

THE STATE OF GARBAGE IN AMERICA

Latest national data on municipal solid waste management find estimated generation is 389.5 million tons in 2008 — 69 percent landfilled, 24 percent recycled and composted, and 7 percent combusted via waste-to-energy.

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A joint study by BioCycle and the Earth Engineering Center of Columbia University

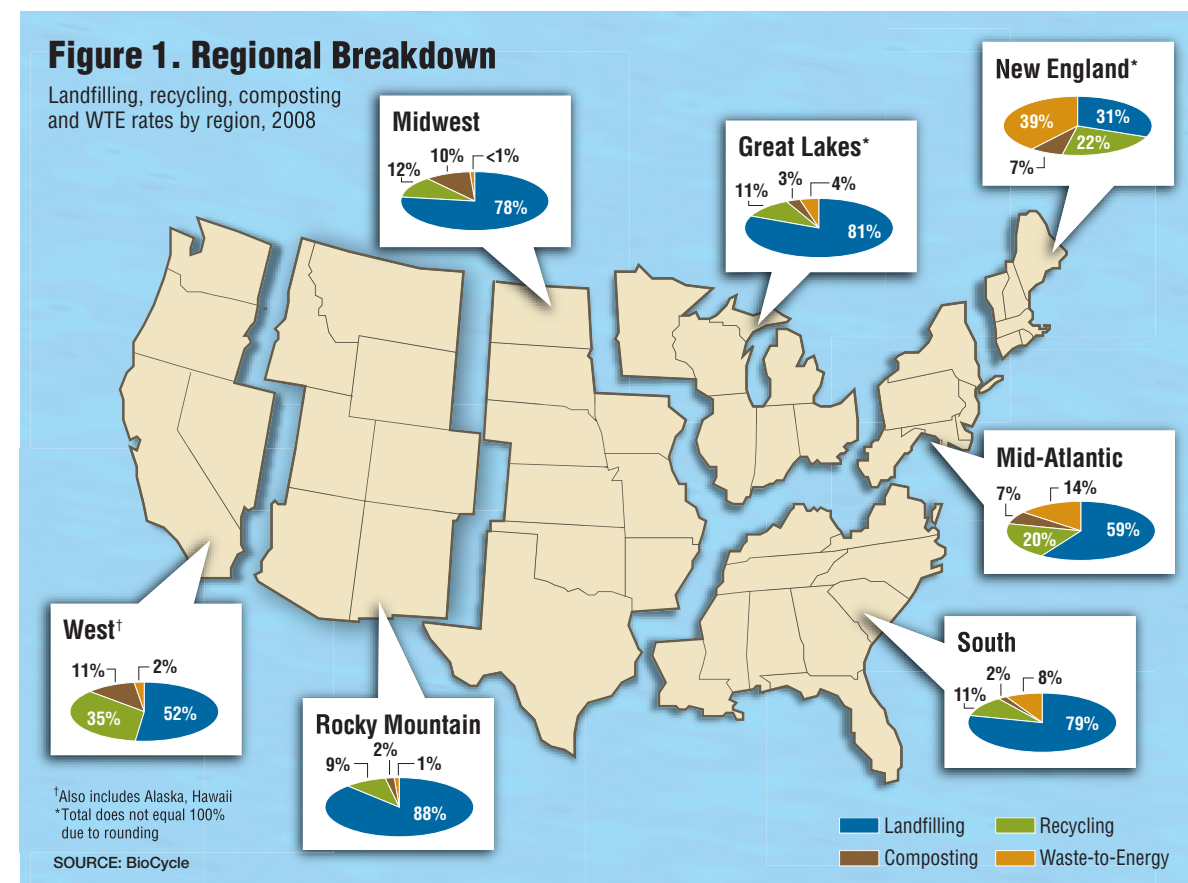
BIOCYCLE, in collaboration with the Earth Engineering Center (EEC) of Columbia University, conducts the biennial State of Garbage In America survey on the generation and management of municipal solid waste (MSW) in the United States. The State of Garbage In America Report, launched by BioCycle in 1989, is unique in that actual tonnage data is collected from each individual state, with waste characterization studies solely used for validation of the numbers. This is the 17th nationwide survey, reporting data from calendar year 2008.

