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Cutting the Waste Stream in Half:

Community Record-Setters Show How

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A fact sheet summarizing this report, also entitled *Cutting the Waste Stream in Half: Community Record-Setters Show How* (EPA-530-F-99-017), is available from the RCRA hotline at 1-800-424-9346.

Abbreviations

ARTS — Advanced Recycling Technology Systems, Inc.
BCUA — Bergen County Utilities Authority
BES — Bureau of Environmental Services
BFI — Browning Ferris Industries
BIRV — Business and Industry Recycling Venture
BWA — Business Waste Assistance
BY — backyard
C&D — construction and demolition
CPI — Consumer Price Index
CS — curbside
DO — drop-off
DPW — Department of Public Works
EPA — Environmental Protection Agency
est. — estimated
FTE — full-time equivalent
FY — fiscal year
GDP – gross domestic product
HDPE — high-density polyethylene
HH — household
HHW — household hazardous waste
ICW — institutional and commercial waste
ILSR — Institute for Local Self-Reliance
IWM — integrated waste management
lb. — pound
MFD — multi-family dwelling
MRAP — Municipal Recycling Assistance Program
MRF — materials recovery facility
MSW — municipal solid waste
NA — not available
NEC — Neighborhood Energy Consortium
O&M — operating and maintenance
OCC — old corrugated cardboard
OMG — old magazines
ONP — old newspapers
PAYT — pay as you throw
PET — polyethylene terephthalate
RDF — refuse-derived fuel
RLPC — Recycling and Litter Prevention Council
RMP — residential mixed paper
RSW — residential solid waste
SCORE — Select Committee on Recycling and the Environment
SFD — single-family dwelling
SW — solid waste
SWM — solid waste management
TPD — tons per day
TPY — tons per year
WMI — Waste Management Inc.
WMSC — Waste Management Service Charge
YR — year

Definitions and Terms Used in This Report

Communities may define the terms and calculate the amounts of waste and recycling in various ways. To facilitate comparison among programs, we have utilized a uniform methodology whenever possible to determine residential and commercial/institutional waste, municipal solid waste, and waste reduction levels. The following definitions apply to this report only and are not meant to represent industry-wide definitions. Some in particular differ or further delineate from definitions used to calculate EPA's Standard Recycling Rate (see U.S. EPA, *Measuring Recycling: A Guide for State and Local Governments*, 1997). For this report, *Cutting the Waste Stream in Half*, for instance, composting rates and costs are calculated separately from recovery rates and costs of other recovered materials. In addition, amounts of materials diverted from disposal for reuse are included in recycling figures.

Accrual Basis Accounting:	accounting that recognizes costs as services are provided, resources are used, or as events and circumstances occur that have resource consequences, regardless of when cash outlays are made
Avoided Disposal Fees:	disposal tip fees or costs at landfills, incinerators, or waste transfer stations multiplied by the tonnage of material recovered through community-sponsored waste reduction programs
Before Year:	a year prior to 1996 for which community solid waste management was collected and analyzed. Specific "before years" were chosen for each community to reflect years either before community waste reduction programs were begun or expanded.
Cash-Flow Accounting:	an accounting system where cash outlays are recorded as they are actually paid out for goods and services
Composting:	recovering and processing discarded organic materials into a soil amendment, fertilizer, and/or mulch. Composting is a form of recycling, but for the purpose of this report it is split out from the recycling figure in order to add detail.
Composting Rate:	the tonnage of source-separated organic materials collected for composting divided by the tonnage of waste generated
Cut It and Leave It:	leaving grass clippings on mowed lawns in order to avoid collection and disposal of this organic material; grasscycling
Deposit Containers Recycled:	the annual tonnage of beverage containers recycled as a result of state bottle bills. Massachusetts figures also include an estimate of refillable bottle usage.
Disposed Waste:	materials landfilled or incinerated (with or without energy recovery). Tires burned to recover their heating value are counted as disposed.
Diversion:	source reduction, reuse, recycling, and composting. Used interchangeably with "waste reduction."
Diversion Level:	the sum of materials recovered divided by total waste generated; waste reduction level
Dual-collection:	simultaneous curbside collection of trash and source-separated recyclables in the same vehicle

Flow Controls:	legal authority used by state and local governments to designate where municipal solid waste must be taken for processing, treatment, or disposal
Franchise System:	an arrangement whereby municipal government grants contractors exclusive rights to provide services in all or part of the municipality in return for a fee
Full Cost Accounting:	a systematic accounting approach for identifying, summing, and reporting the actual costs of solid waste management, taking into account past and future outlays, oversight and support service (overhead) costs, and operating costs
Grasscycling:	leaving grass clippings on mowed lawns in order to avoid collection and disposal of this organic material; Cut It and Leave It
Gross Domestic Product (GDP):	a measure of the size of the U.S. economy calculated by adding up all output produced
Institutional/Commercial Waste:	municipal solid waste from the institutional and commercial sectors (excluding medical waste). The commercial sector includes theaters, offices, retail establishments, hotels, and restaurants. The institutional sector includes establishments such as government agencies, hospitals, and schools.
Materials Recovery:	materials recycling and/or composting
Materials Recovery Facility:	facility where recyclables are sorted, baled, or otherwise processed so as to prepare them for end users
Mulch Mowing:	mowing whereby grass clippings are left on lawns to decompose
Municipal Solid Waste:	the sum of residential and commercial/institutional wastes. MSW excludes construction and demolition debris and manufacturing wastes. Also excluded is used motor oil.
Net SWM Program Costs:	the costs of residential waste reduction programs plus the costs of residential trash collection and disposal minus materials revenues
Net SWM Program Costs/ Household:	net SWM program costs divided by the number of households served by trash and recycling systems
Participation Rate:	the portion of households served that take part in the curbside collection program for recyclable materials
Pay As You Throw:	volume- or weight-based collection and/or disposal fees. Volume-based systems can charge customers on a per-bag or volume subscription basis.
Recyclables:	materials separated from the solid waste stream and transported to a processor or end user for recycling
Recycling:	the series of activities by which discarded materials are collected, sorted, processed, and converted into raw materials and used in the production of new products. Excludes the use of these materials as a fuel substitute or for energy production. In this report, recycling does not include composting. For communities with reuse programs, we have included reuse in recycling rates, even though we do not consider reuse to be one and the same as recycling. (Reuse is not significant enough currently to be calculated as a separate reuse rate.)
Recycling Rate:	the tonnage of source-separated materials collected for recycling divided by the tonnage of waste generated

Reject Rate:	the percentage by weight of recyclables or compostables entering a processing or composting facility that is disposed as residue
Residential Waste:	municipal solid waste from single-family and multi-unit residences and their yards
Reuse:	the repair, refurbishing, washing, or just the simple recovering of discarded products, appliances, furniture, and textiles for use again as originally intended. Reuse is generally considered a form of source reduction but in this report reuse is included in recycling.
Source Reduction:	the design, manufacture, purchase, or use of materials, such as products and packaging, to reduce the amount or toxicity of materials before they enter the municipal solid waste management system, such as redesigning products or packaging to reduce the quantity of materials used, reusing products or packaging already manufactured, backyard composting, grasscycling, and mulch mowing
Source-Separated:	divided by households into different fractions for disposal, recycling, and composting
Tip Fees:	the fees charged to haulers for delivering materials at recovery or disposal facilities
Trash:	materials destined for disposal facilities (incinerators or landfills)
Waste Generated:	the sum of materials recycled, composted, and disposed (including materials handled at waste-to-energy facilities)
Waste Generation Rate:	the average amount of waste produced over unit time
Waste Reduction:	source reduction, reuse, recycling, and composting; diversion
Waste Reduction Costs:	costs incurred by a community and/or its residents for the provision of waste reduction services including recycling (including reuse) and composting programs. Net costs include credit for any revenue derived from the sale of recovered materials.
Waste Reduction Level:	the sum of source reduction, recycling, and composting divided by total municipal solid waste generated (including source reduction)
Yard Debris:	leaves, grass clippings, brush, and/or plant clippings; yard trimmings
Yard Trimmings:	leaves, grass clippings, brush, and/or plant clippings; yard debris

INTRODUCTION

During the past decade, the national recycling rate (including composting) has climbed to 27%. Hundreds of communities have surpassed this level. Dozens report waste reduction levels above 50%. Who are they? What features are common to these successful programs? Are the programs cost-effective? What roles do source reduction, reuse, and composting play in community waste reduction programs? What can other communities, governments, and organizations — and the nation as a whole — learn from these record-setters?

To answer these questions, the Institute for Local Self-Reliance (ILSR), in cooperation with the United States Environmental Protection Agency (EPA), created the Waste Reduction Record-Setters project. The goal of the project is to identify successful waste reduction programs in communities, businesses, and other organizations and to encourage their replication.

In this report, *Cutting the Waste Stream in Half: Community Record-Setters Show How*, the terms "waste reduction" and "waste reduction level" are used in a manner similar to the use of the EPA Standard Recycling Rate in other EPA publications. However, as explained later in this introduction under the heading "Calculating Waste Reduction Levels," on page 4, and in the sidebar "Definition of Waste Reduction Level," on page 2, waste reduction levels were calculated using a refinement of the methodology used to calculated the Standard Recycling Rate. Furthermore, the terms "recycling" and "composting" are used somewhat differently from standard EPA usage.

As shown in Tables 1 and 2, this report features 18 communities with record-setting residential or municipal solid waste (MSW) reduction levels. This report examines the policies and strategies used to reach high diversion levels; it does not include an in-depth discussion of materials markets.[1] Seventeen of the communities profiled are diverting between 40% and 65% of their residential waste streams from disposal. Six are diverting between 43% and 56% of their municipal solid waste streams (residential plus commercial/institutional waste).

This report is divided into six main sections. This section, the introduction, explains the methodology used to identify and document record-setting waste reduction programs. The second section, "Keys to Residential Program Success," discusses residential waste reduction program features and characteristics common to many of the record-setters. The next section, "Keys to Institutional/Commercial Program Success," presents program features and characteristics common to institutional and commercial waste (ICW) reduction programs in those communities achieving high diversion in this sector. The "Keys to Cost-Effectiveness" section presents methods for determining whether community waste reduction programs are cost-effective and evaluates each of the featured communities in these terms. The "Tips for Replication" section presents tips supplied by community contacts that may help other communities achieve high waste reduction levels. Finally, the sixth section includes in-depth profiles of the 18 communities and their waste reduction efforts. The information in these profiles has been reviewed and validated by each community prior to publication of this report.

This report features 18 communities with record-setting residential or municipal solid waste reduction levels.

We chose the communities profiled based on a number of factors: waste reduction level, community size and type, program diversity, geographical balance, and willingness and ability to provide data. Two of the 18 are counties. San Jose, California, is the largest city with 873,300 people; Leverett, Massachusetts, is the smallest with less than 2,000. Five are jurisdictions with more than 400,000 residents. These record-setting communities are diverse, including rural, urban, and suburban places. San Jose is probably the most ethnically diverse with large Hispanic and Asian populations. Chatham, New Jersey, is the wealthiest with a median household income of $62,100. Crockett, Texas, has

DEFINITION OF WASTE REDUCTION LEVEL

Recycling refers to the series of activities by which discarded materials are collected, sorted, processed, and converted into raw materials and used in the production of new products. In this report, recovery of yard debris such as grass clippings, leaves, and brush is termed composting and treated separately from the recycling of other commodities in order to add detail. One shorthand method for referring to the materials included in recycling by this definition is "product and packaging recycling" since this excludes recycling of leaves, brush, and grass clippings.

Composting is the recovering and processing of discarded organic materials into a soil amendment, fertilizer, and/or mulch. This recovery and processing can take place either through centralized collection and processing programs or in backyard bins operated by individuals. According to the methodology developed to calculate the EPA Standard Recycling Rate, material recovered in centralized programs is considered recycled while that recovered in backyard systems is considered source reduction. In this report, we include all this recovered material when calculating composting rates.

Reuse refers to the repair, refurbishing, washing, or just the simple recovering of discarded products, appliances, furniture, and textiles for use again as originally intended. Reuse is generally considered a form of source reduction, but in this report reuse is included in calculated recycling rates.

Source reduction is the design, manufacture, purchase, or use of materials, such as products and packaging, to reduce the amount or toxicity of materials before they enter the municipal solid waste management system, such as redesigning products or packaging to reduce the quantity of materials used, reusing products or packaging already manufactured, backyard composting, grasscycling, and mulch mowing. In this report, we include source reduction achieved through backyard composting in the calculated composting rates if creditable data support the estimation of tonnage diverted through such programs.

