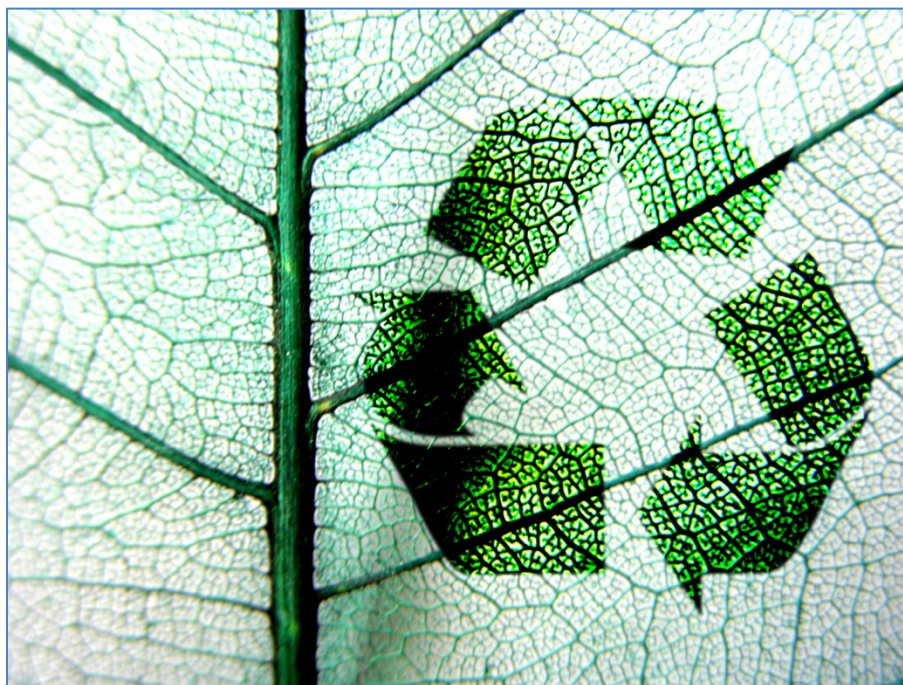
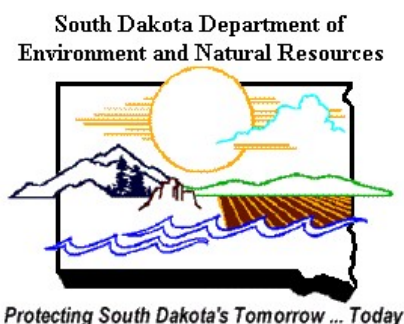


State of South Dakota Recycling/Diversion Report 2011



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Prepared by:
South Dakota Department of Environment & Natural Resources
Waste Management Program



Protecting South Dakota's Tomorrow ... Today

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I. Introduction

In June of 2010 EPA Region 8 States (CO, MT, ND, SD, UT, and WY) convened to discuss the potential for regional consistency among materials measurement. A voluntary committee was formed that represented each state's office of solid waste and state recycling/solid waste association representatives. The initial goal of the Materials Management Committee was to find an agreement on interstate consistency of terminology/definitions, common commodities, units of measurement, and a unified data analysis tool. The committee developed a materials methodology hierarchy chart, a list of definitions, and a material commodities reporting form. The long term focus of the committee after achieving these goals was to be able to assess the flow of commodities and develop strategies to retain commodities, the markets, and the value locally within Region 8.

It was through this committee the State of South Dakota Department of Environment and Natural Resources Waste Management Program made an extensive effort to gather statewide recycling/diversion data from entities involved in solid waste management. The data collected during these efforts gave DENR the ability to determine statewide recycling and diversion rates for South Dakota, an approximate percentage of the population that has access to recycling, and percentages to compare nationally and regionally.

The focus of this report will be to summarize the following: 1) methods and materials used to collect and process statewide recycling and diversion data, 2) results of the data collected and an understanding of the percentages and rates calculated in the report, and 3) an overall conclusion of the State of South Dakota's recycling and diversion efforts from a solid waste management perspective.

