	102,219,608	105,252,647	102,235,506	111,348,835	120,905,577	129,094,736	127,873,902	129,211,612	124,126,535	124,361,073	124,062,089	125,349,525
Totals	287,625,193	290,107,933	292,805,298	295,516,599	298,379,912	301,231,207	304,093,966	306,771,629	308,746,538	311,591,917	314,004,040	316,128,839	318,857,036

NM = Not Monitored

Table 5
High Cities - Year Round Particle Pollution (Annual PM-2.5)
(2012 - 2014)

Rank	MSA	PW DV	Grade	2013 Population
1	**Visalia, CA**	**17.2**	**F**	458,198
2	**Hanford, CA**	**16.2**	**F**	150,269
3	**Fresno, CA**	**14.0**	**F**	965,974
4	**Modesto, CA**	**13.4**	**F**	531,997
5	**Lebanon, PA**	**12.8**	**D**	136,539
6	**Bakersfield, CA**	**12.2**	**D**	874,589
7	Harrisburg, PA	12.0	C	562,849
8	Stockton, CA	11.9	C	715,597
9	Altoona, PA	11.7	C	125,955
9	Merced, CA	11.7	C	266,353
11	Johnstown, PA	11.6	C	137,132
11	Lancaster, PA	11.6	C	533,320
13	Portland, OR	11.5	C	2,348,247
14	Erie, PA	11.4	C	278,443
14	Indianapolis, IN	11.4	C	1,841,205
16	Canton, OH	11.2	C	403,923
16	Houston, TX	11.2	C	6,518,179
18	Shreveport, LA	11.0	C	405,809
18	York, PA	11.0	C	440,755
18	Steubenville, OH	11.0	C	121,336
21	Cincinnati, OH	10.9	C	2,165,137
21	St. Joseph, MO	10.9	C	127,431
23	Evansville, IN	10.8	C	362,157
23	Los Angeles, CA	10.8	C	13,262,220
25	Little Rock, AR	10.7	B	729,135
25	Owensboro, KY	10.7	B	116,506
25	Reading, PA	10.7	B	413,691

MSA = Metropolitan Statistical Area PW = Population Weighted DV = Design Value

Of the top 27 cities, six have air quality that exceeds the revised national ambient air quality standard. Eighteen cities are rated as C and three are rated as B.

Table 6
Highest Cities – Short Term Particle Pollution (24-hour PM-2.5)
(2012 - 2014)

Rank	MSA	PW DV	Grade	2013 Population
1	Hanford, CA	64	F	150,269
2	Visalia, CA	56	F	458,198
3	Fresno, CA	51	F	965,974
4	Modesto, CA	50	F	531,997
5	Bakersfield, CA	44	F	874,589
5	Logan, UT	44	F	131,197
7	Provo, CA	43	F	571,460
8	Merced, CA	41	F	266,353
8	Stockton, CA	41	F	715,597
10	Fairbanks, AK	40	F	99,357
11	Salt Lake City, UT	39	F	1,192,445
12	Odgen, UT	36	D	580,775
13	Medford, OR	35	C	210,287
14	Lebanon, PA	34	C	136,539
15	Harrisburg, PA	33	C	562,849
16	Yakima, WA	32	C	247,687
17	Lancaster, PA	31	B	533,320
18	Reading, PA	29	B	413,691
19	Altoona, PA	28	B	125,955
19	Elkhart, IN	28	B	201,971
19	Eugene, OR	28	B	358,337
19	Johnstown, PA	28	B	137,132
23	Corpus Christi, TX	27	A	448,108
23	Grand Junction, CO	27	A	148,255
23	Portland, OR	27	A	2,348,247
23	Riverside, CA	27	A	4,441,890
23	York, PA	27	A	440,755
23	Allentown, PA	27	A	829,835
23	Los Angeles, CA	27	A	13,262,220

MSA = Metropolitan Statistical Area **PW = Population Weighted** **DV = Design Value**

Of the 29 highest cities, 11 have ratings of F, 1 is a D, 4 are C, 6 are Band 7 are A.

Table 7
Highest 8-Hour Ozone Cities
(2012 - 2014)

Rank	MSA	PW DV	Grade	2013 Population
1	Riverside, CA	0.089	F	4,441,890
1	Fresno, CA	0.089	F	965,974
3	Visalia, CA	0.085	F	458,198
4	Bakersfield, CA	0.083	F	874,589
5	Bridgeport, CT	0.082	D	945,438
6	Merced, CA	0.081	D	266,353
6	Sheboygan, WI	0.081	D	115,290
8	Madera, CA	0.079	D	154,548
8	Niles, MI	0.079	D	155,233
8	Muskegon, MI	0.079	D	172,344
8	Norwich, CT	0.079	D	273,676
12	Los Angeles, CA	0.078	D	13,262,220
12	Modesto, CA	0.078	D	531,997
12	Pittsburgh, PA	0.078	D	2,355,968
12	Hartford, CA	0.078	D	1,214,295
16	Yuma, AZ	0.077	D	203,247
16	Dallas, TX	0.077	D	6,896,953
18	El Centro, CA	0.076	D	179,091
18	New Haven, CT	0.076	D	861,277
20	Holland, MI	0.075	C	276,292
21	Sacramento, CA	0.075	C	2,244,397
22	Boulder, CO	0.074	C	313,333
22	Chico, CA	0.074	C	224,241
22	Fort Collins, CO	0.074	C	324,122
22	Michigan City, IN	0.074	C	111,444
22	Provo, UT	0.074	C	571,460
22	St. Louis, MO	0.074	C	2,855,934
22	San Antonio, TX	0.074	C	2,328,652
22	Stockton, CA	0.074	C	715,597