Using the terminology presented, the following equations define other terms used in this report:

Recycling tonnage = Product and packaging recycling tonnage + Reuse tonnage

Composting tonnage = Centralized composting tonnage + Backyard composting tonnage

Total waste generation tonnage = Recycling tonnage + Composting tonnage + Disposal tonnage

Recycling rate = Recycling tonnage / Total waste generation tonnage

Composting rate = Composting tonnage / Total waste generation tonnage

Waste reduction level = Recycling rate + Composting rate

the lowest median household income of $15,700. They are on the west coast, the east coast, in the south, and in the mid-west. Twelve states are represented. See Table 3, on page 5, for demographic information.

With regard to waste reduction programs, these record-setters are just as diverse. Table 4, page 6, summarizes major program features. (See Table 5, page 14, and Table 6, page 15, for additional program features.) In five communities, the public sector has designed and implemented all programs; in five others the private sector provides virtually all waste reduction services. In the remaining communities, a combination of the two exists. Curbside collection service is the heart of many of these programs. Only one — Leverett, Massachusetts — relies solely on drop-off. Two communities with curbside collection have plastic bag-based recycling programs; the rest use bins or a combination of bins and paper bags for curbside set-out. Two have dual-collection systems in which crews collect trash and recyclables at the same time using a single truck. Four serve all their multi-family households in addition to single-family households. In two communities, all households, both single- and multi-family, are eligible to be served, although some households choose not to participate. Eleven of the programs have local ordinances requiring residents to source-separate or banning them from setting out designated materials with their trash. Eleven have instituted pay-as-you-throw systems in which residents have to pay per-bag or per-can volume-based trash fees.

TABLE 1: RECORD-SETTING RESIDENTIAL WASTE REDUCTION

Community	(Recycling Level[1])	+	(Composting Level[1])	=	(Waste Reduction Level[2])	Are Waste Reduction Programs Cost-effective?[3]
Ann Arbor, Michigan	30%		23%		52%	Yes
Bellevue, Washington	26%		34%		60%	NA
Bergen County, New Jersey	17%		32%		49%	NA
Chatham, New Jersey	22%		43%		65%	Yes
Clifton, New Jersey[4]	16%		28%		44%	Yes
Crockett, Texas	20%		32%		52%	Yes
Dover, New Hampshire	35%		17%		52%	Yes
Falls Church, Virginia	25%		40%		65%	Yes
Fitchburg, Wisconsin	29%		21%		50%	Yes
Leverett, Massachusetts[5]	31%		23%		53%	Yes
Loveland, Colorado	19%		37%		56%	No
Madison, Wisconsin	16%		34%		50%	Yes
Portland, Oregon	23%		17%		40%	Yes
San Jose, California[6]	19%		26%		45%	Yes
Seattle, Washington	29%		20%		49%	Yes
Visalia, California	16%		33%		50%	Yes
Worcester, Massachusetts	27%		27%		54%	NA

Key: NA = not available HH = household

Note: Figures may not total due to rounding. Ramsey County, MN, not included because data on residential waste generation and recovery not tracked separately from total municipal solid waste. All data represents the 1996 calendar year except for Ann Arbor (fiscal year 1996 data); Bergen County (1995); and Falls Church, Leverett, San Jose, and Visalia (all fiscal year 1997 data). Waste reduction levels above represent residential solid waste (RSW) only. In some cases, residential waste reduction levels largely represent rates for single-family households and exclude multi-family households, which are often served by private haulers. See individual profiles for this detail.

[1]ILSR recognizes composting as a form of recycling but treats it separately in this report so that the costs and diversion levels of materials such as paper, bottles, and cans can be compared to the recycling of yard trimmings. Therefore, "Recycling Level" + "Composting Level" = "Waste Reduction Level."

[2]Waste reduction levels may differ from the EPA Standard Recycling Rate as defined in *Measuring Recycling: A Guide for State and Local Governments*. ILSR excluded MRF rejects from recycling tonnages and included estimates of materials collected through container deposit systems for the communities in bottle bill states. Furthermore, materials recovered for reuse are included in both recycling and generation figures and backyard composting tonnage was included in the composting and generation figures for those communities that provided creditable data on the amounts of material handled this way.

[3]Have net solid waste management costs per household served decreased as compared to a specific previous year (these years were chosen to reflect the period before waste reduction program implementation or a major program expansion or change) or can trash disposal fee increases wholly account for increased per household costs? See individual profiles for more information.

[4]Clifton serves approximately 1,300 small businesses in its primarily residential trash and recycling programs. The reported rates include the total waste stream from 26,200 households and these 1,300 business and, as such, is not strictly residential.

[5]The waste reduction level for Leverett includes an estimate of material composted at home because the community has no municipal composting program.

[6]San Jose's residential waste reduction in FY97 was 45%; for single-family households it was 55%.

Source: Institute for Local Self-Reliance, 1999.

Participation requirements and economic incentives such as pay-as-you-throw trash fees are key elements of these programs' success — in both the residential and commercial sectors. In fact, five communities have both pay-as-you-throw trash systems and mandatory participation requirements. For many, state programs, policies, and legislation have also contributed to high recovery levels. These include grants, landfill bans, mandatory recycling requirements, waste reduction goals, and bottle bills. Other contributors to boosting waste reduction levels include targeting a wide range of materials for recovery (especially yard trimmings and multiple paper grades), providing convenient curbside collection service augmented with availability of drop-off sites, high public participation, and strong public outreach programs.

In addition to considering waste reduction levels as a criterion for inclusion, we sought to include cost-effective programs. The majority (13 out of 14 with comparative year cost data) of the record-setters could be considered "cost-effective" according to the definition we set for this evaluation. When a significant portion of the waste stream is diverted from disposal, communities benefit from avoiding trash disposal fees. Especially in communities where tip fees are high, avoiding these charges can free substantial amounts of money to pay

TABLE 2: RECORD-SETTING MUNICIPAL WASTE REDUCTION

Community	(Recycling Level[1])	+	(Composting Level[1])	=	(Waste Reduction Level[2])
Bergen County, New Jersey	33%		21%		54%
Clifton, New Jersey	38%		19%		56%
Portland, Oregon	36%		13%		50%
Ramsey County, Minnesota	40%		8%		47%
San Jose, California	34%		9%		43%
Seattle, Washington[3]	34%		10%		44%

Note: Figures may not total due to rounding. All data represent the 1996 calendar year except for San Jose (fiscal year 1997 data). Waste reduction levels above represent total municipal solid waste (MSW) (the combined waste from the residential and commercial/institutional sectors).

[1]ILSR recognizes composting as a form of recycling but treats it separately in this report so that the costs and diversion levels of materials such as paper, bottles, and cans can be compared to the recycling of yard trimmings. Therefore, "Recycling Level" + "Composting Level" = "Waste Reduction Level."

[2]Waste reduction levels may differ from the EPA Standard Recycling Rate as defined in *Measuring Recycling: A Guide for State and Local Governments*. ILSR excluded MRF rejects from recycling tonnages and included estimates of materials collected through container deposit systems for the communities in bottle bill states. Furthermore, materials recovered for reuse are included in both recycling and generation figures and backyard composting tonnage was included in the composting and generation figures for those communities that provided creditable data on the amounts of material handled this way.

[3]Seattle tracks its waste in three streams: residential, commercial, and self-haul. Self-haul represents materials delivered directly to a city transfer station. The source of this material (residential versus commercial/institutional) is not tracked. In 1996, Seattle's residential waste reduction level was 49%, commercial waste reduction was 48%, and waste reduction in the self-haul sector was 18%. The figures above are based on the aggregation of these sectors.

Source: Institute for Local Self-Reliance, 1999.

for other solid waste management options. Yet, even waste reduction programs in communities with tip fees below the national average were found to be cost-effective.[2]

In addition to avoiding trash disposal fees, other factors have contributed to waste reduction program cost-effectiveness. In particular, the programs have saved waste management funds by developing programs that encourage reduced waste generation, allow reduction in the number of trash routes serving the community, generate revenues from the sale of recovered materials, and employ low-cost composting methods to divert yard trimmings from disposal.

Although no two solid waste management programs are alike and no one definitive model exists, the communities have all developed their waste reduction programs along a common theme: waste diversion is not an "add-on" to the trash management program. Rather, source reduction, recycling, and composting are all integral elements of their overall solid waste management programs.

Identifying Record-Setters

In late 1996, ILSR distributed more than 500 announcements to government organizations, industry associations, state recycling organizations, and recycling research groups soliciting information on record-setting waste reduction programs. ILSR follow-up identified more than 100 communities reporting 50% or higher residential or total MSW reduction levels. A one-page assessment was sent to these communities requesting further information on their programs. We used these responses and targeted follow-up calls to identify a pool of 40 record-setters from which to develop profiles on 15 to 20.

Calculating Waste Reduction Levels

We have defined waste reduction success in this report as achieving a high waste reduction level. For each community profiled, we first clarified the portion of MSW on which to focus. Our choices were often limited by data availability. In general, we focused on the portion of the discard stream handled by city-sponsored programs. For 12 of the communities, we focus solely on residential discards. This was further delineated for some communities. For example, in Loveland, although all households are eligible to participate in city programs, private contractors collect trash from more than 1,000 households. All materials from these households, including trash and recovery, were excluded from our calculations. Worcester's city programs only serve residents of single-family homes and multi-family complexes with six or fewer units. The city's calculated recovery rate of 54% applies to these households only. In contrast, San Jose's residential programs serve all households and its residential

TABLE 3: DEMOGRAPHICS

	Population	Community Type	Households[1] Total	SFDs	MFDs	Avg. Persons /HH	Households/ Square Mile	Per Capita Income (1989)	Median HH Income (1989)	Residential Waste (lbs/HH/day)[2]
Ann Arbor, Michigan	112,000	urban, college town	46,000	22,000	24,000	2.43	2,875	$17,786	$33,334	5.71
Bellevue, Washington	103,700	suburban, urban	44,387	26,026	18,361	2.34	1,451	$23,816	$43,800	9.18
Bergen Co., New Jersey	825,380	suburban (70 towns)	330,473	~250,000	~80,000	2.50	1,384	$24,080	$49,249	15.21
Chatham, New Jersey	8,289	suburban borough	3,285	2,735	550	2.52	1,363	$31,947	$62,129	15.81
Clifton, New Jersey	75,000	suburban, urban	31,000	25,500	5,500	2.42	2,583	$18,950	$39,905	10.14
Crockett, Texas	8,300	small rural city	3,293	2,834	459	2.52	523	$9,801	$15,720	4.51
Dover, New Hampshire	26,094	small rural city	11,315	5,641	5,674	2.31	400	$15,413	$32,123	4.71
Falls Church, Virginia	~10,000	suburban	4,637	2,194	2,443	~2.16	2,108	$26,709	$51,011	12.45
Fitchburg, Wisconsin	17,266	small rural city	7,500	3,860	3,640	2.30	216	$17,668	$35,550	5.89
Leverett, Massachusetts	1,908	rural town	~650	650	0	~2.94	28	$19,254	$45,888	5.50
Loveland, Colorado	44,300	small residential city	17,476	15,220	2,256	2.53	744	$13,345	$30,548	6.00
Madison, Wisconsin	200,920	urban, college town	82,949	40,314	42,635	2.42	1,257	$15,143	$29,420	8.38
Portland, Oregon	503,000	urban city	198,368	130,755	59,613	2.54	1,437	$14,478	$25,592	7.10
Ramsey Co., Minnesota	496,068	urban, suburban, rural	197,500	~138,250	~59,250	2.51	1,268	$15,645	$32,043	NA
San Jose, California	873,300	large ethnically diverse city	269,340	188,900	80,440	3.24	1,539	$16,905	$46,206	8.82
Seattle, Washington	534,700	urban city	248,970	149,300	99,470	2.15	2,706	$18,308	$29,353	6.34
Visalia, California	91,314	urban city in rural area	28,869	25,346	3,523	3.16	1,009	$12,994	$35,575	10.71
Worcester, Massachusetts	169,759	urban industrial city	63,588	22,500	41,088	2.67	1,696	$15,657	$35,977	6.20

Key: HH = households MFDs = multi-family dwellings SFDs = single-family dwellings

Notes: "~" denotes "approximately"

[1]Represents total households in each community; not just the number of households served by curbside recycling programs.

[2]Represents residential waste generated (recycling, composting, and disposal) by households served by recycling and trash programs divided by the number of households served. See individual profiles for more detail.

Source: Institute for Local Self-Reliance, 1999.