II. Methods and Materials

It was determined that the most effective way to collect the statewide data required to estimate comprehensive recycling/diversion percentages was to use a volunteer reporting form. The State Commodities Reporting Form 2011 (see appendix A) was developed to gather recycling/diversion tonnages from entities involved in solid waste management. The reporting form was developed using Microsoft Word and Excel applications. The reporting form was designed in a manner that allowed businesses or municipalities the ability to report commodities that were either mixed together or sorted. This was done in an effort to make filling out the reporting form more convenient for the individual based upon the collection system used by the reporter. By offering a form where entities could report tonnages based on how their collection systems operated, an increase in voluntary participation was expected. Participation also increased as entities were informed that all information provided in this report is from a cumulative aspect with no individual tonnages shown.

Approximately 118 reporting forms were mailed out to businesses, counties, and municipalities that were involved in solid waste management from a recycling/diversion aspect. For convenience and to increase participation, the option to request the form electronically was also offered. Of the 118 reporting forms mailed out, the DENR Waste Management Program received 71 completed State Commodities Reporting Forms. Approximately 60% of entities that received the reporting form completed it. It should be noted that the vast majority of entities that compile the largest tonnage totals in South Dakota did participate in filling out a reporting form. The approximate 40% that did not participate in the reporting form survey were smaller or private business entities that don't accumulate large yearly tonnages, thus their participation in the survey would not significantly change the survey results.

A generous timeline was given to all entities that were mailed a reporting form. This was done to give everyone ample time to fill out the reporting form. An extended cutoff date also resulted in a higher participation rate. Once all the reporting forms were received, a Microsoft Excel Spreadsheet was used to track, record, and calculate the total tonnage of materials (see appendix B). This spreadsheet was used to separate total tonnages of materials into the following categories:

- | | |
|----------------------------|--------------------------------------|
| 1) Papers | 6) Single Stream |
| A. High-grade office paper | 7) Compost |
| B. Mixed/newspaper | 8) Aggregates |
| 2) Cardboard | A. Concrete |
| 3) Metals | B. Asphalt pavement |
| A. Aluminum cans | 9) Asphalt shingles |
| B. Steel/tin cans | 10) Wood/ash |
| C. White goods | 11) Textiles |
| D. Scrap metal | 12) Glass |
| 4) Batteries | 13) Tires |
| 5) Plastics | 14) Used oil |
| A. PET #1 | 15) Antifreeze |
| B. HDPE #2 | 16) Electronics |
| C. #1 & #2 mixed | 17) Household hazardous waste |

III. Results

In 2011, South Dakota disposed of approximately 579,951 tons of municipal solid waste in 15 different landfills while recycling approximately 131,427 tons of MSW across the state. The total tonnage of MSW landfilled is derived from the \$1 per ton tipping fee that is charged by all landfills across the state that goes into a state funding account to assist solid waste management projects. The total tonnage of recycled MSW across the state comes from the data recorded in the reporting forms received. The State of South Dakota in 2011 achieved an estimated **MSW recycling rate of 18.5%.**

The following equation was used to determine the MSW recycling rate:

$$579,951 \text{ (tons of MSW disposed)} + 131,427 \text{ (tons of MSW recycled)} = 711,378 \text{ tons; } 131,427/711,378 = 18.5\%$$

The table below illustrates the materials that were reported in the survey and used to calculate an MSW recycling rate of 18.5%.

Material	Tons
Paper	34293.5
Cardboard	23611.9
Aluminum Cans	2929.7
Steel/Tin Cans	1580.6
White Goods	4967
Batteries	3896.2
Plastic	3217.3
Yard Waste	49111
Textiles	27.2
Glass	3317.2
Electronics	2173.5
Household Hazardous Waste	186.4
Tires	2115.3
Total	131426.8

Table 1. List of materials associated with the MSW recycling rate of 18.5%

It should be noted that the tonnages in Table 1 for paper, aluminum and steel cans, plastic, and glass will not reflect the same tonnage that is displayed in appendix B. This is due to the single stream tonnage of 27,288 in appendix B being distributed to the appropriate separated materials at the following percentage in Table 1: paper 70 %, aluminum 4.5 %, steel cans 4.5 %, plastic 9 %, and glass 12 %. The resource used to determine the percentages of material separation in the single stream commodity came from the facility reporting the single stream tonnage.