MSA = Metropolitan Statistical Area PW = Population Weighted DV = Design Value
Of the 29 highest rated cities, four are rated F, 15 are rated D and 10 are rated C.

Table 8

Highest Counties - Short Term Particle Pollution (24-hour PM-2.5) (2012 - 2014)

Rank	County/State	DV	Grade	2013 Population
1	Kings, CA	64	F	150,269
1	Tulare, CA	64	F	458,198
3	Lake, OR	57	F	7,838
4	Fresno, CA	51	F	965,974
5	Stanislaus, CA	50	F	531,997
6	Kern, CA	44	F	874,589
6	Cache, UT	44	F	118,343
8	Siskiyou, CA	43	F	43,628
8	Utah, UT	43	F	560,874
10	Franklin, ID	42	F	13,021
10	Crook, OR	42	F	20,998
12	Merced, CA	41	F	266,353
12	San Joaquin, CA	41	F	715,597
14	Fairbanks, AK	40	F	99,357
14	Salt Lake, UT	40	F	1,091,742
16	Davis, UT	38	D	329,692
17	Lemhi, ID	37	D	7,726
17	Box Elder, UT	37	D	51,518
19	Jackson, OR	35	C	210,287
20	Klamath, OR	34	C	65,455
20	Lebanon, PA	34	C	136,359
22	Plumas, CA	33	C	18,606
22	Cumberland, PA	33	C	245,762
22	Weber, UT	33	C	240,475
25	Bucks, PA	32	C	626,685
25	Yakima, WA	32	C	247,687

DV = Design Value

Of the 26 highest counties, 15 are rated F, 3 are D, and 8 are C.

Table 9
Highest Counties Year Round Particle Pollution (Annual PM-2.5)
(2012 - 2014)

Rank	County/State	DV	Grade	2013 Population
1	**Tulare, CA**	**17.2**	**F**	458,198
2	**Kings, CA**	**16.2**	**F**	150,269
3	**Fresno, CA**	**14.0**	**F**	965,974
4	**Stanislaus, CA**	**13.4**	**F**	531,997
5	**Lebanon, PA**	**12.8**	**D**	136,359
6	**Kern, CA**	**12.2**	**D**	874,589
7	Cumberland, PA	12.0	C	245,762
8	San Joaquin, CA	11.9	C	715,597
9	Merced, CA	11.7	C	266,353
9	Butler, OH	11.7	C	374,158
9	Blair, PA	11.7	C	125,955
12	Cambria, PA	11.6	C	137,132
12	Delaware, PA	11.6	C	562,960
12	Lancaster, PA	11.6	C	533,320
15	Jefferson, OH	11.5	C	67,694
15	Beaver, PA	11.5	C	169,392
17	Marion, IN	11.4	C	934,243
17	Erie, PA	11.4	C	278,443
19	Los Angeles, CA	11.3	C	10,116,705
19	Lemhi, ID	11.3	C	7,726
19	Bucks, PA	11.3	C	626,685
22	Cuyahoga, OH	11.2	C	1,259,828
22	Stark, OH	11.2	C	375,736
22	Harris, TX	11.2	C	4,441,370
25	DeKalb, GA	11.1	C	722,161
25	Marshall, WV	11.1	C	32,416

DV = Design Value

Of the 26 highest counties, four are rated an F and two are D. All others meet the National Ambient Air Quality Standards with 20 being rated as C.

Table 10
Highest Ozone Counties
(2012 - 2014)

Rank	County/State	DV	Grade	2013 Population
1	San Bernardino, CA	0.093	F	2,112,619
2	Fresno, CA	0.089	F	965,974
3	Riverside, CA	0.085	F	2,329,271
3	Tulare, CA	0.085	F	458,198
5	Kern, CA	0.083	F	874,589
5	Allegan, MI	0.083	F	113,847
7	El Dorado, CA	0.082	D	183,087
7	Fairfield, CT	0.082	D	945,438
9	Los Angeles, CA	0.081	D	10,116,705
9	Merced, CA	0.081	D	266,353
9	Middlesex, CT	0.081	D	164,943
9	Kenosha, WI	0.081	D	168,068
9	Sheboygan, WI	0.081	D	115,290
14	Tolland, MI	0.080	D	151,367
14	Denton, TX	0.080	D	753,363
16	Madera, CA	0.079	D	154,548
16	New London, CT	0.079	D	273,676
16	Lake, IL	0.079	D	705,186
16	Berrien, MI	0.079	D	155,233
16	Muskegon, MI	0.079	D	172,344
16	Uintah, UT	0.079	D	36,867
22	Stanislaus, CA	0.078	D	531,997
22	Douglas, CO	0.078	D	314,638
22	Collin, TX	0.078	D	885,241
22	Tarrant, TX	0.078	D	1,945,360

DV = Design Value
Of the top 25 counties, 6 are rated as F and 19 are rated as D.