TABLE 4: PROGRAM FEATURES

	Waste Stream	Waste Reduction Level (%)[1]	Materials Targeted[2]	Participation Mandatory[3]	PAYT	Private/ Public Collection	Curbside/ Drop-off[4]
Ann Arbor, MI	Residential	52%	31	Yes	No	Both	CS and DO
Bellevue, WA	Residential	60%	29	No	Yes	Private	CS and DO
Bergen Co., NJ	Municipal	54%	Varies	Yes	Some[5]	Varies	Varies[6]
Chatham, NJ	Residential	65%	24	Yes	Yes	Both	CS and DO
Clifton, NJ	Municipal	56%	20	Yes	No	Both	CS and DO
Crockett, TX	Residential	52%	25	Yes	No	Public	CS and DO
Dover, NH	Residential	52%	28	No	Yes	Private	CS and DO
Falls Church, VA	Residential	65%	21	No	No	Both	CS and DO
Fitchburg, WI	Residential	50%	25	Yes	Yes	Both	CS and DO
Leverett, MA	Residential	53%	25	Yes	Yes	Public	DO only
Loveland, CO	Residential	56%	19	No	Yes	Public	CS and DO
Madison, WI	Residential	50%	17	Yes	No	Public	CS (DO for YT only)
Portland, OR	Municipal	50%	22	No	Yes	Private	CS and DO
Ramsey Co., MN	Municipal	47%	Varies	Yes[7]	Yes	Both	CS and DO
San Jose, CA	Municipal	43%	23	No	Yes	Private	CS only
Seattle, WA	Municipal	44%	23	Yes	Yes	Private	CS and DO
Visalia, CA	Residential	50%	20	No	No	Public	CS and DO
Worcester, MA	Residential	54%	24	Yes	Yes	Both	CS (DO for YT only)

Key: CS = curbside DO = drop-off YT = yard trimmings

Notes: Waste reduction levels above may represent residential solid waste only or municipal solid waste (the combined waste from the residential and commercial/institutional sectors). The "Waste Stream" column above clarifies upon which waste stream the waste reduction levels are based. In some cases, residential waste reduction levels largely represent rates for single-family households and exclude multi-family households, which are often served by private haulers. See individual profiles for this detail.

[1]Waste reduction levels may differ from the EPA Standard Recycling Rate as defined in *Measuring Recycling: A Guide for State and Local Governments.* ILSR excluded MRF rejects from recycling tonnages and included estimates of materials collected through container deposit systems for the communities in bottle bill states. Furthermore, materials recovered for reuse are included in both recycling and generation figures and backyard composting tonnage was included in the composting and generation figures for those communities that provided creditable data on the amounts of material handled this way.

[2]Represents number of material categories (out of 37 possible) collected for recovery via curbside or drop-off in the residential sector only. Each of the following is counted as one category: old newspapers, old corrugated cardboard, glossy paper (such as magazines and catalogues), paperboard (such as cereal boxes, shoe boxes, egg cartons, toilet paper rolls), mail, office waste paper, kraft paper, juice and milk boxes, phone books, other books, glass bottles, other glass (such as flat glass, ceramics, heat-resistant glass), aluminum cans, steel cans, aerosol cans, aluminum foil and scrap, PET bottles, HDPE bottles, other PET, other HDPE, other plastics, lead-acid batteries, other batteries, oil filters, appliances/white goods, scrap metal, tires, wood, household durables, textiles, paint, brush, leaves, grass clippings, garden trimmings, soiled paper, food discards.

[3]Programs are designated as mandatory if localities have passed bylaws or ordinances requiring residents to set out source-separated recyclables or compostables, or prohibiting disposal of designated materials. ILSR did not differentiate between bylaws and ordinances that are actively enforced and those that are not.

[4]Represents services or facilities provided by municipal staff or contractors, or services offered by private contractors but required by statute or ordinance. For example, Ramsey County directs municipalities to assure curbside recycling is available to all residents but does not provide the service. The county operates a network of eight yard trimmings drop-off sites for county residents.

[5]Bergen County consists of 70 municipalities, each responsible for its own trash system. Four of these municipalities have implemented pay-as-you-throw trash systems.

[6]Bergen County consists of 70 municipalities, each responsible for its own trash system. Sixty-nine of the 70 communities offer curbside recycling service to their residents and 44 of these supplement their curbside program with drop-off facilities. The remaining community offers its residents a drop-off recycling program only.

[7]Saint Paul and three other county municipalities have enacted mandatory recycling ordinances. State law also bans leaves, grass, brush, and yard debris from state landfills and incinerators.

Source: Institute for Local Self-Reliance, 1999.

recovery rate of 45% applies to materials generated by all city households (including those in multi-family dwellings). When comparing recovery rates among communities, keep in mind the differences in discard streams.

Communities define terms and calculate amounts of trash, recycling, and composting in various ways. To facilitate comparison among programs, we have utilized a uniform methodology wherever possible to determine residential and commercial/institutional waste, MSW, and waste reduction levels. (See definitions on pages vi-viii and the sidebar on page 2.) Many of our calculated waste reduction levels differ from those reported initially by these communities. Major differences include the following:

- We included estimates of tonnage diverted via state bottle bills for relevant communities.

- We excluded recyclables from waste generators when the trash from those same waste generators could not also be included. (For example, we did not include recyclables collected from 500 Loveland households served by the city's recycling program that were not part of the city's trash program.)
- We subtracted material rejected at materials processing facilities from waste reduction levels and added it to disposal.
- We sometimes added estimates for materials recovered that were not originally included in community calculated rates. For example, Portland's Bureau of Maintenance collects and recovers leaves from the street in the fall. ILSR calculated the weight of the leaves based on the volume reported by the city and the standard volume-to-weight conversion factor for compacted leaves from the EPA publication *Measuring Recycling: A Guide for State and Local Governments*.
- If tires, wood waste, or other MSW materials were burned (even to recover their heating value), we considered this to be disposal and not waste reduction.
- We excluded non-municipal solid waste items such as construction and demolition debris and used motor oil.
- For some of our New Jersey communities, where collapse of flow control may be leading to trash bypassing tracking systems, we have used previous years' data for trash tonnage.[3]

These adjustments serve a variety of purposes. First, some adjustments were necessary to achieve consistency with the definitions of waste generation and waste reduction used in this report. Second, use of a consistent methodology allows comparison of waste reduction results among communities. Also, most adjustments lower calculated waste reduction levels, ensuring our reported recovery levels would not be considered inflated.[4]

In addition to differing from waste reduction levels reported by the communities, our calculated recovery rates do not include materials known to be recovered but not quantified. Many residents of the communities included have access to private and county facilities that accept trash, recyclables, and/or materials for composting. Unfortunately, such facilities rarely track tonnages according to the community of origin. For example, residents of Fitchburg and Madison, both located in Dane County, Wisconsin, can deliver yard debris to county composting sites but the county does not track these materials separately from those delivered by other county residents. In these, and similar cases, we did not include any of this material in calculating waste reduction levels.

Our methodology for calculating recycling levels further refines the EPA Standard Recycling Rate. (See the sidebar on page 2.) While we recognize that composting is a form of recycling, we treat it separately in this report so that the costs and diversion levels of recycling of products and packaging, such as paper, bottles, and cans, may be compared to the recycling of yard trimmings. Collection and processing of paper, bottles, and cans are almost always separate operations from collection and processing of yard trimmings. We include both recycling and composting under the term "waste reduction." In fact, waste reduction, as used in this report, is more than just recycling and composting. It also encompasses some source reduction from backyard composting and product reuse.

Waste reduction, as used in this report, is more than just recycling and composting. It also encompasses some source reduction from backyard composting and product reuse.

Quantifying source reduction is difficult. While many of our record-setters have shopper education, backyard composting, and grasscycling programs, few have reliable figures on the amount of material prevented from entering the waste stream as a result of these programs. Thus, we only include estimates of source reduction in waste reduction levels reported for a given year (such as those listed in Table 1) if creditable data on the amount of material recovered through these programs were available. We do, also, compare per household residential waste generation before and after program start-up or major program expansion. If generation has decreased, we consider this decrease source reduction. (See Table 10, page 22, for data on waste generation levels and possible source reduction.)

The reuse component of source reduction is hard to quantify. Four of our record-setters have substantial product reuse programs but few actually weigh the goods reused. Many more collect textiles and bulk goods, a portion of which is reused. Where decent estimates were available for reused goods, we have included these in calculated waste reduction levels as part of recycling. (Ideally, we would have reported source reduction as a separate rate, but measured amounts are not significant enough to be shown as a source reduction/reuse rate. In addition, for some materials such as textiles, the amount reused versus recycled is not tracked.)

We believe that the waste reduction levels as we have reported them may be understated for many of these record-setting communities.

Thus, we believe that the waste reduction levels as we have reported them may be understated for many of these record-setting communities. Initially Chatham reported 85% of residential waste reduced; Madison, 52%; Leverett, 62%; and Crockett, 70%. The waste reduction levels calculated according to our methodology are lower, with Chatham at 65%; Madison, 50%; Leverett, 53%; and Crockett, 52%.

Because of variations in waste generation rates, the highest waste reduction levels do not necessarily correspond with the lowest per household disposal rates. For example, although Chatham recovers 65% of its residential solid waste generation, the average household still disposes more than 5.5 pounds per household per day. Crockett, on the other hand, has a waste reduction level of 52% but average per household disposal is only 2.2 pounds per day. (See Figure 1, page 12.) Household income levels in each community may explain much of the variation in residential waste generation rates. The community with the lowest per household waste generation (4.5 pounds per household per day) is Crockett, which is also the community with the lowest median household income ($15,720 in 1989) according to 1990 U.S. Census data. Similarly, the municipality with the highest per household waste generation (15.8 pounds per household per day) is Chatham, which is also the community with the highest median household income ($62,129 in 1989).[5] See Table 3, page 5, for community demographic information and residential waste generation rates.

Determining Costs

As we have gone to great lengths to make residential waste reduction levels comparable, we have also tried to use a consistent methodology in calculating costs.[6] Most profiles contain detailed information on costs of waste reduction (separated into recycling and composting and also aggregated) and trash management programs. These costs include the annualized cost of capital expenditures; annual operating and maintenance costs; and credits for revenues generated from material sales. We added waste reduction and trash management costs to calculate total solid waste management costs. (See the sidebars on pages 9 and 10 for further details on methodology used to calculate these costs.)

Communities account for and track their costs very differently. Some expend much effort to include all indirect and administrative overhead costs; others exclude these entirely. Some use accrual accounting techniques, others rely on cash-flow accounting. Appendix B and each profile carefully explain the basis for cost data, what is included, what is excluded, and the accounting technique employed by the community to track costs.[7]

We have made a concerted effort to use a uniform methodology for documenting and assessing costs. Yet, due to the difficulty in gathering reliable and consistent cost information, the figures presented in this report have some limitations. The costs documented focus on the costs of trash management and waste reduction incurred by the local government or community profiled or fees for services paid directly by the residents of the communities. We, therefore, did not include the value of services, such as technical assistance, provided to localities by counties and states. But, if communities received program support funds from these sources, the full costs of the programs are included, not just out-of-pocket expenditures made from community funds. In addition, costs of capital equipment are reflected in debt service or depreciation costs, regardless of the source of funds used to purchase the equipment. When communities or individual residents hired private entities to provide waste management services, the

CAPITAL COSTS AND OPERATING & MAINTENANCE COSTS

Communities incur two types of costs when implementing a materials recovery program: capital costs and operating and maintenance (O&M) costs.

Capital costs are large expenditures for items expected to have a lifespan extending over multiple years including equipment (e.g., vehicles, household recycling containers, conveyors, crushers, balers, grinders), land, and building construction and improvement. Each profile includes a table listing equipment used in the program, quantity, what it is used for, how much it cost, and when those costs were incurred.

The annualized value of capital expenditures can be accounted for through built-in replacement fees, debt service payments for past purchases, or depreciation costs. If a community did not already include the annualized cost of capital expenditures in their reported costs, ILSR calculated depreciation costs for these outlays. For example, Falls Church's reported SWM costs included depreciation costs for its equipment used in the trash and composting programs but did not include depreciation for city-purchased recycling bins. ILSR calculated this amount and added it to reported costs for the city's recycling program. ILSR assumed contractors providing services to our record-setters passed on the annualized cost of capital expenditures in the fees they charged.

Annual O&M costs are ongoing expenses that include such items as equipment leasing and maintenance, utilities, labor and benefits, tip fees, administrative expenses, licenses, supplies, insurance, marketing fees, contract fees, and publicity programs.