The data was gathered during the spring of 2010, using an Excel form that was e-mailed to the solid waste management departments in all 50 states and the District of Columbia. All entries were checked and validated using results of former State of Garbage in America reports, EPA waste characterization studies, and also a survey of Materials Recovery Facilities (MRF) carried out by Eileen Berenyi of Government Advisory Associates (GAA). We greatly appreciate the time spent and the contributions made by the solid waste and recycling officials listed at the end of this report. Thanks to their help and expertise, we can present the 2010 edition of "The State of Garbage in America." All tonnages are reported in U.S. tons (1.1 U.S. ton = 1 metric ton).

SURVEY METHODOLOGY

In 2004, the EEC was invited by BioCycle to collaborate on a science-based version of the State of Garbage survey. The State of Garbage methodology uses the principles of mass balance: all MSW generated is equal to the MSW landfilled, combusted in waste-to-energy (WTE) plants, composted and/or recycled. This relies on the assumption that all management methods employed for municipal solid waste are quantified/tracked and reported to the state agencies. According to our survey results, at least 15 states require waste management companies and local government agencies to report annual tonnages. Nineteen states reported that there was no

such requirement and another 12 states did not respond to this question. Only five states did not complete the 2010 State of Garbage survey. For states where companies and local agencies are not required to report to the state, disposal data can and, in most cases, are still collected from waste management facilities. This is especially true for landfills and waste-to-energy



plants, since they track all of the disposed waste by simply weighing incoming and outgoing trucks. Composting and materials recycling facilities, however, may not have scales and/or are commercial or public enterprises that are not obligated to report tonnages received and processed to local or state government agencies.

An important part of MSW accounting in the State of Garbage survey is "filtering out" non-MSW materials that may be included in the states' responses. The BioCycle/EEC survey uses the US EPA definition of Municipal Solid Waste, which includes:

residential and commercial wastes like paper, plastic packaging, bottles and cans, tires, yard trimmings, batteries, furniture, appliances, etc. Typical "non-MSW" materials are: industrial and agricultural wastes, construction and demolition (C&D) debris, automobile scrap and sludge from wastewater treatment plants. To account for these non-MSW materials, survey respondents were asked to provide a more specific breakdown of the waste streams being reported. This was done either by estimate or from measured tonnages. The non-MSW tonnages were automatically subtracted in the Excel spreadsheet from the total generation reported.

Over the past six years (with the survey conducted every two years), the methodology developed by EEC has been further refined. In the 2008 State of Garbage In America Report (December 2008), MSW

post reported tonnages are reported in separate columns in Table 2. It is quite likely that some smaller composting operations have, inadvertently, not been included and, therefore, the total MSW composted may be somewhat higher than reported.

In the 2010 survey, an additional "filter" on the reported composting/recycling rates for different materials was introduced: The total amount of MSW generated was estimated using the 2008 State of Garbage national number of per capita generation (1.38 tons/capita; 2006 data) and the population of the state. EEC then used EPA's MSW Facts And Figures waste characterization report (EPA, 2008) of the average (U.S.) percent composition of MSW times the population of the state to estimate how many tons of each material were generated in the state. On the basis of this information, we were able to "filter out" reported recycling tonnages that were "through the roof," most likely due to the inclusion of non-MSW materials (e.g., automobile scrap). Reported recycling tonnages that were higher than the estimated waste generation of a particular material were decreased to 100 percent of the estimated waste generation.