Table 11

Cleanest U.S. Cities for Short-term Particle Pollution (24-hr PM-2.5)
(2012 - 2014)

Rank	MSA	PW DV	Grade	2013 Population
1	Santa Fe, NM	9	A	148,164
2	Farmington, NM	12	A	123,785
2	Honolulu, HI	12	A	991,788
4	Casper, WY	13	A	81,624
4	Cheyenne, WY	13	A	96,389
4	Salinas, CA	13	A	431,344
4	Santa Cruz. CA	13	A	271,804
4	Tucson, AZ	13	A	1,004,516
9	Cape Coral, FL	14	A	679,513
9	Lakeland, FL	14	A	634,638
9	Las Cruces, NM	14	A	213,676
9	Manchester, OH	14	A	405,184
9	Miami, FL	14	A	5,929,819
14	Bismarck, ND	15	A	120,325
14	Burlington, VT	15	A	216,167
14	Deltona, FL	15	A	507,531
14	Orlando, FL	15	A	2,321,418
14	Pueblo, CO	15	A	161,875
14	Rapid City, SD	15	A	135,193
14	Tampa, FL	15	A	2,915,582
14	Wilmington, NC	15	A	171,649
22	Asheville, NC	16	A	442,316
22	Albuquerque, NM	16	A	904,587
22	Bangor, ME	16	A	153,414
22	Colorado Springs, CO	16	A	686,968
22	Gainesville, GA	16	A	190,761
22	Greenville, NC	16	A	196,447
22	Kingsport, TN	16	A	297,498
22	Palm Bay, FL	16	A	556,885
22	Pensacola, FL	16	A	474,081
22	Providence, RI	16	A	1,609,367
22	Redding, CA	16	A	179,804
22	Santa Barbara, CA	16	A	440,668
22	Syracuse, NY	16	A	661,478

MSA= Metropolitan Statistical Area PW = Population Weighted DV = Design Value
Of the 34 cleanest cities, all are rated as A.

Table 12
Cleanest U.S. Cities for Year Round Particle Pollution (Annual PM-2.5)
(2012 - 2014)

Rank	MSA	PW DV	Grade	2013 Population
1	Cheyenne, WY	4.1	A	96,389
2	Farmington, NM	4.5	A	123,785
2	Santa Fe, NM	4.5	A	148,164
4	Casper, WY	4.7	A	81,624
5	Honolulu, HI	5.3	A	991,788
5	Anchorage, AK	5.3	A	398,892
7	Salinas, CA	5.4	A	431,344
8	Manchester, OH	5.7	A	405,184
8	Redding, CA	5.7	A	179,804
8	Tucson, AZ	5.7	A	1,004,516
11	Bismarck, ND	5.8	A	120,325
12	Palm Bay, FL	5.9	A	556,885
13	Burlington, VT	6.0	A	216,167
13	Santa Cruz, CA	6.0	A	271,804
15	Cape Coral, FL	6.2	A	679,513
15	Colorado Springs, CO	6.2	A	686,968
15	Las Cruces, NM	6.2	A	213,676
18	Duluth, MN	6.3	A	280,218
18	Orlando, FL	6.3	A	2,321,418
18	Pueblo, CO	6.3	A	161,875
18	Rapid City, SD	6.3	A	135,193
22	Miami, FL	6.4	A	5,929,819
22	Deltona, FL	6.4	A	507,531
22	Tampa, FL	6.4	A	2,915,582
25	Albuquerque, NM	6.5	A	904,587
25	North Port, FL	6.5	A	748,708
25	Providence, RI	6.5	A	1,609,367

MSA = Metropolitan Statistical Area **PW = Population Weighted** **DV = Design Value**

Of the 27 cleanest cities all are rated as A.