The DENR Waste Management Program estimates that approximately 56% of the population in South Dakota has reasonable access to an MSW recycling program. The population of South Dakota in 2011 according to the US Census Bureau was 824,082. In researching which towns/cities in South Dakota have reasonable access to an MSW recycling program it was determined that approximately 459,013 people have reasonable access. The following equation was used to determine that 56% of the population has access to an MSW recycling program:

$$459,013/824,082=55.6 \text{ rounded up to } 56\%$$

In 2011 South Dakotans generated approximately 4.7 lbs. of MSW per person/day. This is comparable to the national average of 4.4 lbs. of MSW per person/day. South Dakota disposed of approximately 579,951 tons of MSW while recycling 131,427 tons.

The equation used to determine 4.7 lbs. of MSW per person/day is as follows:

$$579,951 + 131,427 = 711,378 \text{ tons} \times 2,000 \text{ lbs} = 1,422,756,000 \text{ lbs}; 1,422,756,000 / 824,082 \text{ (population)} = 1726.5 \text{ lbs per person/year}; \\ 1726.5 / 365 \text{ (days in a year)} = 4.7 \text{ lbs of MSW per person/day}$$

The Waste Management Program also broke down certain materials as a percentage of the total recycled MSW in tons. Those percentages were then compared to an EPA document titled *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2011*.

The figures below show the pie chart from the EPA document on the left and South Dakota on the right. The pie chart percentages allow us to compare national numbers to South Dakota numbers for different recyclable materials. Our state numbers for metals, glass, and plastic compare relatively closely with national numbers while there is some variability with paper fiber and yard waste.

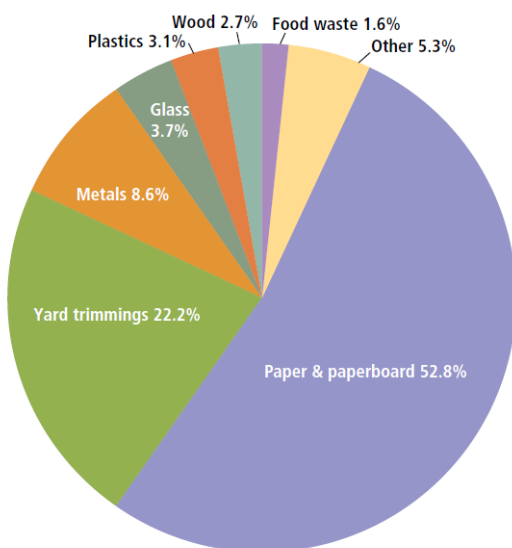


Figure 1. EPA Total MSW recovery (by material), 2011
87 million tons

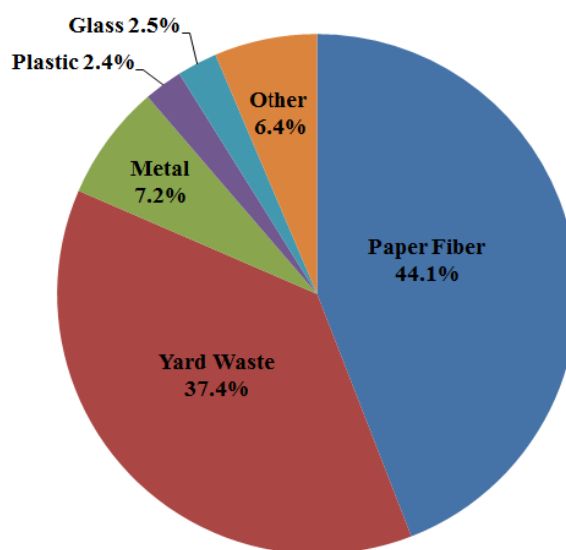


Figure 2. South Dakota total MSW recovery (by material), 2011
131,427 tons

The percentages used in the figure 2 pie chart above were determined using the following equations:

$$\begin{aligned} \text{Percentage of MSW recycling is paper fiber} &= 57,905 / 131,427 = \mathbf{44.1\%} \\ \text{Percentage of MSW recycling is metal} &= 9,477 / 131,427 = \mathbf{7.2\%} \\ \text{Percentage of MSW recycling is plastic} &= 3,217 / 131,427 = \mathbf{2.4\%} \\ \text{Percentage of MSW recycling is glass} &= 3,317 / 131,427 = \mathbf{2.5\%} \\ \text{Percentage of MSW recycling is yard waste} &= 49,111 / 131,427 = \mathbf{37.4\%} \end{aligned}$$