PROTOCOL USED FOR RECYCLING TONNAGES

For a consistent determination of the tonnages to report in the survey, the following protocol was established: Use reported tonnage unless any of the following factors were evident:

1. States did not report a recycled material tonnage: The GAA MRF survey reported MRF-processed tonnages that in general were one half of the recycling tonnages reported by the states. Therefore, EEC concluded that approximately 50 percent of all

Table 1. State of Garbage in America survey data 1989–2008: Reported and estimated MSW generation and rates of MSW recycling, waste-to-energy and landfilling¹

Year Of Data	Reported MSW Generation ² (tons/yr)	Estimated MSW Generated ³ (tons/yr)	MSW Recycled ⁴ (%)	MSW Waste-To-Energy (%)	MSW Landfilled (%)
1989	269,000,000		8.0	8.0	84.0
1990	293,613,000		11.5	11.5	77.0
1991	280,675,000		14.0	10.0	76.0
1992	291,472,000		17.0	11.0	72.0
1993	306,866,000		19.0	10.0	71.0
1994	322,879,000		23.0	10.0	67.0
1995	326,709,000		27.0	10.0	63.0
1996	327,460,000		28.0	10.0	62.0
1997	340,466,000		30.0	9.0	61.0
1998	374,631,000		31.5	7.5	61.0
1999	382,594,000		33.0	7.0	60.0
2000	409,029,000		32.0	7.0	61.0
2002	–	369,381,411	26.7	7.7	65.6
2004	–	387,855,461	28.5	7.4	64.1
2006	–	413,014,732	28.6	6.9	64.5
2008	–	389,488,026	24.1	6.7	69.3

¹2002, 2004, 2006 and 2008 estimated MSW Generated, MSW Recycled, WTE and Landfilled have been adjusted to exclude non-MSW. ²Reported MSW Generation is reported values calculated by BioCycle prior to collaboration with Columbia University and use of current methodology. ³Estimated MSW Generated is sum of MSW Recycled, WTE and Landfilled. ⁴MSW Recycled includes composting and recycling.

An important part of MSW accounting in the State of Garbage is filtering out non-MSW materials that may be included in the states' responses.

percent of the total MSW and was three million tons higher than two years ago. An estimated 7 percent, nearly 26 million tons, were combusted with energy recovery in WTE plants. The total recycling and composting tonnages for 2008 were estimated to be close to 94 million tons, or 24 percent of the total MSW. They consisted of over 69

million tons of materials recycled and 24.5 million tons of yard trimmings and some food wastes composted or mulched.

It is interesting to note that national MSW generation dropped between 2006 and 2008, from 413 million tons in the 2008 State of Garbage Report to 389.5 million tons in this 2010 Report. This may be a reflection of the economic downturn, as well as the more detailed exclusion of non-MSW materials that was done in the survey of 2008 data.

Table 2 provides the main results of the 2008 data, by state. The “Reported MSW Generated” column shows the raw generation number as provided by each state. It may differ from the “Estimated MSW Generation” column because of differences between definitions of MSW, as discussed earlier. Some states base this number on an extrapolation of occasional measurements of household MSW generation. The “Estimated” generation number is a summation of the MSW sent to each of the four recovery and disposal methods. All tonnages have been adjusted for import and export, assigning waste to the place of generation, not where it was disposed (e.g., out-of-state landfills). On average, 1.28 tons of MSW were generated per capita in 2008. This is 0.10 tons/capita lower than 2006. Hawaii reported the highest per capita generation number: 2.89 tons/capita. However, it has to be taken into account that the population number is skewed by the high influx of tourists — around 7 million people visit Hawaii each year.

Figure 1 provides a breakdown, by region, of recycling, composting, combustion and landfilling rates. According to the 2008 state data, the West leads the nation in recycling (35%) and composting (11%). New England has the second highest recycling rate (22%), followed by the Mid-Atlantic (20%). The Midwest has the second highest composting rate (10%), followed by New England and the Mid-Atlantic (7%). With respect to combustion with energy recovery, New England is the leader by combusting 39 percent of its MSW. The Mid-Atlantic region is a distant second with 14 percent of the MSW combusted. The Rocky Mountain region has the highest landfilling rate (88%), followed by the Great Lakes (81%), the South (79%) and the Midwest (78%).