Table 13
Cleanest U.S. Cities for Ozone Air Pollution
(2012 - 2014)

Rank	MSA	PW DV	Grade	2013 Population
1	Bellingham, WA	0.045	A	208,351
1	Mount Vernon, WA	0.045	A	120,365
3	Fairbanks, AK	0.046	A	99,357
4	Honolulu, HI	0.049	A	991,788
5	Santa Cruz, CA	0.053	A	271,804
6	Santa Rosa, CA	0.054	A	500,292
7	Missoula, MT	0.055	A	112,684
7	Olympia, WA	0.055	A	265,851
7	Salinas, CA	0.055	A	431,344
7	Duluth, MN	0.055	A	280,218
11	San Francisco, CA	0.056	A	4,594,060
11	Seattle, WA	0.056	A	3,671,478
13	Brunswick, GA	0.057	A	114,806
13	Eugene, OR	0.057	A	358,337
13	McAllen, TX	0.057	A	831,073
13	Portland, OR	0.057	A	2,348,247
13	Tuscaloosa, AL	0.057	A	225,949
18	Bangor, ME	0.058	A	153,414
18	Brownsville, TX	0.058	A	420,392
18	Lincoln, NE	0.058	A	318,945
21	Bend, OR	0.059	A	170,388
21	Bismarck, ND	0.059	A	120,325
21	Columbia, SC	0.059	A	800,495
21	Jacksonville, FL	0.059	A	1,419,127
21	Monroe, LA	0.059	A	178,864
21	Napa, CA	0.059	A	141,667
21	Naples, FL	0.059	A	348,777
21	Ocala, FL	0.059	A	339,167
21	Savannah, GA	0.059	A	372,708

MSA = Metropolitan Statistical Area **PW = Population Weighted** **DV = Design Value**

Of the cleanest 29 cities, all are rated A.

Table 14
Cleanest Counties – Short Term Particle Pollution (24-hour PM-2.5)
(2012 - 2014)

Rank	County/State	DV	Grade	2013 Population
1	Santa Fe, NM	9	A	148,164
2	Custer, SD	10	A	8,445
3	Montezuma, CO	11	A	25,772
3	Hancock, ME	11	A	54,696
3	Billings, ND	11	A	901
6	Lake, CA	12	A	64,184
6	Hawaii, HI	12	A	194,190
6	Honolulu, HI	12	A	991,788
6	Maui, HI	12	A	163,019
6	San Juan, NM	12	A	123,785
6	Teton, WY	12	A	22,930
12	Pima, AZ	13	A	1,004,516
12	Monterey, CA	13	A	431,344
12	San Benito, CA	13	A	58,267
12	Santa Cruz, CA	13	A	271,804
12	Litchfield, CT	13	A	184,993
12	Palm Beach, FL	13	A	1,397,710
12	Rosebud, MT	13	A	9,326
12	Belknap, NH	13	A	60,305
12	Essex, NY	13	A	38,679
12	Kent, RI	13	A	165,128
12	Jackson, SD	13	A	3,274
12	Albany, NY	13	A	37,811
12	Laramie, WY	13	A	96,389
12	Natrona, WY	13	A	81,624
12	Sweetwater, WY	13	A	45,010

DV = Design Value

The cleanest 26 counties are all rated as A.

Table 15
Cleanest Counties - Year Round Particle Pollution (Annual PM-2.5)
(2012 - 2014)

Rank	County/State	DV	Grade	2013 Population
1	Custer, SD	3.5	A	8,445
2	Lake, CA	4.0	A	64,184
3	Essex, NY	4.1	A	38,679
3	Laramie, WY	4.1	A	96,389
5	Hancock, ME	4.4	A	54,696
5	Billings, ND	4.4	A	901
5	Park, WY	4.4	A	28,989
8	San Juan, NM	4.5	A	123,785
8	Santa Fe, NM	4.5	A	148,164
8	Washington, RI	4.5	A	126,653
11	McKenzie, ND	4.6	A	10,996
11	Jackson, SD	4.6	A	3,274
13	Natrona, WY	4.7	A	81,624
14	Matanuska, AK	4.8	A	97,882
14	Dunn, ND	4.8	A	4,399
14	Albany, WY	4.8	A	37,811
17	Maui, HI	5.0	A	163,019
17	Teton, WY	5.0	A	22,930
19	San Benito, CA	5.1	A	58,267
19	Rosebud, MT	5.1	A	9,326
19	Ashland, WI	5.1	A	16,103
22	Oliver, ND	5.2	A	1,850
22	Kent, RI	5.2	A	165,128
24	Litchfield, CT	5.3	A	184,993
24	Honolulu, HI	5.3	A	991,788
24	Aroostook, ME	5.3	A	69,447
24	Campbell, WY	5.3	A	48,320

DV = Design Value
The cleanest 27 counties are all rated as A.

Table 16
Cleanest Counties - Ozone Air Pollution
(2012 - 2014)