In addition to an MSW recycling rate of 18.5%, another recycling rate was figured that included scrap metal and wood tonnages reported across the state. South Dakota achieved a **recycling rate of 21% when all scrap metal and wood tonnages are included with MSW recycling**. South Dakota in 2011 recycled approximately **93,680 tons of scrap metal** in addition to the 9,477 tons of metal recycled in the MSW recycling rate. A total of **16,993 tons of wood material** was recycled in 2011. South Dakota disposed of approximately 646,561 tons of MSW and C&D debris in the 15 different MSW landfills across the state. This along with 263,023 tons of C&D debris from restricted use sites make up the total amount of waste materials disposed of in South Dakota in 2011. Restricted use sites in South Dakota are not required to report tonnage data to the DENR, therefore, to determine an accurate tonnage the population base of South Dakota 824,082 was multiplied by a C&D waste generation of .4 tons per person/year. That number of 329,633 tons was then subtracted from a tonnage number of 66,610 that was reported by MSW landfills across the state that disposed of C&D. The equation used is as follows: $824,082 \times .4 = 329,633$; $329,633 - 66,610 = 263,023$

The following equation was used to determine a recycling rate of 21%:

$$646,561 \text{ (landfills)} + 263,023 \text{ (RU sites)} + 131,427 \text{ (MSW recycling)} + 93,680 \text{ (scrap metal)} + 16,993 \text{ (wood)} = 1,151,684;$$

$$242,100 \text{ (total amount recycled)} / 1,151,684 = 21\%$$

Big Stone Power Plant generates approximately 91,394 tons of ash a year during operation of the power plant. Of that tonnage approximately 40,132 tons is disposed of and 51,262 tons is recycled. **When you incorporate Big Stone Power Plant's tonnage into the above recycling rate of 21% the rate increases to 23.6%.** The following equation is used to determine a recycling rate that incorporates Big Stone Power Plant:

$$646,561 \text{ (landfills)} + 263,023 \text{ (RU sites)} + 40,132 \text{ (ash buried)} + 131,427 \text{ (MSW recycling)} + 93,680 \text{ (scrap metal)} + 16,993 \text{ (wood)}$$

$$+ 51,262 \text{ (ash recycled)} = 1,243,078; 293,362 \text{ (total amount recycled)} / 1,243,078 = 23.6\%$$

In 2011 a total of approximately **949,716 tons of waste material was buried in South Dakota**. This compared with approximately **611,617 tons of material diverted from landfills and restricted use sites** across the state gives South Dakota a **39.2% diversion rate**. The materials used in determining South Dakota's diversion rate are: MSW, scrap metal, aggregates (concrete & asphalt), used oil, antifreeze, wood, coal ash, asphalt shingles. The equation used to determine South Dakota's diversion rate is as follows:

$$686,693 \text{ (MSW + ash buried)} + 263,023 \text{ (RU site buried)} + 611,617 \text{ (total diverted)} = 1,561,333;$$

$$611,617 / 1,561,333 = 39.2\%$$

The table below illustrates the materials that were reported in the survey and used to calculate a total diversion tonnage of 611,617.

<u>Material</u>	<u>Tons</u>
MSW	131426.8
Scrap Metal	93680.4
Aggregates	310106
Used Oil	1460.8
Antifreeze	401.9
Diverted HHW	224
Wood/Ash	71174.5
Asphalt Shingles	3143
Total	611617.4

Table 2. List of materials associated with the diversion rate of 39.2%

IV. Conclusion

In 2011 South Dakota had a calculated MSW recycling rate of 18.5% with an estimated 56% of the population having reasonable access to MSW recycling programs. A 21% recycling rate was achieved when all scrap metal and wood commodities were included in the rate. According to the EPA the United States generated nearly 250 million tons of MSW and recycled almost 87 million tons of this material, equivalent to a 34.7% MSW recycling rate. While South Dakota's MSW recycling rate does not compare with the national average of 34.7%, it is worth noting that approximately 44% of South Dakota's population does not have access to an MSW recycling program. A lower program availability statewide will likely result in a lower statewide MSW recycling rate. Due to transportation costs, lower population centers, and the volume of materials created, it is challenging for these areas that make up the 44% to find feasible ways to bring programs to those areas. The DENR will continue to work with towns and counties to develop new strategies to implement efficient recycling programs throughout South Dakota and these challenging rural areas. South Dakota kept waste materials from being buried in our landfills and restricted use sites at a 39.2% diversion rate across the state. This accomplishment in diverting waste is over one third of the total waste generated in South Dakota. With a diversion rate reaching 39.2% and an overall recycling rate at 21%, our communities, cities, and businesses across the state continue to have a positive impact on landfill life expectancies in South Dakota while conserving natural resources and sustaining the environment for future generations.