RECYCLING AND COMPOSTING ACTIVITY

The tonnages of specific materials recycled in 2008 are shown in Table 3. All but 10 states and the District of Columbia provided data on at least one recycled material. Sixteen states had data available on tons collected through single-stream recycling programs; only four states reported aggregated dual stream data. Table 3 shows the “as reported” tonnages for various materials. It can be seen that some states have reported material recycling figures that most likely included non-MSW,

primarily in the categories “Iron and Steel Scrap” and “Other Metals.” States that were adjusted for this in the final results of Table 2 are: Arkansas, Florida, Kentucky, Maine, Montana, Nevada, New Hampshire, New Jersey and Washington (see item No. 2 in section above titled “Protocol Used For Recycling Tonnages”).

The State of Garbage survey requested information on the number of curbside recycling collection programs and population served by curbside recycling in each state, as well as the number of MRFs, drop-off sites and “pay-as-you-throw” programs. Only 25 states had data on curbside programs, and only 21 reported the population served by such programs. These states reported a total of 4,371 curbside recycling programs; New York State did not report a number, but according to the 2006 State of Garbage in America Report (2004 data), New York had 1,500 curbside programs. The total population served by these programs amounts to 87.9 million, of which 23.6 million is from California. California did not report a curbside population number, but this information was obtained from the calrecycle.ca.gov website (calrecycle.ca.gov, 2010).

The State of Garbage survey also requested information on the number of facilities composting yard trimmings in each state. Thirty states reported a total of 2,284 facilities. New Jersey reported the most sites (345) that compost over 1.9 million tons of MSW yard trimmings.

LANDFILLS, WASTE-TO-ENERGY AND LANDFILL GAS RECOVERY

The State of Garbage results for number of landfills and WTE plants, gate (“tipping”) fees for these facilities, and remaining landfill capacity are shown in Table 4. Where states did not provide 2008 data, data from the 2008 State of Garbage Report (2006 data) were used. A total of 1,908 MSW landfills were reported. (Interestingly, when *BioCycle* conducted the first State of Garbage In America survey in 1989, there were almost 8,000 MSW landfills in the U.S.). Average gate (“tipping”) fees have increased slightly since the 2008 survey; landfill and WTE gate fees were, on average two dollars higher than in 2006, at \$44.09 and \$67.93 per ton of handled waste, respectively.

Another section of the 2010 State of Garbage survey requested data on the recovery of landfill gas (LFG). Twenty-eight states reported that 260 out of 1,414 landfills recovered landfill gas. However, some of the non-LFG landfills may be closed. A total of 95 landfills reported volumes of LFG captured: 59.1 billion cubic feet. Since LFG generally contains 500 Btu per cubic foot, the energy recovery from these 95 landfills was about 30 trillion Btu. This amount represents only 20 percent of the total LFG energy used by the U.S. in 2004 (150 trillion Btu), according to the U.S. Energy Information Administration (EIA, 2006). Since this

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is the first time that LFG capture was included in the State of Garbage survey, it is hoped that more states will collect and report such data in future surveys.

MSW IMPORTS AND EXPORTS, LANDFILL BANS

Waste imports and exports are shown in Table 5. There is an obvious discrepancy between the totals of these categories: imported MSW was almost two times higher than exported MSW. EEC believes this is due to the fact that imported wastes are much better tracked than those exported. MSW imports/exports from other countries, primarily Canada, were excluded where possible.

Table 6 shows materials banned from landfills. It can be seen that whole tires are banned from landfills in almost every state, except Alabama, Alaska, Montana, Nevada, North Dakota and Wyoming. Oil and lead-acid batteries are banned from most U.S. landfills as well. Twenty-five states ban leaves, grass and/or brush from landfill disposal. Seven states have bans on

Table 5. Waste imports and exports by state, where reported, for 2008 (unless noted)¹