Most of the profiles include a table presenting net costs for waste reduction programs, followed by a second table summarizing costs for total solid waste operations. The net costs represent the annualized cost of capital expenditures, O&M costs, and any offsetting revenues from material sales. These costs generally cover the residential sector only. The tables break costs down into basic categories, such as collection, processing and marketing, tip fees, administration /overhead, depreciation, and educational/publicity. Recycling and composting are shown separately and then combined to show overall waste reduction costs. Appendix B provides further detail on what types of expenses were included in the cost analysis for each community.

costs of these services are represented by fees, which likely include a profit margin. Furthermore, we did not consider financing arrangements of facilities used by communities but owned by other public bodies. For example, Loveland disposes of its trash at the Larimer County Landfill and delivers its recyclables to the Larimer County MRF for processing. Larimer County levies a tip fee surcharge on waste disposed at its landfill. These funds are used to subsidize its MRF. In this case, we allocated the entire tip fee paid at the landfill to the city's trash management program and the city's waste reduction costs do not reflect the subsidy of the MRF. A justification for this accounting decision is that Loveland would have to pay the same tip fee at the landfill regardless of whether they chose to use the county MRF. Another example is that some communities use county-owned facilities. These county facilities may be supported by tax revenues, some of which were paid by the profiled community or its residents. We did not account for local subsidies of county facilities in our cost analysis, only any fees charged directly for the use of the facility. Again, the justification is that the communities were required to pay taxes to the counties regardless of whether they or their residents use county facilities. None of the profiled communities operate their own disposal facilities. Disposal costs reflect only collection costs and tip fees, and administration, education, and equipment depreciation costs, when applicable.

While our preference would have been to use full-cost accounting techniques to document and compare these record-setting communities, such research and analysis were beyond the scope of this report.[8]

All source data, unless otherwise noted, were provided directly by our program contacts. We have checked and corroborated data to the best of our ability. In most cases, additional analysis was necessary so the costs presented reflect only those associated with the relevant programs. For example, costs of Crockett's municipally provided institutional/commercial trash and waste reduction programs were excluded because the profile focuses on the residential waste stream.

We do not believe cost data presented in this report should be used to make comparisons among communities regarding the relative cost-effectiveness of their programs. Differences in local costs of living

CALCULATING DEPRECIATION COSTS

If the communities did not account for the annualized cost of capital expenditures, ILSR calculated depreciation costs for these outlays. For example, Falls Church included depreciation costs for its equipment used in the trash and composting programs but did not include depreciation for city-purchased recycling bins. ILSR calculated this amount and added it to reported costs for the city's recycling program.

When depreciation calculations were necessary, ILSR used straight-line depreciation. We did not include estimates of the salvage value of the equipment or time value of money in making these calculations. In addition, we continued to add a line item for depreciation even after equipment lifespan expired (to avoid a sudden artificial drop in depreciation simply because a year had passed and to account for potential increases in purchase prices in replacement equipment). This methodology ensured that our calculations were conservative.

Equipment lifespans used in ILSR's depreciation calculations are as follows:

Equipment Type	Lifespan
Baler	10 years
Chippers	5 years
Conveyor system	10 years
Dump-trailer	5 years
Fork lift	7 years
Front-end loader	7 years
Front-end loader claw attachments	7 years
Glass crusher	10 years
Leaf vacuums	5 years
Oil filter crusher	10 years
Open-body trucks	5 years
Plastics granulator	10 years
Recycling bins and trash containers	10 years
Recycling trucks	5 years
Self-dumping hoppers	7 years
Stationary processing equipment (such as screeners, roll-offs, leaf boxes, dumpsters)	10 years
Trash trucks	7 years
Tub grinder	10 years
Windrow turner	7 years
Yard debris collection trucks	7 years

Note: Lifespan estimates provided by Ecodata, Inc., Westport, CT.

and market conditions, and service levels offered by programs all have financial consequences. Local factors influence fuel costs, labor costs, and tip fees. Two communities offering the exact same services would have different costs because of these and other locally and regionally variable factors. Local market conditions can have a substantial effect. For example, communities near well-established markets often have lower transportation costs and receive higher revenues for collected materials. Finally, because each program is configured differently, comparisons of costs across programs can be misleading. For example, Falls Church offers residents free delivery of leaf mulch as part of its yard debris management program. This extra service adds to the program cost but gives residents of Falls Church a benefit not received by residents of the other communities profiled.

Evaluating Program Cost-Effectiveness

We examined cost-effectiveness of each community's waste management program in light of two standards. These standards are:

(1) net solid waste management program costs per household have stabilized or decreased as a result of new or expanded waste reduction programs; and

(2) net solid waste management program costs per household have increased but the increase can wholly be accounted for by increased disposal tip fees.

In order to determine the effect of waste reduction programs on community solid waste management budgets over time, we looked at the effect these programs had on total annual waste management costs, comparing 1996 costs to costs for some "before year." For most communities included in the report, the "before year" represents a year either before the community's waste reduction program began or before a major expansion of that program.[9] In order to normalize for changes in population, we compared costs on a per household basis. For nine (out of 14) of our record-setters for which these data are available, net program costs per household served have remained the same or decreased. See Table 14 on page 33 for comparisons of net solid waste management costs per household over time.

Our second standard for evaluating cost-effectiveness is a variation of the first. Of the five communities where per household waste management costs increased, three would have experienced no per household cost increases and one would have experienced a per household increase of less than 5% if trash tip fees had not increased since the waste reduction program began or expanded. In effect, the communities' costs increased but the increases were less than they would have been if the communities had no waste reduction programs.

We also examined whether the implementation of waste reduction programs has cushioned the community from future cost increases in solid waste management. ILSR did not consider any waste reduction program cost-effective based on this criterion alone but does consider this effect as further evidence of cost-effectiveness of waste reduction programs that meet other criteria.

Notes:

[1]Additional resources on this topic are available from the U.S. EPA at its Jobs Through Recycling web site (http://www.epa.gov/jtr) including publications and links to other resources. Two specific publications available at this site are *Jobs Through Recycling Annotated Resource Bibliography* and *Market Share: Successful Strategies Learned from the JTR Experience* .

[2]Disposal tip fees averaged close to $40 per ton in 1996. Average tip fees at landfills for 1996 were $31 per ton; at incinerators $63 per ton. Of total MSW, 57% was landfilled and 16% was incinerated. Data source: U.S. EPA software "Municipal Solid Waste (MSW) Factbook, " version 4.0, August 1, 1997.

[3]Our community contacts in New Jersey indicated that after flow control was struck down in the courts, trash tonnages delivered to disposal facilities in the state decreased. The contacts believe trash generation did not decrease, only reported tonnage decreased because some trash generated in New Jersey communities was disposed in facilities outside the state and therefore outside the data tracking system. In these cases, we estimated trash disposal tonnages from historical data believed to provide a more realistic estimate of actual disposal tonnages.

[4]The adjustments that increased calculated waste reduction rates were due to the addition of deposit container recovery amounts and the inclusion of materials recovered but not included in community calculations.

[5]Linear regression reveals a strong association (correlation coefficient > 0.75) between median household income and per household residential waste generation among 17 of the communities profiled. (Per household residential waste generation data are not available for Ramsey County, Minnesota.)

[6]Unless otherwise noted, costs are presented in 1996 dollars (having been converted, when necessary, using the Gross Domestic Product deflator for state and local government expenditures).

[7]Appendix B, located in the report after the community profiles, contains more detailed information on reported costs than is in each profile. Specific information in the appendix includes whether debt service or capital repayment costs were included by the community or have been calculated by ILSR and which overhead and administrative costs were included.

[8]For more information on full-cost accounting techniques see U.S. Environmental Protection Agency. *Full Cost Accounting for Municipal Solid Waste Management: A Handbook.* EPA/530-R-95-041. September 1997.

[9]The "before year" used for Bergen County was 1993. This year was used simply because it is the earliest year for which county staff had accurate data for both trash and waste reduction tonnages.

KEYS TO RESIDENTIAL PROGRAM SUCCESS

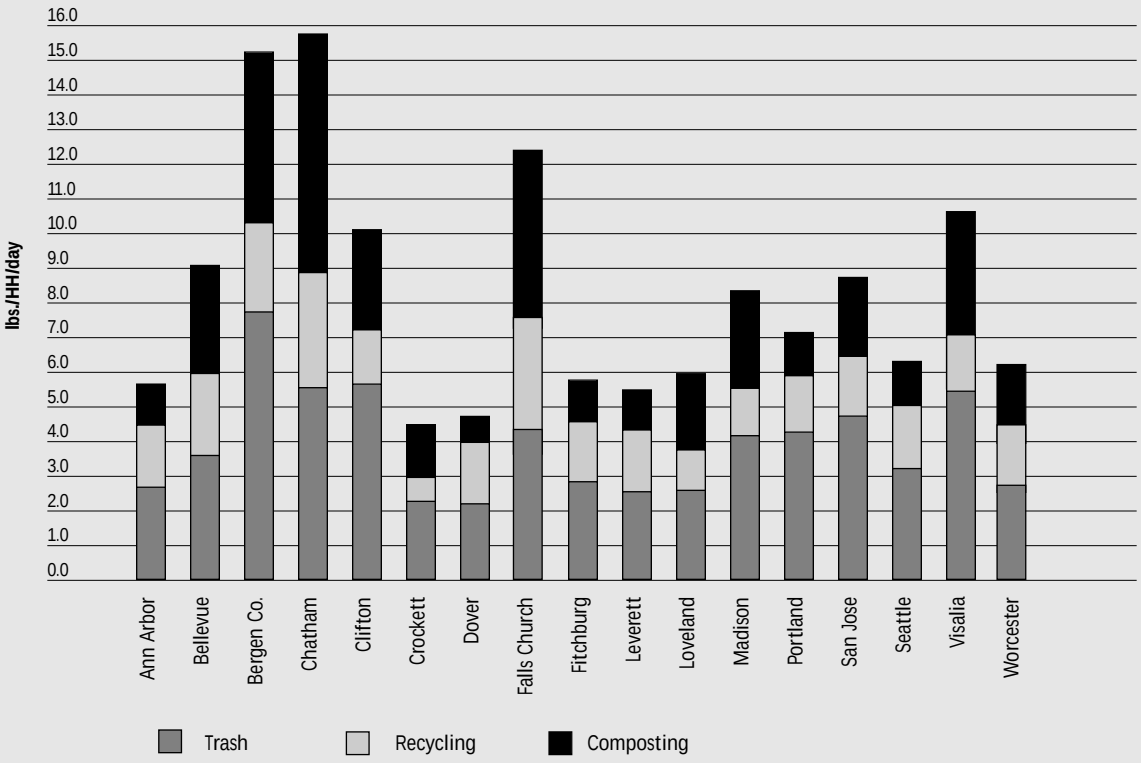
Why are our residential record-setters so successful? What strategies are common to community programs achieving high residential waste reduction levels? Do local or state mandates and goals affect waste reduction levels? Is drop-off collection needed when curbside collection services are offered? Can implementing pay-as-you-throw (PAYT) trash systems contribute to reaching high diversion levels?

The communities profiled are achieving residential waste recovery rates from 40 to 65%. Key strategies for achieving these high residential recovery levels include:

- targeting a wide range of materials for recovery (specifically yard trimmings and multiple paper grades),
- encouraging or requiring participation (by using such strategies as making programs convenient, enacting mandates, and instituting pay-as-you-throw trash programs),
- offering service to multi-family dwellings (see Table 11, page 23, for information concerning households served in each community's curbside recycling program), and
- augmenting curbside collection with drop-off collection.

In addition, fundamental to the success of all waste reduction programs are education and outreach and finding markets for materials.

FIGURE 1: RESIDENTIAL WASTE GENERATION PER HOUSEHOLD PER DAY



Notes: Ramsey Co. is not included because MSW generation data cannot be broken down into residential versus commercial. ILSR recognizes composting as a form of recycling but treats it separately in this report so that the costs and diversion levels of materials such as paper, bottles, and cans can be compared to the recycling of yard trimmings. Therefore, "Recycling" + "Composting" + "Trash" = Average waste generation per household per day. Waste reduction levels may differ from the EPA Standard Recycling Rate as defined in *Measuring Recycling: A Guide for State and Local Governments.* ILSR excluded MRF rejects from recycling tonnages and included estimates of materials collected through deposit containers for the communities in bottle bill states. Furthermore, materials recovered for reuse are included in both recycling and generation figures, and backyard composting tonnage was included in the composting and generation figures for those communities that provided creditable data on the amounts of material handled this way.

Source: Institute for Local Self-Reliance, 1999.