References:

Environmental Protection Agency, *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2011*, May 2013.

U.S. Department of Commerce, U.S. Census Bureau, *Table 1. Annual Estimates of the Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2011*.

Department of Environment and Natural Resources – Waste Management Program, *Reporting data 2011*.

Appendix A
State Commodities Reporting Form 2011

State Commodities Reporting Form 2011

Name of facility: _____
Address: _____
City: _____
ZIP code: _____
Mailing Address: _____
of Facility Employees: _____
Contact person: _____
Phone: () _____
Fax: () _____
E-mail: _____
Reporting Period: 2011 _____

Any records in our possession identified as “confidential business information” or as a “trade secret” **will not be disclosed with any other entity.** To assert a claim of business confidentiality please check the box below, adding your facility information and submitting this sheet along with your reporting forms.

Yes. (Please mark with an "X" to claim privilege) _____

Facility Name:

Street Address: City: Zip Code:

Telephone: County:

Submitted By:

Date:

Submit only one confidentiality form per facility. Applies only to facility identified above.

****Account for Materials actually Diverted to viable Resource Recovery End Use****

Select Facility Type:

Select from drop list

or circle on of the following:

(MRF, Permitted Landfill, Municipality, Transfer Station, Salvage Recycler, Community, Large Retail Business, Broker)

Materials within each General Commodity grouping are organized by Sub-category, and futher to Individual Commodity. Please provide data in the most specific categories possible.

General Commodity	Sub-category	Individual Commodity	Amount	Units of Measure	Optional: Shipped Out-of-State?
Paper			Total:		No / Yes, where
	Paper (All Mixed)				No / Yes, where
		White Office Paper (high grade paper)	#		No / Yes, where
	(not included in the All Mixed amount above)	Mixed Paper (newsprint, other office paper)	#		No / Yes, where
		Phonebooks	#		No / Yes, where
		Cardboard (& Paperboard)			No / Yes, where
	(not included in the Cardboard amount above)	Paperboard	#		No / Yes, where
		Cardboard	#		No / Yes, where

Metals			Total:	Units	No / Yes, where
		Residential Aluminum Cans	#		No / Yes, where
		Residential Steel Cans / Tin Cans (food containers)	#		No / Yes, where
		White Goods	#		No / Yes, where
		Auto Scrap / Shred	#		No / Yes, where
		Industrial Non-Ferrous	#		No / Yes, where
		Industrial Ferrous	#		No / Yes, where
		Other Industrial steel	#		No / Yes, where

Batteries			Total:	Units	
		Vehicle Batteries	#		No / Yes, where
		Other Batteries (AA's, etc)	#		No / Yes, where

Plastics			Total:	Units	No / Yes, where
(#1 -#7 Mixed)					
			Subtotals		No / Yes, where
		#1 & #2 Mixed	#		No / Yes, where
		PET #1	#		No / Yes, where
(not included in the #1& #2 Mixed amount above)		HDPE #2 - Mixed	#		No / Yes, where
	(not included in the HDPE #2 Mixed amount above)	HDPE #2 Natural	#		No / Yes, where
		HDPE #2 Colored	#		No / Yes, where
		All others #3 through #7	#		No / Yes, where

Organics		Total:	Units	No / Yes, where
(not included in the Other Organics amount above)	Other Organics			No / Yes, where
	Food Scraps	#		No / Yes, where
	Yard Trimmings (grass & wood chips)	#		No / Yes, where
	Agricultural Organics (livestock, manure, food waste)	#		No / Yes, where
	Compost Feed Stock	#		No / Yes, where
	Biosolids	#		No / Yes, where
	Food Processing Residuals	#		No / Yes, where
	Sewage Sludge	#		No / Yes, where
	Drywall	#		No / Yes, where
	Other Compostables	#		No / Yes, where
	Wood	#		No / Yes, where
	(not included in the Wood amount above)			
	Agricultural Wood	#		No / Yes, where
	Construction/Dimensional Lumber/ Pallets/Crates/Shingles	#		No / Yes, where
	Forestry Secondary Materials - Mill byproducts	#		No / Yes, where