State	Imported (tons/yr)	Exported (tons/yr)
Alaska	—	23,207
California ²	58,375	337,563
Connecticut	64,088	223,999
Georgia	1,857,687	—
Idaho	—	66,159
Illinois	1,893,223	—
Indiana ²	1,318	242,799
Iowa	226,675	93,273
Kansas	537,791	98,303
Maine	243,397	60,491
Maryland	29,542	1,849,121
Massachusetts	240,000	840,000
Michigan	5,214,000	—
Minnesota	—	604,287
Mississippi	674,163	—
Missouri	65,561	1,239,069
Nevada	342,959	113,435
New Hampshire	522,782	38,558
New Mexico	613,024	—
New York	1,089,152	4,814,843
North Carolina	139,446	863,604
Ohio	2,265,321	902,234
Oregon	2,581,423	15,375
South Carolina	1,257,017	162,194
South Dakota	8,606	—
Tennessee	623,119	564,618
Texas	351,172	—
Utah	27,910	—
Vermont	—	108,431
Virginia	4,833,820	—
Washington	183,488	1,277,140
Wisconsin	1,369,938	101,590
Wyoming	—	558
Total	27,314,996	14,640,850

¹Total imported and exported MSW, consisting of MSW landfilled, recycled, composted and incinerated in WTE plants.

²Includes (some) non-MSW. “—” indicates information not reported by the state.

Table 4. Number of municipal solid waste landfills and waste-to-energy plants, average tip fees and landfill capacity by state for 2008 (unless noted)

State	Number of MSW Landfills	Average Landfill Tip Fee (\$/ton)	Landfill Capacity Remaining (units listed)	Number of WTE Plants	Average WTE Tip Fee (\$/ton)
Alabama	31	25 ¹	-	1 ²	25 ³
Alaska	245	-	-	2	-
Arizona	44	-	-	0	-
Arkansas	24	35	600+ yrs	1	-
California	135 ⁴	-	1,900,000,000 cy	3	-
Colorado	56	30.47	-	0 ⁵	-
Connecticut	2 ⁴	63	190,000 cy	7 ⁶	64
Delaware	3	58.97	5,000,000 cy ⁷	0	-
District of Columbia	-	-	-	0	-
Florida	50	37	-	12	52.95 ⁷
Georgia	63	34.92	572,000,000 cy	1 ⁷	-
Hawaii	-	-	-	0	-
Idaho	24	-	-	0	-
Illinois	45	-	1,024,452,000 cy ⁷	0	-
Indiana	35 ⁷	29.57 ⁷	325,341,444 cy	1	-
Iowa	45 ⁴	40.71	118,616,405 tons	1 ⁷	64 ⁷
Kansas	51 ⁴	30 ¹	-	0	-
Kentucky	34 ⁷	29.21 ⁷	212,043,842 tons ⁷	2 ⁷	-
Louisiana	26 ⁴	46	186,177,934 tons	0	-
Maine	8	35-85 ⁷	15,834,570 cy	4	-
Maryland	23	52	8,235,391 cy	9 ⁷	-
Massachusetts	16	72	2,506,455 cy ⁷	7	69
Michigan	50 ⁷	-	461,824,259 cy ⁷	3 ⁷	-
Minnesota	21	50	27,000,000 cy ⁷	9	55
Mississippi	18	25	288,142,319 cy	0	-
Missouri	21	-	217,579,836 cy	7 ⁷	-
Montana	30	42	92,025,335 cy ⁷	0	-
Nebraska	23 ⁷	-	-	0	-
Nevada	22 ⁸	-	-	0	-
New Hampshire	7	77	12 yrs	2	68 ⁹
New Jersey	13	68 ¹⁰	-	5	85
New Mexico	30	28	162,033,429 cy ⁷	0	-
New York	27	44.69	219,535,298 tons	10	72.34
North Carolina	40 ⁷	35 ¹	157,920,815 tons ⁷	1 ⁷	-
North Dakota	13	34	22,680,000 cy	0	-
Ohio	42 ⁷	32 ⁷	667,843,591 cy ⁷	0	-
Oklahoma	38 ⁷	15-22 ⁷	-	0	-
Oregon	33 ⁷	35 ⁷	-	1 ⁷	-
Pennsylvania	48 ⁷	-	265,000,000 tons ⁷	6 ⁷	-
Rhode Island	2	52	2,700,000 tons	0	-
South Carolina	18	35	130,267,111 tons	1	-
South Dakota	15	39.5	74,000,000 cy	0	-
Tennessee	34 ⁴	34 ^{10,11}	145,533,153 tons	0	-
Texas	191	27.8	1,439,621,096 tons	1 ⁷	-
Utah	34	-	300,000,000 tons	1	-
Vermont	5	96 ⁷	-	0	-
Virginia	56 ⁴	-	249,070,298 tons ⁷	12 ⁴	-
Washington	15	52.65	223,000,000 tons	3 ¹²	98
West Virginia	19 ⁷	45.18 ⁷	-	0	-
Wisconsin	33	42.5	91,500,000 cy ¹¹	2	51
Wyoming	50	55	-	0	-
Total or average	1,908	44.09	-	115	67.93