CATEGORIES OF RECOVERED MATERIALS

To represent the variety of materials collected in residential waste reduction programs, ILSR defined 37 categories. These categories are:

1. Newspaper
2. Corrugated cardboard
3. Glossy paper (such as magazines and catalogues)
4. Paperboard
5. Mail
6. Office waste paper
7. Kraft paper
8. Juice and milk boxes
9. Phone books
10. Other books
11. Glass bottles and jars
12. Other glass (such as flat glass, ceramics, and heat-resistant glass)
13. Aluminum cans
14. Aluminum foil and scrap
15. Steel cans
16. Aerosol cans
17. PET bottles
18. Other PET
19. HDPE bottles
20. Other HDPE
21. Other plastics
22. Lead-acid batteries
23. Other batteries
24. Oil filters
25. Appliances and/or white goods
26. Scrap metal
27. Tires
28. Wood
29. Household durables
30. Textiles
31. Paint
32. Brush
33. Leaves
34. Grass clippings
35. Garden trimmings
36. Soiled paper
37. Food discards

Targeting a Wide Range of Materials

All of our record-setters target a wide range of materials for recovery including several grades of paper and yard trimmings. For this report, ILSR defined 37 categories of materials collected in residential waste reduction programs. See the sidebar on this page. Table 7, on pages 16 and 17, lists the materials each community collects for reuse, recycling, and composting at curbside and through drop-off sites, and Table 6, on page 15, summarizes key features of residential recycling programs. Ann Arbor targets more types of materials at curbside than any other community documented. Heat-resistant glass, ceramics, textiles, and used oil filters are some of the nonconventional materials collected at curbside in this city. San Jose recycles all types of plastics including polystyrene and film plastics. Seven communities include textiles, and nine recover juice and milk cartons. Saint Paul in Ramsey County picks up reusable household goods such as small appliances, books, hardware and tools, unbreakable kitchen goods, games, and toys as part of its curbside recycling program. Fitchburg has a similar program; reusable household goods are collected once a month at curbside. Leverett accepts reusable goods at its drop-off facility; the town's diversion rate rose by 1% as a result of reuse at this facility. Targeting several grades of paper and yard trimmings is critical to reaching high diversion levels. Paper and yard trimmings are the two most significant components of the residential waste stream. Our record-setters compost between 17% and 43% of their residential waste. Paper recovery (all grades) accounts for 12% to 45% of residential materials diverted.

Targeting several grades of paper and yard trimmings is critical to reaching high diversion levels.

Composting

Our data indicate that collecting and composting yard trimmings is a key to reaching 50% and higher waste reduction levels and doing so cost-effectively. Figure 1 shows the contribution of composting yard trimmings to residential waste reduction levels. For 11 of the 18 communities, composting accounts for half or more of all residential waste reduction. Three of these — San Jose and Visalia, California, and Crockett, Texas — are in warm climates and generate yard trimmings year-round. They also collect yard trimmings weekly at curbside year-round. Most of the other programs combine seasonal curbside collection with drop-off

TABLE 5: PROGRAM FEATURES: RESIDENTIAL COMPOSTING

	Residential Waste Reduction Level[1]	Residential Composting Level	Ratio of CS to DO Tons	Curbside Pick-up Frequency	Participation Incentives
Ann Arbor, MI	52%	23%	13:1	YT weekly (April-Nov.); loose leaves 2x in Nov. and Dec.	Convenience, Fines
Bellevue, WA	60%	34%	all CS	YT twice monthly except monthly Dec.-Feb.	Convenience, PAYT
Bergen Co., NJ	49%	32%	NA	Varies	NA
Chatham, NJ	65%	43%	4:1	Leaves weekly (Oct.-Dec.)	PAYT
Clifton, NJ	44%	28%	all CS	YT weekly (March-Dec.); loose leaves 2-3x in fall	Convenience, Fines
Crockett, TX	52%	32%	NA	YT weekly year-round	Convenience, Fines
Dover, NH	52%	17%	1:2.6	YT 2x each in fall and spring[2]	PAYT
Falls Church, VA	65%	40%	all CS	YT weekly (Jan.-Oct.); fall leaves; brush year-round[3]	Convenience
Fitchburg, WI	50%	21%	1:1.5	YT 4x/year; brush 8x/year	PAYT, Fines
Leverett, MA	53%	23%	all BY	None	PAYT
Loveland, CO	56%	37%	1:2	YT weekly 8 mos./year (at $4.25 per mo.)	PAYT, CP
Madison, WI	50%	34%	2:1	YT 5x per year; brush monthly April-Oct.	Fines
Portland, OR	40%	17%	2.4:1	YT biweekly year-round	PAYT
Ramsey Co., MN	47%[4]	8%[4]	NA	Varies	PAYT
San Jose, CA	45%	26%	all CS	YT weekly year-round	Convenience, PAYT
Seattle, WA	49%	20%[5]	all CS and BY	YT weekly to monthly year-round[6]	Convenience, PAYT
Visalia, CA	50%	33%	5.7:1	YT weekly year-round	Convenience, CP
Worcester, MA	54%	27%	NA	leaves 1x in fall	PAYT

Key: BY = backyard; CP = container provided; CS = curbside; DO = drop-off; NA = not available; PAYT = pay-as-you-throw trash fees; YT = yard trimmings

Notes:

[1]"Recycling Level" + "Composting Level" = "Waste Reduction Level." Waste reduction levels may differ from the EPA Standard Recycling Rate as defined in *Measuring Recycling: A Guide for State and Local Governments.* ILSR excluded MRF rejects from recycling tonnages and included estimates of materials collected through container deposit systems for the communities in bottle bill states. Furthermore, materials recovered for reuse are included in both recycling and generation figures and backyard composting tonnage was included in the composting and generation figures for those communities that provided creditable data on the amounts of material handled this way.

[2]Effective 1997, spring collections were discontinued.

[3]Brush year-round weekly except during fall leaf season.

[4]Reduction levels are based on municipal solid waste as residential waste figures are not available.

[5]Composting rate excludes self-haul (drop-off) tonnage as self-haul materials are both residential and commercial in origin.

[6]South section of city: biweekly March-Nov., monthly Dec.-Feb. North section of city: weekly March-Oct., two November collections, monthly Dec.-Feb.

Source: Institute for Local Self-Reliance, 1999.

site availability. Table 5 summarizes key features of the residential composting programs and breaks out composting levels from overall waste reduction levels.

Those communities with PAYT trash fees are particularly successful in getting residents to take their yard trimmings to drop-off sites when curbside is not available. In 1996, Dover, New Hampshire, for instance, only collected yard trimmings at curbside four times per year (twice in the spring and twice in the fall). Almost three times more tonnage was collected at drop-off than through curbside. Loveland, Colorado, is another example. Residents can subscribe to weekly curbside pick-up of yard debris (available eight months of the year), or take the material to a central drop-off site. In 1997, about 27% of households subscribed to the curbside program; most of the remainder opted for the drop-off site, which is free, or they source reduce via mulch mowing and backyard composting. In 1996, the drop-off site accounted for two-thirds of yard trimmings collected for composting. Worcester's PAYT system also helped it achieve high composting levels. Worcester only offers fall leaf collection once to each household. But it has three drop-off sites for leaves, grass clippings, garden debris, brush, and Christmas trees. The sites, which are free of charge to residents, are open April through November, Wednesday, Saturday, and Sunday. Residents bring yard trimmings to drop-off sites rather than pay per-bag fees to set them out at their curb for disposal.

For communities without PAYT trash fees as an incentive to use drop-off sites, providing regular or at least frequent curbside collection during the spring, summer, and fall seasons is essential to reaching high composting levels. Madison and Fitchburg, in Dane

TABLE 6: PROGRAM FEATURES: RESIDENTIAL RECYCLING

	Waste Reduction Level[1]	Recycling Level[2]	Ratio of CS to DO Tons	Pick-up Frequency	Containers Provided	Container Type	Segregations Required[3]	Participation Rate	Participation Incentives
Ann Arbor MI	52%	30%	19.3:1	Weekly	Yes	11-gallon bins	3	93%	Convenience, Fines
Bellevue, WA	60%	26%	63:1	Weekly	Yes	set of three stackable bins	4	90%	Convenience, PAYT
Bergen Co., NJ	49%	17%	NA	Varies	Varies	Varies	Varies	Varies	Varies
Chatham, NJ	65%	22%	NA	2x/Month	No	resident provided bins	5	80%	PAYT, Fines
Clifton, NJ	44%	16%	NA	1x/3 Weeks	No	resident provided bins	7	80-85%	Fines
Crockett, TX	52%	20%	NA	Weekly	No	clear plastic bags[4]	3	80-90%	Convenience, Fines
Dover, NH	52%	35%	4.5:1	Weekly	Yes	bins and bags[5]	3	74%	Convenience, PAYT
Falls Church, VA	65%	25%	3.3:1	Weekly	Yes	18-gallon bin and paper bags	4	~90%	Convenience
Fitchburg, WI	50%	29%	4.8:1	Weekly	Yes	12-gallon stackable bins	4	98%	Convenience, PAYT, Fines
Leverett, MA	53%	31%	all DO	--	--	--	--	--	PAYT
Loveland, CO	56%	19%	19.3:1	Weekly	Yes	12-gallon and 15-gallon bins	3	97%	Convenience, PAYT
Madison, WI	50%	16%	13.1:1	Weekly	No	clear plastic bags and paper bags	4	97%	Convenience, Fines
Portland, OR	40%	23%	all CS	Weekly	Yes	14-gallon bin and paper bags	Varies	81%	PAYT
St. Paul, MN	NA	NA	NA	2x/Month	Yes	14-gallon bin and bags[6]	5	62%	PAYT
San Jose, CA	45%	19%	all CS	Weekly	Yes	18-gallon stacking bins[7]	5	83%	Convenience, PAYT
Seattle, WA	49%	29%	3.7:1[8]	Weekly-Monthly[9]	Yes	Varies[10]	2 or 3	>90%[11]	Convenience, PAYT
Visalia, CA	50%	16%	mostly CS	Weekly	Yes	110-gallon special split bin	1	~100%	Convenience
Worcester, MA	54%	27%	NA	Weekly	Yes	14-gallon bins	3	NA	Convenience, PAYT

Key: CS = curbside DO = drop-off NA = not available PAYT = pay as you throw -- = not applicable
Notes: "~" = "approximately"

[1]Waste reduction levels may differ from the EPA Standard Recycling Rate as defined in *Measuring Recycling: A Guide for State and Local Governments.* ILSR excluded MRF rejects from recycling tonnages and included estimates of materials collected through container deposit systems for the communities in bottle bill states. Furthermore, materials recovered for reuse are included in both recycling and generation figures and backyard composting tonnage was included in the composting and generation figures for those communities that provided creditable data on the amounts of material handled this way.

[2]ILSR recognizes composting as a form of recycling but treats it separately in this report so that the costs and diversion levels of materials such as paper, bottles, and cans can be compared to the recycling of yard trimmings. Recycling rate as reported here does not include recovery of materials through composting.

[3]The number of segregations residents in the SFD recycling program must make when setting out recyclables at the curb, excluding the set-out of appliances, white goods, other durables, scrap metal, tires, batteries, motor oil and filters, telephone books, and textiles (which are usually not set out on a weekly or even monthly basis).

[4]Paper can be set out in paper bags.

[5]Dover gave each single-family household a free 18-gallon bin for commingled containers at the start of its curbside recycling program. The city no longer distributes free bins so residents of new homes and those whose bins have been lost or damaged must use their own containers. These containers must be clearly distinguishable from trash containers.

[6]The city provides each household with one blue recycling bin. Durable goods and textiles go in plastic bags; glass, old newspapers, mixed paper, and cans must each go in a separate bin or bag.

[7]The stacking bins are for newspaper, mixed paper, and glass. Residents also use a 32-gallon container, which they provide, for cans, juice and milk cartons, plastics, and scrap metals.

[8]This ratio compares tons of materials collected in the curbside residential program with tons of material collected at private recycling drop-offs and buy-backs. Additional residential recyclables are delivered to the city's transfer stations for recycling but the tonnage is not separable from commercial materials recycled at the stations.

[9]North section of city has weekly collection; the south section has monthly collection.

[10]Residents in the north section receive three 12-gallon bins. In the south section, they receive a 60- to 90-gallon toter in which they commingle all recyclables except glass, which is set out in a separate bin.

[11]Estimate for single-family households. In 1996, 43% of multi-family buildings, representing 56% of units, participated.

Source: Institute for Local Self-Reliance, 1999.

County, Wisconsin, are two communities that provide only seasonal curbside service, thereby avoiding the costs of year-round collection. Madison collects leaves, grass clippings, garden and other yard debris, twice in the spring and three times in the fall. Brush is collected monthly, April through October. The city also operates three drop-off sites (open April through the first week in December), and city residents can also opt to take leaves and other yard trimmings to three Dane County compost sites. Fitchburg has a similar program. Mandatory ordinances banning set out of yard trimmings with trash (backed by the threat of steep fines) help encourage participation in these communities.

Fall leaf collection is perhaps the single largest contributor to waste reduction levels in communities with fall seasons. For six of the record-setters with fall leaf collection data, leaves alone reduced residential waste by 12% (in Ann Arbor) to 34% (in Chatham).