Aggregates		Total:	0	Units	No / Yes, where
	Concrete	#			No / Yes, where
	Asphalt pavement	#			No / Yes, where
	Other	#			No / Yes, where

Coal Combustion Products		Total:	Units	No / Yes, where
	Fly Ash	#		No / Yes, where
	FGD Gypsum	#		No / Yes, where
	Bottom Ash	#		No / Yes, where
	Coal Slag	#		No / Yes, where
	All others	#		No / Yes, where

Textiles		Total:	Units	No / Yes, where
	Carpet	#		No / Yes, where
	Carpet Padding	#		No / Yes, where
	Other textiles (clothing, fabric, upholstery)	#		No / Yes, where

Glass		Total:	Units	No / Yes, where
	Mixed Glass	#		No / Yes, where
	Amber Glass (not included in the Mixed amount above)	#		No / Yes, where

Scrap Tires / Rubber		Total:	Units	No / Yes, where
	Passenger Tires	#		No / Yes, where
	Commercial Truck	#		No / Yes, where

Used Oil	Total:		Units	No / Yes, where
-----------------	--------	--	-------	-----------------

Anti-Freeze	Total:		Units	No / Yes, where
--------------------	--------	--	-------	-----------------

Cooking Oils	Total:		Units	No / Yes, where
---------------------	--------	--	-------	-----------------

Biofuels	Total:		Units	No / Yes, where
-----------------	--------	--	-------	-----------------

Electronics	Total:		Units	No / Yes, where
Mixed Electronics	#			No / Yes, where
Monitors & TV's (not included in the Mixed amount above)	#			No / Yes, where

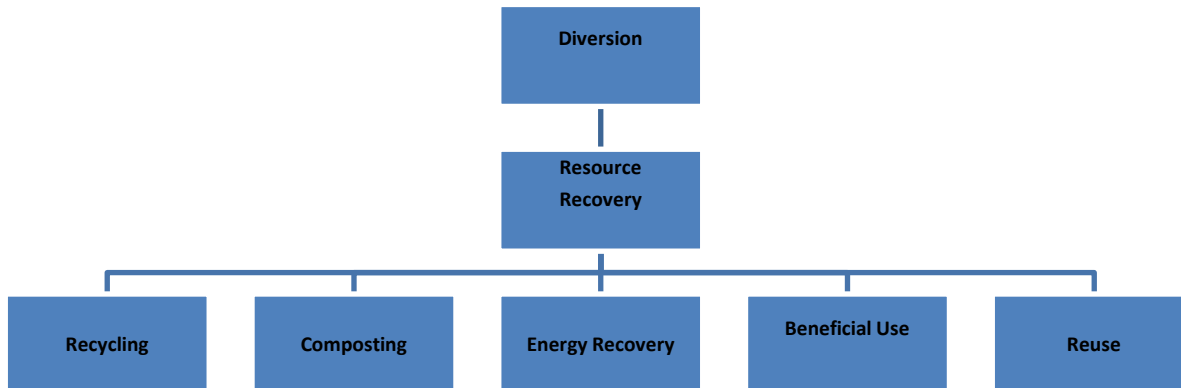
Asphalt Shingles	Total:		Units	No / Yes, where
-------------------------	--------	--	-------	-----------------

Alternative Daily Cover	Total:		Units	No / Yes, where
List amounts of different materials used for alternative daily cover. For Tracking purposes only, amounts will not be added to total of Resource Recovery.	Write in...			
	Write in...			
	Write in...			
	Write in...			
	Write in...			
	Write in...			

Single Stream Recyclables	Total:		Units	No / Yes, where
List materials in your Single Stream collection				

Other Materials	Total:		Units	No / Yes, where
Write in...				No / Yes, where
Write in...				No / Yes, where
Write in...				No / Yes, where

Materials Management Flowchart



References: Definition of Materials

Regional Agreement Definitions: (draft)

Diversion: Process of systematically redirecting waste from disposal.