Rank	County/State	DV	Grade	2013 Population
1	Humboldt, CA	0.044	A	134,809
2	Skagit, WA	0.045	A	120,365
2	Whatcom, WA	0.045	A	208,351
4	Fairbanks, AK	0.046	A	99,357
5	San Francisco, CA	0.047	A	852,469
6	Honolulu, HI	0.049	A	991,788
7	Columbia, OR	0.051	A	49,459
8	Santa Cruz, CA	0.053	A	271,804
8	Aroostook, ME	0.053	A	69,447
8	Oxford, ME	0.053	A	57,238
8	Flathead, MT	0.053	A	94,924
12	Denali, AK	0.054	A	1,921
12	Sonoma, CA	0.054	A	500,292
12	Washington, ME	0.054	A	31,808
15	Monterey, CA	0.055	A	431,344
15	St. Louis, MN	0.055	A	200,949
15	Lewis & Clark, MT	0.055	A	65,856
15	Missoula, MT	0.055	A	112,684
15	Colleton, SC	0.055	A	37,771
15	Edgefield, SC	0.055	A	26,553
15	King, WA	0.055	A	2,079,967
15	Thurston, WA	0.055	A	265,851
23	Alameda, CA	0.056	A	1,610,921
23	Marin, CA	0.056	A	260,750
23	San Mateo, CA	0.056	A	758,581
23	Rosebud, MT	0.056	A	9,326
23	Billings, ND	0.056	A	901
23	Multnomah, OR	0.056	A	776,712
23	Clark, WA	0.056	A	451,008

DV = Design Value
Of the 29 cleanest counties, all are rated A.

MASSACHUSETTS

Ozone

Significant progress has been made in ozone levels in Massachusetts. In the 2000 – 2002 time period, approximately 600 thousand people (9.3%) lived in counties that met the ozone standard. By 2012 – 2014 this had increased to approximately 6.2 million people (91.3%). The remainder of the population lived in counties where ozone was no monitored. Figure MA-1 shows the distribution of people by year.

24-Hour PM-2.5

24-hour PM-2.5 levels in Massachusetts have generally been better than the standard, except for the first three periods. In the 2000 – 2002 time period, approximately 5.3 million people (82.6%) lived in counties where 24-hour PM-2.5 levels met the standard. By 2012 - 2014 this was approximately 4.0 million people (59.4%). The remainder of the population lived in counties where PM-2.5 was not measured. Figure MA-2 shows the distribution of people by year.

Annual PM-2.5

Annual PM-2.5 levels in Massachusetts have historically been better than the standard. In the 2000 – 2002 time period, approximately 5.8 million people (90.1%) lived in counties where annual PM-2.5 levels met the standard. By 2012 – 2014 this was approximately 4.0 million people (59.4%). The remainder of the population lived in counties where PM-2.5 was not measured. Figure MA-3 shows the distribution of people by year.

Table MA-1

2012 – 2014

		OZONE			PARTICLE POLLUTION (PM-2.5)				
County	**Population**	**Avg. DV**	**Grade**	**MM**	**Avg. 24-Hr DV**	**Grade**	**Avg. Ann DV**	**Grade**	**MM**
Barnstable	214,914	0.069	C	N	ND	--	ND	--	--
Berkshire	128,715	0.067	B	N	18	A	7.3	A	N
Bristol	554,194	0.072	C	N	15	A	6.3	A	N
Dukes	17,356	0.068	C	N	ND	--	ND	--	--
Essex	769,091	0.068	C	Y	15	A	6.2	A	Y
Hampden	468,161	0.070	C	N	18	A	7.1	A	Y
Hampshire	160,939	0.071	C	N	ND	--	ND	--	--
Middlesex	1,570,315	0.067	B	N	ND	--	ND	--	--
Norfolk	692,254	0.070	C	N	ND	--	ND	--	--
Plymouth	507,022	ND	--	--	17	A	6.7	A	N
Suffolk	767,254	0.062	B	Y	18	A	7.7	A	Y
Worcester	813,475	0.067	B	Y	17	A	7.1	A	Y
Subtotal	**6,663,690**								
Not Monitored	81,718								
Total	**6,745,408**								

DV = Design Value **ND = No Data** **MM = Multiple Monitors**

MASSACHUSETTS

Table MA-2
People Breathing Ozone

Grade	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
A	0	0	0	0	0	0	0	0	0	0	0	0	383,627
B	0	0	0	77,692	343,596	0	702,201	716,214	361,012	221,191	824,324	2,414,905	2,896,132
C	594,744	0	423,146	1,798,168	78,084	693,368	817,332	1,504,925	4,036,650	3,779,259	3,542,087	3,012,020	2,876,909
D	76,731	420,851	1,592,308	1,566,695	3,642,429	2,705,807	3,820,330	3,259,342	1,556,970	0	17,041	0	0
F	3,744,491	3,982,866	2,959,142	2,377,119	1,777,678	2,462,571	556,993	462,777	0	0	0	0	0
Subtotal	4,415,966	4,403,817	4,974,596	5,819,674	5,741,787	5,861,746	5,896,856	5,943,258	5,954,632	5,991,450	4,383,452	5,426,925	6,156,668
NM	2,001,240	2,018,848	1,437,685	583,616	568,297	569,813	572,111	574,355	592,997	596,086	2,262,692	1,265,899	588,740
Total	6,417,206	6,422,565	6,412,281	6,403,290	6,410.084	6,431,559	6,468,967	6,517,613	6,547,629	6,587,536	6,646,144	6,692,824	6,745,408

People Breathing Short-term Particle Pollution (24-Hour PM-2.5)