TABLE 7: MATERIALS COLLECTED AT CURBSIDE AND DROP-OFF

Community	Materials Collected at Curbside	Materials Collected at Drop-off
Ann Arbor, MI	ONP, OCC, OMG, RMP, paperboard, paperback and phone books, milk and juice cartons, steel and aluminum cans, aluminum and ferrous scrap, aerosol cans, white goods, glass containers, glass dishes and heat-resistant glass, ceramics, #1-3 plastic bottles, household batteries, used motor oil, oil filters, textiles, brush, leaves, grass clippings, other yard debris, holiday trees	all materials collected at curbside plus tires, car batteries, hardcover books, polystyrene, packing peanuts, foam egg cartons, wood waste, and automotive fluids, freon-containing appliances, building materials
Bellevue, WA	ONP, OCC, OMG, RMP, paperboard, kraft paper bags, phone books, juice and milk cartons, steel and aluminum cans, aluminum foil, non-ferrous scrap metal, white goods, glass containers, #1 and #2 plastic bottles, brush, leaves, grass clippings, and other yard and garden debris	all materials collected at curbside plus #6 plastic food containers, lead-acid and household batteries, antifreeze, oil filters, tires, household goods (textiles, working small appliances, usable furniture), scrap metal, scrap lumber, fluorescent lamps and ballasts, ceramic bathroom fixtures
Chatham, NJ	ONP, OCC, OMG, RMP, paperboard, brown paper bags, paperback and phone books, milk and juice cartons, steel and aluminum cans, aluminum foil, metal clothes hangers, aerosol cans, white goods, glass containers, #1-3 plastic bottles, household batteries, empty latex paint cans, leaves	all materials collected at curbside (except household batteries and white goods) plus brush, grass clippings
Clifton, NJ	ONP, OMG, RMP, paperback and phone books, hardcover books without covers, steel and aluminum . cans, scrap metal, white goods, glass containers, leaves, grass clippings, brush, other yard debris, holiday trees	all materials collected at curbside (except compostables, scrap metal, and white goods) plus OCC, aluminum plates and trays, #1 and #2 plastic bottles, lead-acid batteries
Crockett, TX	ONP, OCC, OMG, RMP, paperboard, phone books, steel and aluminum cans, aluminum foil and plates, scrap metal, aerosol cans, white goods, glass containers, all plastics, used motor oil, brush, leaves, grass clippings, other yard debris	all materials collected at curbside plus oil filters
Dover, NH	ONP, OCC, OMG, RMP, paperboard, phone books, juice and milk cartons, steel and aluminum cans, aluminum foil, scrap metal, large appliances, glass food and beverage containers, #1-2 plastic bottles, leaves, grass clippings, other "soft" yard trimmings	all materials collected at curbside (except milk and juice cartons) plus brush, tires, car and other batteries, textiles, empty aerosols, holiday trees, oil filters, wood, construction and demolition materials
Falls Church, VA	ONP, OCC, OMG, RMP, paperboard, phone books, steel and aluminum cans, white goods, glass containers, #1 and #2 plastic bottles, grass clippings, leaves, brush, and other yard debris	all recyclables collected at curbside plus aluminum foil and pie pans, some household batteries, and scrap metal
Fitchburg, WI	ONP, OCC, OMG, RMP, paperboard, kraft paper, phone and paperback books, steel and aluminum cans, white goods, glass bottles and jars, all plastic containers, #4 plastic container lids, rigid and foam polystyrene, reusable household items (e.g., textiles, small appliances, housewares, and toys), leaves, grass clippings, brush, holiday trees, and other yard debris	ONP, OCC, OMG, RMP, paperboard, kraft paper, phone and paperback books, scrap metal, leaves, grass clippings, holiday trees, other yard and garden debris,
Leverett, MA	no curbside collection	ONP; OCC; OMG; RMP; paperboard; kraft paper bags; phone books; other books; juice and milk boxes; glass containers; steel and aluminum cans; all plastic bottles, tubs, trays, and jars; lead-acid batteries; household batteries; textiles; reusable goods; white goods; paint; and scrap metal

Key: OCC = old corrugated cardboard OMG = old magazines ONP = old newspapers RMP = residential mixed paper
Note: Bergen County is not included. Each community in the county has its own recycling program and materials accepted vary in the different programs.

Source: Institute for Local Self-Reliance, 1999.

TABLE 7: MATERIALS COLLECTED AT CURBSIDE AND DROP-OFF (CONTINUED)

Community	Materials Collected at Curbside	Materials Collected at Drop-off
Loveland, CO	ONP, OCC, kraft paper bags, steel cans, aluminum cans, clean aluminum foil, pie, or food trays, empty aerosol cans, white goods, glass containers, narrow necked #1 and #2 plastic bottles, grass clippings, small branches, leaves, garden trimmings	OMG, office paper, phone books, automotive batteries, brush, leaves, grass clippings, garden trimmings, fluorescent tubes, motor oil, transmission fluid, antifreeze
Madison, WI	ONP, OCC, OMG, kraft paper bags, phone books, tin/steel cans, aluminum cans, scrap metal, appliances, glass bottles and jars, #1 and #2 plastic containers, tires, leaves, brush, grass clippings, garden and other yard debris, holiday trees	leaves, brush, grass clippings, other yard trimmings, used oil, appliances, other large items
Portland, OR	ONP, OCC, OMG, RMP, paper egg cartons, paperboard, kraft paper bags, phone books, milk cartons, aseptic containers, steel cans, aluminum cans, other clean aluminum, ferrous and non-ferrous scrap, aerosol cans, glass containers, all plastic bottles, used motor oil, leaves, grass clippings, brush, and other yard debris	varies by site
Saint Paul, MN	ONP, OCC, OMG, RMP, paperboard, steel and tin cans, aluminum cans, glass containers, durable household goods (textiles, books, working small appliances, hardware and tools, unbreakable kitchen goods, games, and toys), yard trimmings collection available for an extra fee	plastic containers, hard-to-handle materials at annual neighborhood clean-ups
San Jose, CA	ONP, OCC, OMG, RMP, paperboard, kraft paper bags, egg cartons, phone books, milk and juice boxes, glass containers, aluminum and steel cans, scrap ferrous metal and aluminum, appliances, textiles, plastic bottles and jugs, polystyrene packaging, used motor oil, furniture, brush, leaves, grass clippings, garden trimmings	private drop-off only; varies by site
Seattle, WA	ONP, OCC, OMG, RMP, paperboard, paper bags, phone books, paperback books, glass containers, aluminum and steel cans, ferrous scrap, white goods, #1 and #2 plastic bottles, brush, leaves, grass clippings, other garden trimmings, holiday trees	same materials as curbside plus lead-acid batteries, used motor oil, used oil filters, and clean wood scrap and lumber
Visalia, CA	ONP, OCC, OMG, RMP, paperboard, glass containers, aluminum cans, steel and tin cans, all plastic containers, milk and juice cartons, wood, brush, leaves, grass clippings, and other garden trimmings	same materials as at curbside plus holiday trees
Worcester, MA	ONP, OCC, OMG, RMP, paperboard, paper bags, phone books, milk and juice cartons, steel cans. aluminum cans, aluminum trays and tins, scrap metal, white goods, glass containers, all plastic containers (except motor oil and antifreeze containers and pails or buckets), leaves	leaves, grass clippings, garden debris, brush, holiday trees

Key: OCC = old corrugated cardboard OMG = old magazines ONP = old newspapers RMP = residential mixed paper
Note: Ramsey County is not included. Each community in the county has its own recycling program. Materials accepted vary. Saint Paul is included as an example of one program in Ramsey County.

Source: Institute for Local Self-Reliance, 1999.

In Loveland, Colorado, residents can pay $4 a month for weekly curbside yard trimmings collection. They receive a 90-gallon roll cart. Here, a 16-cubic-yard semi-automated truck empties a cart.

Residents in the northern part of Seattle sort recyclables into three bins.

Many of the composting programs in our record-setting communities were begun independently of state-legislated requirements for such programs, although some of the communities did expand existing or create new programs when the state-legislated requirements passed. Massachusetts, Michigan, Minnesota, New Hampshire, and Wisconsin all have enacted disposal bans for leaves and/or yard trimmings. New Jersey law requires counties to include plans for recovery of leaves in their recycling plans. Oregon requires some communities (including the metropolitan Portland area) to have yard debris programs. Fitchburg and Madison, both in Wisconsin, began their programs in the 1980s; the state landfill ban did not become effective until 1993. Ann Arbor began its yard debris program in 1990; the state banned the material from disposal in 1993. Worcester began composting fall leaves more than three years before the state's disposal ban on leaves took effect, but the city's programs for collecting and composting other yard trimmings were started in the first year disposal of these materials was banned. Clifton began its leaf collection program the year the state law was passed. Dover's program was instituted the year before the ban became effective.

Achieving High Participation Levels

All of our residential record-setters have high resident participation levels (ranging from 62% to 100%).[1] Strategies used to reach high participation, and consequently high diversion levels, include making programs convenient, enacting mandates, and instituting PAYT programs. Communities are enhancing program convenience by providing recycling bins and/or paper bags for yard trimmings. PAYT programs encourage residents to participate in waste reduction efforts; mandatory programs require it. With the exceptions of Visalia and Falls Church, our record-setting communities either mandate program participation (residents are not allowed to put designated recyclables in their trash) or they have instituted PAYT trash systems (residents are charged volume-based fees for their trash). Table 4, page 6, summarizes program features for each community.

Convenience

Residents are more likely to participate in a recycling or waste reduction program if doing so is convenient. Indeed some studies report that perception of inconvenience of recycling was stronger among survey respondents who did not recycle than among those who did.[2] To make participation as convenient as possible, and thus maximize the amount and the quality of material collected, communities are:

- providing curbside collection of recyclables with the same frequency curbside collection of trash is provided;
- providing seasonal and frequent curbside collection of yard trimmings;
- offering service to all households;
- utilizing set-out and collection methods that encourage resident participation as well as yield high-quality, readily marketable materials (such as using large clear plastic bags or bins for commingled food and beverage containers, and separate set-outs for paper grades);
- providing adequate containers for storage and set-out of residential recyclables; and
- establishing recycling drop-off sites at disposal facilities if residents self-haul trash.

Local Mandates

Local requirements and mandates encourage residents to participate in recycling and composting programs. Eleven of our 18 record-setters have some sort of local ordinance either requiring residents to source-separate or banning them from setting out designated recyclables or compostable materials with their trash.

Madison experienced dramatic increases in recovery levels when mandatory programs were enacted. The city's diversion rate jumped from 18% to 34% when the city enacted a local ordinance mandating businesses and residents to source-separate materials for composting. In 1991, when recycling program participation became mandatory, recycling tonnage increased from the previous year.[3]

Many communities with local mandatory recycling ordinances have enforcement programs, which help increase participation. Clifton's city ordinance, for example, provides for two warnings for failure to comply with the law. After the warnings, penalties can be assessed: $25 for the first offense, $100 for the second offense, $250 and/or 90 days of community service for the third offense, and $1,000 fine and/or up to 90 days of community service for each subsequent offense. During 1997, waste enforcement staff issued 750 warnings. Most recipients of the warnings began complying with the law. As a result, only ten summonses were issued resulting in seven fines.

In Falls Church the city code mandates provision of recycling and yard trimmings collection services for all residents receiving city trash services. Participation in these programs is voluntary for residents but the ordinance sends a message to residents that the community is committed to maintaining the programs in the long-term. This message, in turn, may inspire increased participation in the programs.

Local requirements and mandates encourage residents to participate in recycling and composting programs.

State Mandates and Goals

State waste reduction goals, requirements, and policies influenced many of our record-setters. Policies at the state level encourage governments at the local level to implement waste reduction programs. The profiled communities are in 12 states. Table 8 summarizes these states' goals and recycling requirements. Of these states, eight — California, Massachusetts, Minnesota, New Hampshire, New Jersey, Oregon, Texas, and Washington — have statewide waste reduction goals ranging from 40% to 60%. (Virginia's recycling goal was 25% by 1995.) New Hampshire's goal is the only one based on reducing per capita solid waste disposed: 40% reduction by weight by the year 2000 as compared to 1990. State

TABLE 8: STATE PROGRAMS

State	Goal[1]	Mandates/Bottle Bills
California	Each jurisdiction to divert 50% of waste by 2000	Bottle bill
Colorado	Informal goal of 50% disposal reduction by 2000	None
Massachusetts	46% statewide recycling by 2000	Bottle bill, disposal bans
Michigan	None	Bottle bill, yard trimmings ban, county plans required
Minnesota[2]	50% recycling by 12/31/96	Disposal bans, PAYT required,mandates,[3] regional and metropolitan county waste plans required
New Hampshire	40% disposal reduction, as compared to 1990 per capita disposal, by 2000	Yard trimmings and wet-cell battery ban
New Jersey	65% recycling of total waste stream by 2000	County plans required, mandates[4]
Oregon	50% statewide recycling by 2000[5]	Bottle bill, mandates[6]
Texas	40% disposal reduction as compared to 1992 per capita disposal, no date	None
Virginia	25% recycling by 1995	None
Washington	50% recycling by 1995	County plans required
Wisconsin	None	Disposal bans

[1]Massachusetts, New Jersey, Oregon, Virginia, and Washington consider composting to be a form of recycling when evaluating success in meeting state recycling goals.
[2]Goal for seven county metropolitan area only. 50% can include a 5% yard debris credit and a 3% source reduction credit.
[3]Counties must provide citizens with the "opportunity to recycle."
[4]Each county's plan must provide for recovery of leaves and three additional materials. Each county must hire a recycling coordinator.
[5]The state also set a recycling goal for the metropolitan Portland area of 45% by 1995.
[6]Jurisdictions with populations of 4,000 or more must offer curbside recycling and a yard debris program that diverts a similar percent of materials as diverted in weekly curbside programs.