Resource Recovery: means the recovery of material or energy from solid waste.

Recycling: any process by which solid waste, or materials that would otherwise become solid waste, are: collected or processed, and returned to use in the form of raw materials or products. The term does not include any form of energy recovery.

Composting: The process of converting raw organic materials into a biologically-stable soil amendment through intentional and active manipulation. Manipulation may include, but is not limited to, grinding, mixing, turning, and adding liquid and/or bulking agents.

Energy Recovery: Obtaining energy from solid waste through a variety of processes.

Beneficial Use: means the use of solid waste as an ingredient in a manufacturing process, or as an effective substitute for natural or commercial products, in a manner that does not pose a threat to human health to the environment. Avoidance of processing or disposal cost alone does not constitute beneficial use. The use of a material as an Alternative Daily Cover in a solid waste landfill is not considered a beneficial use.

Reuse: Use of a product more than once in its same form for the same or different purpose without substantial alteration.

Disposal: means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters. (SWDA)

Appendix B
2011 State Commodities Reporting Data

2011 State Commodities Report Data

2011 MSW Buried 579,951 tons

2011 MSW Recycling Rate: 18.5%

Material	Tons
Paper	15191.8
Cardboard	23611.9
Aluminum Cans	1701.6
Steel/Tin Cans	352.6
White Goods	4967
Batteries	3896.2
Plastic	761.41
Single Stream	27288.2
Yard Waste	49111
Textiles	27.2
Glass	42.7
Electronics	2173.5
HHW	186.4
Tires	2115.3
	131426.81

Equation: $579,951 + 131,427 = 711,378$; $131,427 / 711,378 = .185 \times 100 = 18.5$

Percentage of MSW Recycling paper fiber is 44.1%/52.8%

$57,905 / 131,427 = .441 \times 100 = 44.1$

Percentage of MSW Recycling metal is 7.2%/8.6%

$9,477 / 131,427 = .072 \times 100 = 7.2$

Percentage of MSW Recycling plastic is 2.4 %/3.1%

$3,217 / 131,427 = .024 \times 100 = 2.4$

Percentage of MSW Recycling glass is 2.5%/3.7%

$3,317 / 131,427 = .025 \times 100 = 2.5$

Percentage of MSW Recycling yard waste is 37.4 %/22.2%

$49,111 / 131,427 = .370 \times 100 = 37.4$

single stream tonnage is broken out 70, 9, 9, & 12 percent

denotes national average percentage

2011 Recycling Rate 21.0 %

(includes all scrap metal & wood tonnages)

Equation: $646,561 \text{ (landfills)} + 263,023 \text{ (RU Sites)} + 131,427 \text{ (MSW Recycling)} + 93,680 \text{ (scrap metal)} + 16,993 \text{ (Wood)} = 1,151,684$; $242,100 / 1,151,684 = .210 \times 100 = 21.0$

2011 Recycling Rate 23.6 %

(includes all scrap metal, big stone ash & wood tonnages)

Equation: $646,561 \text{ (landfills)} + 263,023 \text{ (RU Sites)} + 40,132 \text{ (ash buried)} + 131,427 \text{ (MSW Recycling)} + 93,680 \text{ (scrap metal)} + 16,993 \text{ (Wood)} + 51,262 \text{ (Big Stone Ash)} = 1,243,078$; $293,362 / 1,243,078 = .236 \times 100 = 23.6$

2011 Diversion Rate 39.2 %

Equation: $686,693 \text{ (MSW + Ash)} + 263,023 \text{ (RU Sites)} + 611,617 \text{ (total diverted)} = 1,561,333$; $611,617 / 1,561,333 = .392 \times 100 = 39.2$

2011 MSW generated per day/person= 4.7 lbs

National average is 4.4 lbs per day/person

Equation: $579,951 + 131,427 = 711,378 \text{ tons} \times 2,000 \text{ lbs} = 1,422,756,000$; $1,422,756,000 / 824,082 = 1726.5$; $1726.5 / 365 = 4.7$

56 % of the population has access to MSW recycling

Equation: $450,000 - 465,000 \text{ population base have access to MSW recycling in their towns/cities; population total } 824,082$; $459,013 / 824,082 = .556 \times 100 = 55.6 \%$