¹Estimate. ²Provides steam only to military base. ³Same as MSW landfilled. ⁴Active only. ⁵Currently one facility in the permitting process. ⁶One is tire burner. ⁷2006 data. ⁸Class I and II landfills. ⁹Co-op fee. Spot is \$88. ¹⁰2009 data. ¹¹Based on survey of 24 landfills. ¹²Only one is taking MSW.

A total of 1,908 MSW landfills were reported. The average tipping fee in 2008 was \$44.09/ton.

disposal of containers and/or paper. Three states do not allow disposal of construction and demolition debris.

FINAL NOTE

The U.S. Environmental Protection Agency issues an annual report on MSW generation and management in the U.S. (MSW Facts & Figures, 2008). The State of Garbage methodology differs from that of EPA's in several ways. First, the EPA characterizes the MSW stream for the whole nation and not on a state-by-state basis. Second, the EPA bases its results on

the aggregate of several sources, including estimates of materials and products generated and their life spans, key industry associations and businesses, and waste characterization studies and surveys conducted by governments, the media and industry.

Another important difference is that EPA estimates the tonnage landfilled as the difference between its estimate of MSW generated minus its estimate of what is sent to composting, recycling or WTE plants. The State of Garbage methodology, however, is based purely on tons managed

Table 6. Materials banned from landfills

State	Yard Trimmings	Containers, Paper	Whole Tires	Used Oil	Lead-Acid Batteries	White Goods	Electronics	C&D	Others
Alabama				x	x				
Alaska				x	x				
Arizona			x	x	x				
Arkansas	x		x		x				
California			x	x	x	x	x		
Colorado			x	x	x		x		
Connecticut	x		x		x				
Delaware ¹	x		x						
Florida	x		x	x	x				
Georgia ¹	x ²		x	x	x				
Hawaii			x						
Idaho			x		x				
Illinois	x		x	x	x	x			x ³
Indiana	x		x						
Iowa	x		x	x	x	x			x ⁴
Kansas			x						
Kentucky ¹			x		x				
Louisiana			x	x	x	x			
Maine			x	x ⁵	x	x	x		x ⁶
Maryland	x ⁷		x	x ⁸	x ⁹				
Massachusetts	x	x ¹⁰	x	x	x	x	x	x	
Michigan ¹	x	x ¹¹	x	x	x				
Minnesota	x		x	x	x	x	x	x	
Mississippi			x		x				
Missouri	x		x	x	x	x			
Nebraska ¹	x		x	x	x	x			
New Hampshire	x		x	x	x		x		
New Jersey	x	x	x	x	x	x	x		
New Mexico				x	x				x ¹²
New York			x						
North Carolina ¹³	x	x ¹⁴	x	x	x	x			x ¹⁵
North Dakota			x	x	x	x			
Ohio ¹	x ⁷		x						
Oregon			x				x		
Pennsylvania ¹	x		x		x				
Rhode Island	x	x	x	x	x	x	x		
South Carolina ¹³	x ⁷		x	x	x	x		x	
South Dakota	x		x	x	x	x			
Tennessee			x	x	x				
Texas			x	x	x	x ¹⁶			
Utah			x	x	x				
Vermont	x	x	x	x	x	x			
Virginia			x		x		x		
West Virginia ¹	x ¹⁷		x	x	x				
Wisconsin	x ¹⁸	x	x	x	x	x			
Wyoming				x	x				