Source: Institute for Local Self-Reliance, 1999.

goals and requirements that local jurisdictions develop plans to meet state goals, provided stimulus for many of our record-setters to implement waste reduction programs. Visalia implemented its waste reduction programs in order to meet state requirements. Crockett began its waste reduction programs the year after the state set its 40% MSW recycling goal. Portland implemented citywide curbside recycling in 1987; the state's 1983 Recycling Opportunity Act provided impetus for this decision. After the state legislature enacted the 1991 Recycling Act, Portland expanded waste reduction services, adding curbside collection of yard debris in 1992.

PAYT systems cover solid waste costs directly rather than through the tax base or a flat fee, thus serving as a direct economic incentive for households to reduce their trash and recover as much as possible.

State landfill bans have been another impetus for communities to develop alternative destinations for certain materials. Massachusetts, Michigan, Minnesota, New Hampshire, and Wisconsin ban yard trimmings from landfill disposal. Massachusetts also bans lead-acid batteries; tires; white goods; aluminum, metal, and glass containers; single polymer plastics; and recyclable paper from landfills and incinerators. In addition to yard trimmings, Wisconsin has also banned steel, glass, and aluminum containers; paperboard; polystyrene packaging; corrugated cardboard; newspaper and other paper; and tires from Wisconsin landfills. Minnesota prohibits tires, lead-acid batteries, used oil, major appliances, and rechargeable batteries from placement in mixed municipal waste. New Hampshire bans wet-cell batteries from landfills and incinerators. As discussed earlier, some communities had yard trimmings recovery programs before state bans were enacted and others began or expanded their programs when yard trimmings were banned from disposal facilities. Similarly, while Fitchburg's mandatory recycling program pre-dated the state's disposal bans, start-up of Worcester's program coincided with the institution of the state's landfill bans. Worcester's program was designed with compliance with the bans in mind.

Some states encourage development of waste reduction programs through grant programs providing equipment or funds to localities. All of our record-setting communities are located in states that have or had grant programs. Our 18 record-setting communities have used grant funds for general waste management support and to purchase specific recycling or composting equipment. Falls Church and Madison deposit state aid funds in their general funds which in turn directly fund the cities' waste management programs. The city of Ann Arbor used state grant funds to purchase recycling trucks. Clifton purchased a recycling trailer and a compactor truck (used for brush collection) from state grant funds.

Pay As You Throw

Eleven of the 18 communities utilize some form of pay-as-you-throw (PAYT) trash fees. See Table 9, page 21, for details of these PAYT programs. Many of these communities are among those with the lowest per household residential waste generation levels. PAYT systems cover solid waste costs directly rather than through the tax base or a flat fee, thus serving as a direct economic incentive for households to reduce their trash and recover as much as possible.[4,5]

Two basic PAYT systems exist: (1) the bag and tag system in which residents pay for each bag or tagged can set out at the curb; and (2) the can or container system in which residents subscribe to trash service levels with containers of varying capacities, and pay higher fees for levels with larger or more containers. Under the bag system, two sizes are usually available: a 15-gallon bag or a 30-gallon bag. Communities design special bags, often with the city logo. Loveland uses two different colors (blue and green) for different size bags. Dover has chosen orange bags. Chatham has opted for blue bags. Worcester uses yellow bags.

PAYT programs may contribute to source reduction.[6] In order to measure possible source reduction, we compared total per household residential waste generation from the current year (usually 1996) to the same figure from a prior year. Any evident decline in generation may indicate residents truly are producing less waste per household. However, it could also be the result of other factors (such as a change in measurement methods or accuracy or a change in yard trimmings production due to weather variations). In our 11 PAYT communities, possible source reduction of greater than 20% is evident in Dover and Crockett.

Waste generation rates decreased less than 20% in Chatham, Falls Church, Fitchburg, and Loveland. In the other PAYT communities, while waste reduction levels have drastically increased with the advent of PAYT, per household waste generation has increased or changed very little. Table 10, page 22, lists per household waste generation rates.

Communities with PAYT trash fees do well in encouraging residents to use drop-off sites, especially for recyclable materials not collected at curbside and at times when yard trimmings are not collected at curbside.

Offering or Requiring Service to Multi-Family Households

For the most part, waste reduction levels for our residential record-setters reflect public sector programs only. In most communities, the public sector (often represented by the local public works department) provides services to single-family households but not to multi-family dwellings (MFDs) above a certain size (such as buildings with more than three or four units). Building managers or owners of larger MFDs typically contract directly with a private hauler to provide waste management services. Worcester's 54% residential waste reduction level, for instance, excludes trash and recyclables generated from 12,720 households in buildings or complexes with seven or more units,

TABLE 9: COMMUNITIES WITH PAY-AS-YOU-THROW TRASH FEES

Community	System	Program Initiation	Price Paid by Residents[1]	Service Provider	Residential Waste (lbs/HH/day)
Bellevue	can	1977	$7.13 per month for 19-gal. mini-can; $12.91 for one 30-gal. can; $18.10 for two cans; $22.76 for three cans; $28.85 for four cans; $13.45 for 32-gal. toter; $20.38 for 60-gal. toter; $26.10 for 90-gal. toter	private hauler	9.18
Chatham	blue bag	11/92	$0.65 for 15-gal. bag; $1.25 for 30-gal. bag plus $75/household/year flat fee	private hauler	15.81
Dover	orange bag and tag	10/91	$0.75 for 15-gal. bag; $1.10 for 30-gal. bag; tags cost $2.75	private hauler	4.71
Fitchburg	can and tag	1994	$82 per household/year fee for 32-gal. can. Additional yearly fees for trash over this amount: $34.68 for 64-gal. can; $60.96 for 95-gal. can. Tags are $1.50 each.	private hauler	5.89
Leverett	bag	1990	Annual $20 fee to use transfer station plus 75¢ for 15-gal. bag and $1.50 for 30-gal. bag	town	5.50
Loveland	bag and tag	pilot-1991 citywide 1992	55¢ for 15-gal. bag; $1 for 32-gal. bag; 45¢ for stamp for 13 gallons; 85¢ for stamp for 30 gallons	city	6.00
Portland	can	1992	Weekly service: $14.80 per mo. for 20-gal. can; $17.50 for 32-gal; $18.90 for 35-gal.; $22.85 for 60-gal.; $27.85 for 90-gal. Monthly service: $9.95 for 32-gal.	private haulers	7.10
Ramsey Co.[2]	can	7/91	$8.76 to $14.99 per month for low volume; $10.83 to $16.25 for 30-gal. can; $13.80 to $17.33 for two 30-gal. cans; $17.03 to $22.23 for three cans/unlimited	private haulers	NA
San Jose	can	7/93	$13.95 per month for 32-gal. can; $24.95 for 64-gal.;$37.50 for 96-gal.; $55.80 for 128-gal.	private haulers	8.82
Seattle	can	1981	$10.05 per month for 12-gal. micro-can; $12.35 for 19-gal. mini-can; $16.19 for 32-gal.; $32.15 for two 32-gal. cans; $16.10 for each additional 32-gal. can	private haulers	6.34
Worcester	yellow bag	11/93	25¢ for 15-gal. bag; 50¢ for 30-gal. bag	city	6.20

Key: gal. = gallon HH = household NA = not available

Notes:

[1]Fees as of mid 1997. They may be subject to change. Per month fees are for weekly trash service, unless otherwise noted.

[2]The county requires trash haulers to offer volume-based trash fees. The City of Saint Paul passed a similar ordinance July 1, 1991. Fees shown above represent the range in fees Saint Paul's haulers charge for their four levels of service.

Source: Institute for Local Self-Reliance, 1999.


Resident recycling in an Ann Arbor multi-family complex.

which are not served by the city's Department of Public Works. Our record-setters are serving between 51% and 100% (median 90%) of their total households with city-sponsored recycling programs. For at least three of these — Ann Arbor, Crockett, and San Jose — residential waste reduction levels cover all households in the community. In these communities, all multi-family households have recycling service.[7] Seattle offers recycling and yard debris services to all MFDs, although in 1996, buildings participating in the recycling program included only 54% of total households in MFDs. Table 11, page 23, presents numbers of SFDs and MFDs in each community and the percentage served by curbside recycling programs. San Jose and Crockett also offer their MFDs curbside collection of yard trimmings.

Cities with a large proportion of residents living in multi-unit buildings will have difficulty reaching high reduction levels for total residential waste without targeting multi-unit households for recyclables collection.

Recovering recyclable and compostable materials from multi-unit buildings can be more challenging than collecting recyclables from single-family households. Variables such as space and layout, waste hauling contracts, length of resident tenancy, and janitorial work agreements differ from building to building. Cities also often hesitate to intervene in apartment buildings' private waste hauling arrangements. Yet, currently operating programs demonstrate that multi-unit buildings can achieve high

TABLE 10: PER HOUSEHOLD RESIDENTIAL WASTE GENERATION AND REDUCTION

	Waste (%) Reduction Level[1]	"Before Year" Per Household Waste Generation (lbs/HH/day)			"Current Year" Per Household Waste Generation (lbs/HH/day)		Possible Source Reduction[2] (%)
		Year	Total	Trash	Total	Trash	
Ann Arbor, MI	52%	FY89	5.61	4.68	5.71	2.72	-2%
Bellevue, WA	60%	1989	7.30	6.52	9.18	3.69	-26%
Chatham, NJ	65%	1991	16.85	6.20	15.81	5.56	6%
Clifton, NJ	44%	1987	9.83	8.68	10.14	5.68	-3%
Crockett, TX	52%	1991	6.10	6.10	4.51	2.16	26%
Dover, NH	52%	1990	6.18	5.98	4.71	2.26	24%
Falls Church, VA	65%	FY90	13.23	8.10	12.45	4.34	6%
Fitchburg, WI	50%	1992	6.16	4.02	5.89	2.95	4%
Leverett, MA	53%	NA	NA	NA	5.50	2.56	NA
Loveland, CO	56%	1989	6.63	6.63	6.00	2.63	10%
Madison, WI	50%	1988	8.19	6.75	8.38	4.19	-2%
Portland, OR	40%	1992	6.14	4.36	7.10	4.27	-16%
San Jose, CA	45%	FY93	8.61	5.74	8.82	4.81	-2%
Seattle, WA	49%	1987	5.61	4.54	6.34	3.23	-13%
Visalia, CA	50%	FY94	10.58	10.33	10.71	5.38	-1%
Worcester, MA	54%	1992	5.84	4.97	6.20	2.86	-6%

Key: HH = household NA = not available

Note: The "current year" for Ann Arbor is FY96 and FY97 for Falls Church, Leverett, San Jose, and Visalia. For all other communities the current year is 1996. Bergen County is excluded because ILSR estimated 1995 generation to be equal to 1993 generation, making this comparison invalid. Ramsey County is excluded as MSW generation figures cannot be broken down into residential versus commercial.

[1]Waste reduction levels may differ from the EPA Standard Recycling Rate as defined in *Measuring Recycling: A Guide for State and Local Governments.* ILSR excluded MRF rejects from recycling tonnages and included estimates of materials collected through container deposit systems for the communities in bottle bill states. Furthermore, materials recovered for reuse are included in both recycling and generation figures, and backyard composting tonnage was included in the composting and generation figures for those communities that provided creditable data on the amounts of material handled this way.

[2]Represents the reduction (or increase) in residential waste generated per household per day from 1996 as compared to the "before year." A negative number indicates an increase in waste generation. Waste can increase or decrease as a result of a number of factors such as differences in measurement from year to year or heavy yard trimmings generation one year as compared to the previous year. We label this column "Possible Source Reduction" as there is no way to ascertain if households have truly source reduced.

Source: Institute for Local Self-Reliance, 1999.