Grade	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
A	658,702	0	0	545,437	1,184,593	2,495,503	2,933,415	5,070,900	5,404,732	5,440,002	3,952,987	3,978,758	4,007,912
B	3,832,954	0	0	2,422,074	2,334,345	2,652,959	2,401,294	308,518	0	0	0	0	0
C	809,511	2,876,835	1,024,999	854,570	307,605	153,811	0	0	0	0	0	0	0
D	480,520	0	921,369	0	0	0	0	0	0	0	0	0	0
F	0	230,337	153,614	0	0	0	0	0	0	0	0	0	0
Subtotal	5,781,687	3,106,172	2,099,982	3,822,081	3,826,543	3,302,293	5,334,700	5,379,417	5,404,732	5,445,002	3,952,987	3,978,758	4,007,912
NM	635,519	3,315,393	4,312,299	2,581,209	2,583,541	1,129,286	1,134,257	1,138,195	1,142,897	1,142,534	2,693,157	2,714,066	2,737,496
Total	6,417,206	6,422,565	6,412,281	6,403,290	6,410,084	6,431,559	6,468,967	6,517,613	6,547,629	6,587,536	6,646,144	6,692,824	6,745,408

People Breathing Year round Particle Pollution (Annual PM-2.5)

Grade	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
A	3,970,654	2,354,025	1,427,914	2,999,700	3,329,144	4,975,121	5,334,710	5,225,159	5,404,732	5,440,002	3,952,987	3,978,758	4,007,912
B	979,845	578,877	499,250	1,431,996	497,399	327,153	0	0	0	0	0	0	0
C	631,186	348,546	172,818	171,650	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal	5,781,685	3,281,442	2,099,982	4,603,346	3,826,543	3,302,293	5,334,700	5,225,159	5,404,732	5,445,002	3,952,987	3,978,758	4,007,912
NM	635,521	3,141,123	4,312,299	1,799,944	2,583,541	1,129,285	1,134,257	1,292,454	1,142,897	1,142,534	2,693,157	2,714,066	2,737,496
Total	6,417,206	6,422,565	6,412,281	6,403,290	5,410,084	6,431,559	6,468,967	6,517,613	6,547,629	6,587,536	6,646,144	6,692,824	6,745,408