¹2006 data. ²Yard trimmings are banned from landfills designed and built to Subtitle D standards. ³Medical waste, mercury thermostats. ⁴Hazardous and PCB wastes, free liquids, seepage, hot loads, baled solid wastes. ⁵Includes toxic liquids. ⁶Mercury-containing products. ⁷Separately collected waste is banned from the landfill. ⁸Liquid ban. ⁹Hazardous waste ban. ¹⁰Glass and metal containers, single-resin narrow-necked plastic containers. ¹¹Beverage containers are banned. ¹²Liquids. ¹³Banned materials are banned from Class 3 disposal. ¹⁴Aluminum cans are banned. ¹⁵Wood pallets, oil filters. ¹⁶With CFCs. ¹⁷Landfills can get a waiver for yard trimmings if there is no composting facility nearby. ¹⁸Brush with a diameter smaller than 6-inches is banned from disposal.

Table 7. Comparison of US EPA and BioCycle/EEC MSW generation and management data (calendar year 2008)

MSW Data	EPA/Franklin (million tons)	BioCycle/EEC (million tons)
Total generated	249.6	389.5
Total recovery (recycling, composting, mulch)	82.9	93.8
Combustion with energy recovery	31.6	25.9
Discards to landfill	135.1	269.8

via all four methods in the responding states. Table 7 provides data from the US EPA's MSW Facts And Figures Report (2008 data) compared to the 2010 State of Garbage in America Report (2008 data). As a result, the EPA estimate of MSW landfilled is 98.5 million tons less than what is actually disposed in MSW landfills according to the BioCycle/EEC measurements. ■

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 Calrecycle.ca.gov: <http://www.calrecycle.ca.gov/BevContainer/Curbside/>.
 U.S. Energy Information Administration: www.eia.doe.gov/cneaf/solar.renewables/page/landfillgas/landfillgas.html.

SURVEY CONTRIBUTORS

BioCycle and the Earth Engineering Center of Columbia University would like to thank the following state solid waste management and recycling/composting officials for their assistance with the 2010 State of Garbage In America Report. We greatly appreciate their time and willingness to participate in this national survey. Gavin Adams, Alabama; Douglas Buteyn,

Alaska; Arizona Department of Environmental Quality, Arizona; Nancy Carr, California; Wolf Kray, Colorado; Judy Belaval, Connecticut; Anne M. Germain, Delaware; Shannan Reynolds, Florida; Randy Hartmann, Georgia; Lane Otsu, Hawaii; Dean Ehlert, Idaho; Ellen Robinson, Illinois; Michelle Weddle, Indiana; Becky Jolly, Iowa; Christine Mennicke, Kansas; John Rogers, Louisiana; George MacDonald, Maine; David Mrgich, Maryland; John Fischer, Massachusetts; Matt Flechter, Michigan; Arlene Vee, Minnesota; Mark Williams, Mississippi; Brenda Ardrey, Missouri; Bonnie Rouse, Montana; Steve Danahy, Nebraska; Nevada Division of Environmental Protection - Bureau of Waste Management, Nevada; Donald E. Maurer, New Hampshire; Edward Nieliwocki, New Jersey; Connie Pasteris, New Mexico; Scott Menrath, New York; Scott Mouw, North Carolina; Steve Tillotson, North Dakota; Andrew Booker, Ohio; Mary Lou Perry, Oregon; Mike McGonagle, Rhode Island; Elizabeth Rosinski, South Carolina; Steven Kropp, South Dakota; Department of Environment and Conservation, Tennessee; Kari Bourland, Texas; Ralph Bohn, Utah; Jeff Bourdeau, Vermont; Stephen Coe, Virginia; Gretchen Newman, Washington; Cynthia Moore, Wisconsin; Craig McOmie, Wyoming.

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Reprinted From:
October, 2010