NM = Not Monitored

Figure MA-1

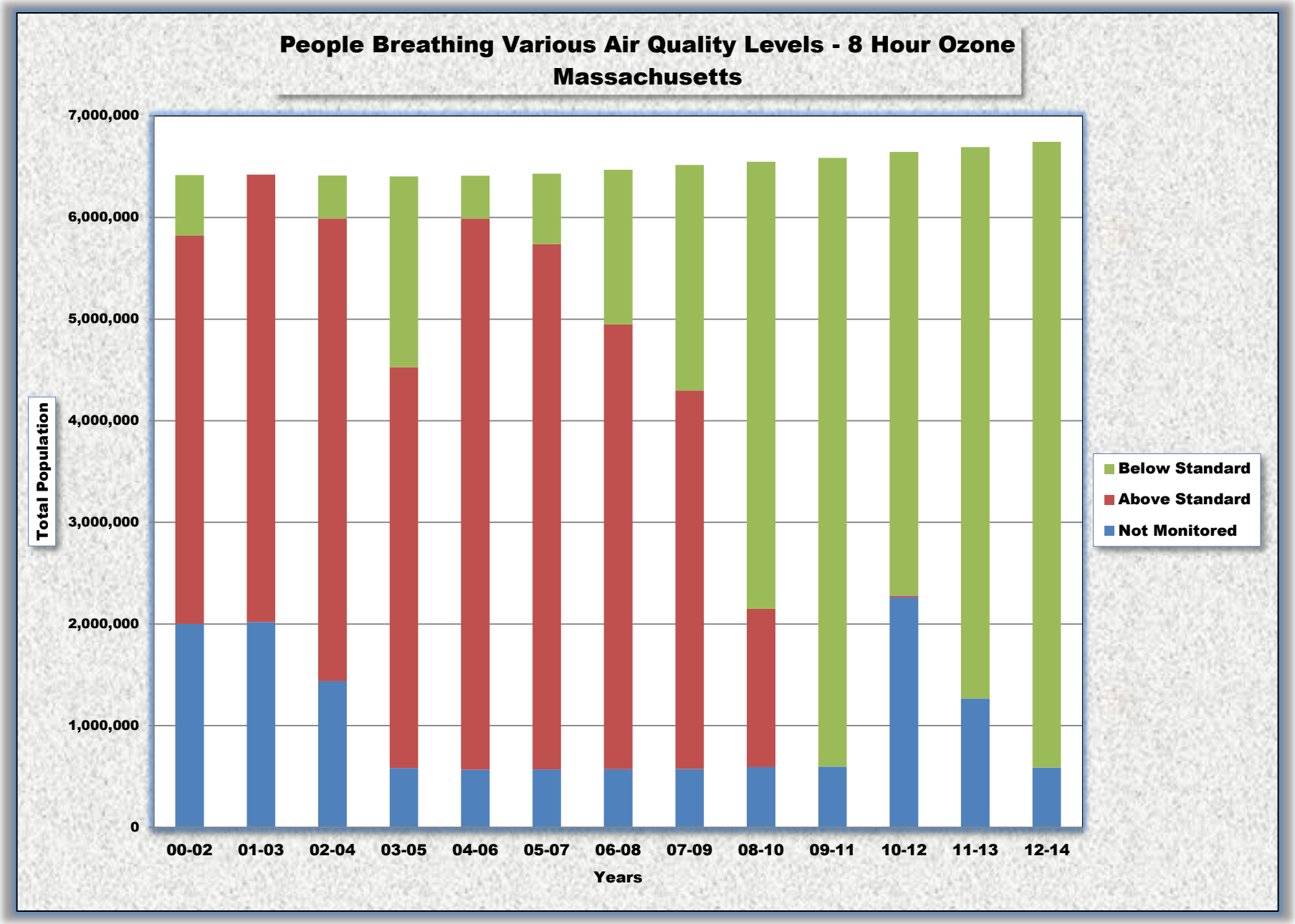

People Breathing Various Air Quality Levels - 8 Hour Ozone
Massachusetts
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Total Population
00-02
01-03
02-04
03-05
04-06
05-07
06-08
07-09
08-10
09-11
10-12
11-13
12-14
Years
Below Standard
Above Standard
Not Monitored

Figure MA-2

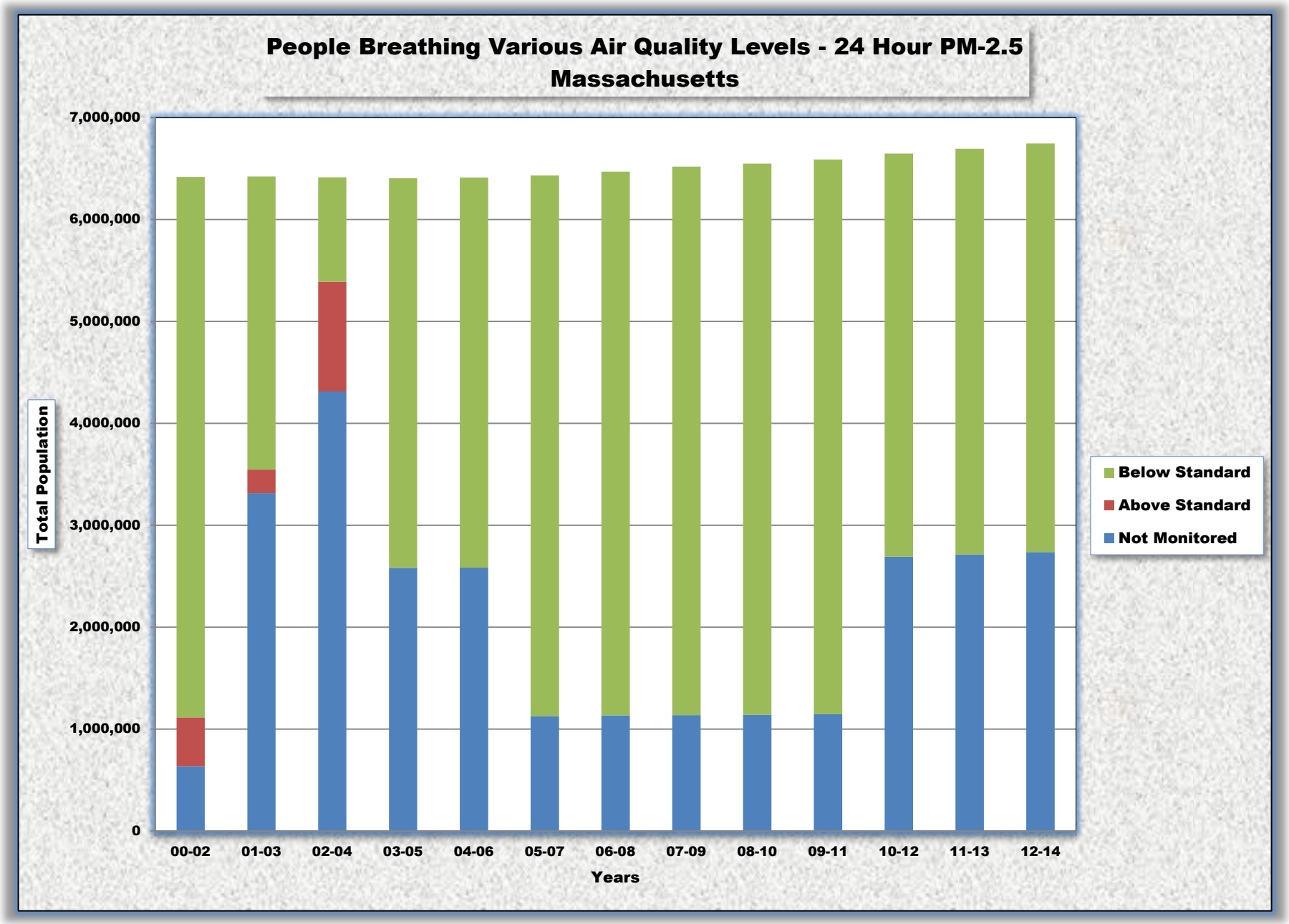
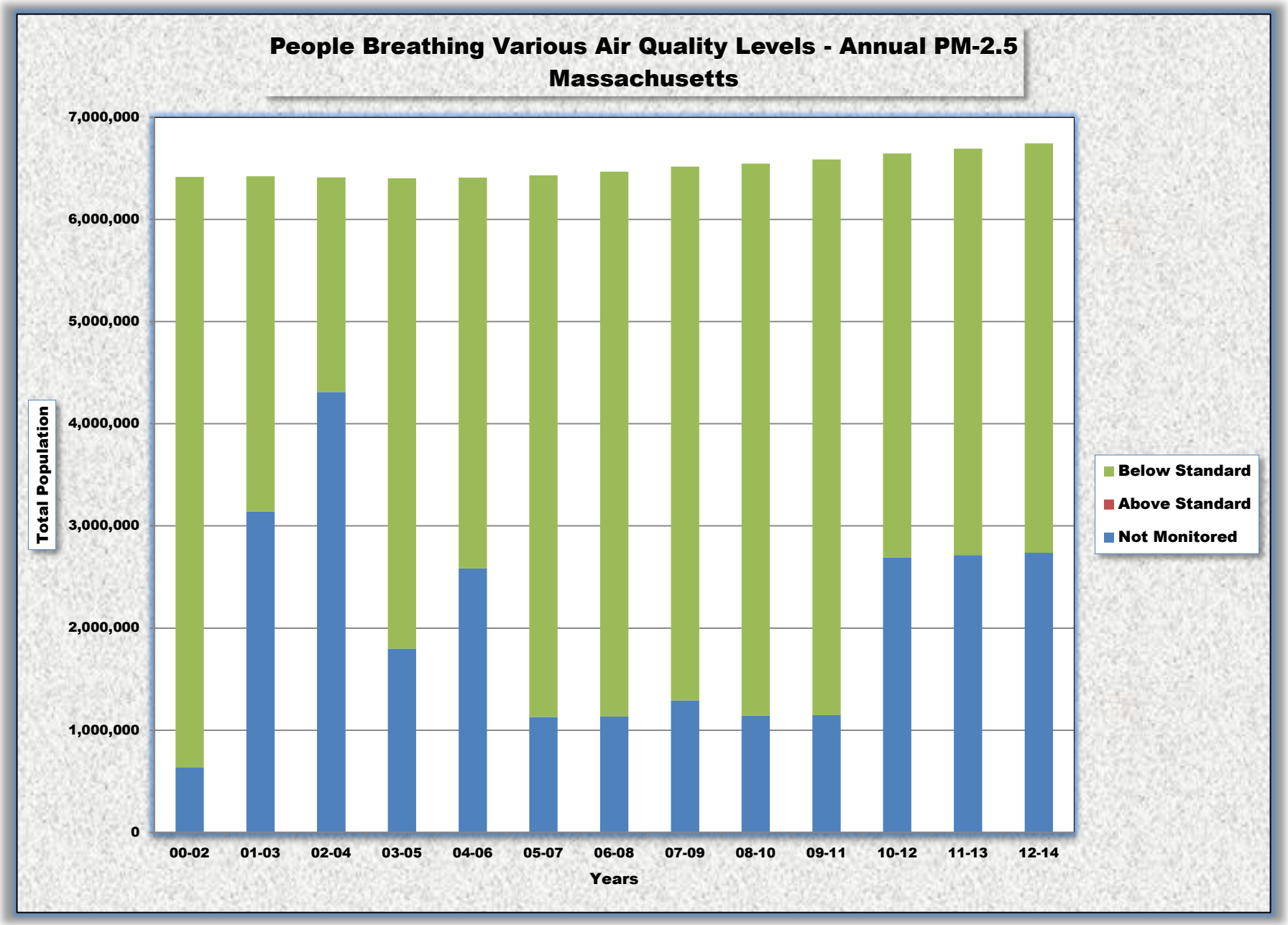

People Breathing Various Air Quality Levels - 24 Hour PM-2.5
Massachusetts
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Total Population
00-02
01-03
02-04
03-05
04-06
05-07
06-08
07-09
08-10
09-11
10-12
11-13
12-14
Years
Below Standard
Above Standard
Not Monitored

Figure MA-3


People Breathing Various Air Quality Levels - Annual PM-2.5
Massachusetts
Total Population
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
00-02
01-03
02-04
03-05
04-06
05-07
06-08
07-09
08-10
09-11
10-12
11-13
12-14
Years
Below Standard
Above Standard
Not Monitored