TABLE 11: HOUSEHOLDS SERVED BY PUBLIC SECTOR CURBSIDE RECYCLING

	No. of Households Total			No. of Households Served by Curbside[1]			% of Total Households Served by Curbside		
	SFDs	MFDs	Total	SFDs	MFDs	Total	SFDs	MFDs	Total
Ann Arbor, MI	22,000	24,000	46,000	22,000	24,000	46,000	100%	100%	100%
Bellevue, WA	26,026	18,361	44,387	23,372	NA[2]	NA	90%	NA	NA
Chatham, NJ	2,735	550	3,285	2,735	0	2,735	100%	0%	83%
Clifton, NJ	25,500	5,500	31,000	23,000	5,000	28,000	90%	91%	90%
Crockett, TX	2,834	459	3,293	2,834	459	3,293	100%	100%	100%
Dover, NH	5,641	5,674	11,315	5,641	5,359	11,000	100%	94%	97%
Falls Church, VA	2,194	2,443	4,637	2,194	734	2,928	100%	30%	63%
Fitchburg, WI	3,860	3,640	7,500	3,860	0	3,860	100%	0%	51%
Leverett, MA[3]	650	0	650	--	--	--	--	--	--
Loveland, CO	15,220	2,256	17,476	15,220	1,702	16,922	100%	75%	97%
Madison, WI	40,314	42,635	82,949	40,314	17,635	57,949	100%	41%	70%
Portland, OR	130,755	59,613	198,368	129,698	0	129,698	99%	0%	65%
St. Paul, MN	73,745	26,582	100,327	73,745	26,582	100,327	100%	100%	100%
San Jose, CA	188,900	80,440	269,340	188,900	80,440	269,340	100%	100%	100%
Seattle, WA[4]	149,500	99,470	248,970	148,300	54,899	203,199	99%	55%	82%
Visalia, CA	25,346	3,523	28,869	25,346	654	26,000	100%	19%	90%
Worcester, MA	22,500	41,088	63,588	22,500	28,368	50,868	100%	69%	80%

Key: MFDs = multi-family dwellings NA = not available SFDs = single-family dwellings

Note: SFDs may include duplexes and households with up to 11 units. See individual profiles for clarity on how each community defines SFDs and MFDs. Data not available for Bergen County, NJ. Ramsey County is not included as county-wide data are not available. Saint Paul is included as an example of one program in Ramsey County.

[1]Represents households served by city-sponsored curbside recycling programs. Actual households served by recycling may be greater. For example, in Fitchburg, the city provides service to 943 MFDs, but all MFDs are required to implement a recycling program for their tenants.

[2]Bellevue serves its residents of multi-family housing in a program separate from the one profiled in this report.

[3]Leverett provides neither curbside trash nor recycling collection.

[4]All Seattle households are eligible to receive trash and recycling services.

Source: Institute for Local Self-Reliance, 1999.

waste reduction levels. Local government can play an important role in facilitating these recycling efforts. Efforts to promote multi-unit recycling by our record-setters included:

- requiring owners of multi-unit buildings to provide a minimum level of recycling services to their tenants;
- requiring residents of multi-unit buildings to recycle designated materials;
- providing collection service or requiring private haulers to provide this service;
- offering haulers economic incentives to collect recyclables;
- providing buildings with recycling containers; and
- conducting education and outreach (including multi-lingual materials) to residents in MFDs.

San Jose and Ann Arbor are good examples. Both provide their multi-family buildings with recycling services; buildings receive recycling carts and can set out the same materials as single-family homes. In Ann Arbor, where recycling is mandatory, multi-unit buildings have to comply with residential recycling requirements. In San Jose's voluntary program, the city has a separate contract with one of its recyclers to serve multi-family households. Built into this contract (and its other residential recycling contracts) is a per ton incentive payment through which the contractor receives more money from the city for each ton of recyclables that are collected from MFDs and actually marketed.

While Fitchburg only provides city service to buildings with four or fewer residences, its local Solid Waste and Recycling Ordinance requires owners of multi-family dwellings with five or more units to implement a recycling program for their tenants. The ordinance specifies 16 categories of materials as recyclable. Falls Church requires apartment and condominium complexes to provide on-site recycling of newspapers, glass, and cans at least once every two weeks. In Portland, multi-family complexes (defined as those with five or more units) must recycle at least five materials; newspapers and scrap paper are two of these. The other three

Two-thirds of yard trimmings collected for composting in Loveland, Colorado, are received at the city's drop-off site, shown above.

materials can be corrugated cardboard, magazines, tin cans, glass containers, or plastic bottles. Ramsey County directs its municipalities to provide recycling to MFDs. As a result, Saint Paul's mandatory recycling ordinance requires occupants of all properties in the city, including MFDs, to recycle at least three materials.

Loveland's requirements are aimed at haulers, not building managers or residents. Loveland requires private trash haulers serving the MFD sector to offer recycling services. Recycling collection from multi-family dwellings must be frequent enough to prevent recycling containers from overflowing.

Drop-Off Collection

While curbside collection is generally a more effective way to maximize the amount of recyclable materials collected, drop-off collection can augment curbside and serve as the primary method of recyclables collection in rural communities in which residents self-haul trash. It can also serve multi-family households who may not have "curbside" service. Furthermore, drop-off facilities can sometimes accept a wider variety of materials than are collected at the curbside and can provide a central location for displaying items available for reuse. Convenient placement of sites and economic incentives (such as payment for recyclables or PAYT trash systems) increase residents' participation in drop-off programs. As Table 4, on page 6, indicates, most of our record-setters utilize some form of drop-off collection.

Reusable materials collected at drop-off site in St. Paul.

Table 7, on pages 16 and 17, lists materials collected at drop-off for each community.

Table 6, on page 15, shows, where data were available, the ratio of curbside recyclables tonnage to that collected at drop-off sites. With the exception of Leverett, in which residents self-haul their trash and recyclables, curbside accounts for the lion's share of material recycled. Drop-off can still play a significant role. In Dover, for every 4.5 tons collected at curbside, another ton is collected at its drop-off site. In Falls Church, the ratio of curbside to drop-off tons is 3.3:1. Both of these communities accept materials at their drop-off sites that are not collected through their curbside programs. Additional materials Falls Church collects include aluminum foil and pie plates, scrap metal, and some household batteries. Dover's drop-off site accepts tires, car batteries, textiles, and empty aerosol cans, none of which are accepted in its curbside program.

TABLE 12: CONTRIBUTION OF DROP-OFF

	RSW Reduction Level	% Via Curbside	% Via Drop-off
Ann Arbor, MI[1]	52%	45%	3%
Bellevue, WA	60%	59%	<1%
Chatham, NJ[2]	65%	34%	9%
Dover, NH	52%	33%	19%
Falls Church, VA	65%	59%	6%
Fitchburg, WI	50%	32%	18%
Leverett, MA[3]	53%	0%	31%
Loveland, CO	56%	31%	25%
Madison, WI[4]	50%	37%	12%
Seattle, WA[5]	49%	36%	6%
Visalia, CA[1]	50%	42%	5%

Key: RSW = residential solid waste

Note: Figures may not total due to rounding. San Jose, CA, not included because drop-off sites are not operated by the public sector and tonnage data were not available. Data not available for Bergen County, NJ; Clifton, NJ; Crockett, TX; Portland, OR; Ramsey County, MN; and Worcester, MA.

[1]Recyclables collected via the state's bottle bill are not included in these figures.

[2]The percentages for curbside and drop-off reflect yard trimmings only. The breakdown of recyclables collected at curbside versus drop-off is not available.

[3]The 31% recovered via drop-off reflects recyclables and reusable items. The other 22% recovered is based on estimates of yard trimmings backyard composted in this rural community.

[4]The residential recovery level includes an estimated 1,320 tons of material recovered through backyard composting.

[5]The "% Via Curbside" and "% Via Drop-off" columns do not add to the residential recovery level because the residential recovery level includes estimated backyard composting by residents. The curbside percentage represents material collected in the city program. The drop-off percentage represents the materials collected at private facilities.

Source: Institute for Local Self-Reliance, 1999.

Drop-off programs are an excellent way to recover reusable items. Leverett's Recycle/Transfer Station has a very active "Swap Shop" which is called the "Take It or Leave It." Residents can leave or take books, furniture, tools, clothes, and other reusable items. In Saint Paul, each of its 17 planning districts offers a drop-off site once a year for hard-to-handle household discards such as tires, furniture, appliances, computers, and bicycles. Most of the materials dropped off are recovered for reuse. In 1996, this program diverted 1,800 tons of material and saved an additional $75,000 in avoided disposal fees.

With regard to yard trimmings, drop-off can account for the majority of material recovered, especially in PAYT communities, where residents have an economic incentive to take materials not collected at curbside to a drop-off site. This is the case in Dover, Fitchburg, and Loveland. For other communities, curbside accounts for most yard trimmings collected. Table 5, on page 14, shows the ratio of yard trimming tonnage collected at curbside versus drop-off sites.

Table 12 breaks down the portion of total materials recovered through curbside and drop-off collection for the 11 communities for which these data were available. Drop-off collection accounts for less than 1% to 31% of waste diverted for these communities. With the exceptions of Bellevue and Falls Church, none of the communities would have reached a 50% or higher waste reduction level without recovery of material collected at drop-off sites.

Education and Outreach

All of our community record-setters promote recycling through education, publicity, and outreach. Educational programs provide residents with information about both "how" and "why" to recycle. Since every community's program is unique, educational programs are necessary to provide residents with the knowledge to participate correctly. Furthermore, research has indicated that individuals who connect recycling with the larger issues of resource conservation and environmental protection are motivated to participate in recycling and reuse programs.[8] Outreach techniques used in our communities include fact sheets and pamphlets, newsletters, recycling guides, posters, utility or tax bill inserts, calendars, radio and newspapers ads, hotlines, public service announcements, appearances on local cable shows, and booths at community events.

In Chatham, the borough's yearly calendar is the principal source of education about solid waste management. The calendars are mailed to each household yearly and detail procedures for preparation of trash, recyclables, and yard trimmings. They also list the dates for leaf and recycling collections and the hours of the drop-off recycling center and mulch site.

All of our community record-setters promote recycling through education, publicity, and outreach... Outreach techniques used in our communities include fact sheets and pamphlets, newsletters, recycling guides, posters, utility or tax bill inserts, calendars, radio and newspapers ads, hotlines, public service announcements, appearances on local cable shows, and booths at community events.

More and more communities are taking advantage of the Internet to spread the word about recycling. Ann Arbor, Saint Paul, Seattle, Portland, and Worcester have or are developing Web pages on waste reduction.

Some communities promote recycling and education through in-person education. In-person outreach includes door-to-door visits, staffed recycling booths at community events, and presentations at neighborhood meetings. Both before and after Visalia implemented its new waste reduction program, staff were always willing to meet with individuals to resolve any issues. This personal contact with residents was an important element in creating Visalia's successful program. Volunteers can help spread the word about recycling and composting through personal contact. Seattle's "Friends of Recycling" provides free training to residents interested in serving their neighborhood for one year as a community resource on waste programs. The

Locally produced compost in Loveland, marketed as "Loveland's Own Compost."

In Ann Arbor, this playground is made from locally collected and processed recycled plastics.

volunteers share information on waste reduction.

The cornerstone of Falls Church's education program is its "Recycling Block Captains" program in which over 100 resident volunteers distribute information and make personal contact door-to-door.

Education programs directed at school-age children produce positive environmental attitudes, which are retained over time.[9] Environmentally aware youth may play a role in the long-term success of a waste reduction program. Many communities utilize formal or informal waste reduction curricula to teach waste reduction concepts. Ann Arbor contracts with a local nonprofit group to do youth education programs in the schools; more than 100 presentations are given each year. Madison airs public service announcements called, "Earth Alerts," during children's television programming. Seattle's school grants program provides money to elementary through high schools to fund development of solid waste class projects.

Recycling collection programs can only be as successful as the recycling marketing program.

Some of our larger communities devote a staff person to publicity and outreach. Ann Arbor has a full-time employee coordinating publicity and outreach for all the city's waste reduction programs.

For cities with ethnically diverse populations, producing educational materials in more than one language can help increase understanding of and participation in recycling programs. Saint Paul produces a recycling guide in English, Spanish, Hmong, Cambodian, and Russian. Many of its hotlines also include messages in languages other than English. In San Jose, all outreach is done in three languages: English, Spanish, and Vietnamese.

Targeting outreach to new residents can help maintain or increase participation levels. Most of Loveland's outreach is targeted at new residents, who are required to sign up with the program at the city utility's office. There, they are given an information packet. Recycling bins are delivered free of charge to new residents.

Demographic factors play an important role in determining the amount of money a community must spend on waste reduction educational programs, and the types of programs implemented. Cities with transient populations and diverse ethnic groups face the greatest challenges in securing broad participation, and must typically spend more money on waste reduction education. Smaller communities, on the other hand, can rely on volunteer efforts, and word-of-mouth to ensure participation in waste reduction programs. Leverett, for instance, reports spending no money on education.

Finding Markets for Materials

One of the most fundamentally important tasks in reaching high waste reduction levels is finding an outlet for collected material. Identifying markets and securing agreements with materials brokers and end users are all part of this task. Recycling collection programs can only be as successful as the recycling marketing program. Consequently, market analysis must be both a planning and ongoing activity.

Identifying outlets for collected material is an important component of all 18 record-setting programs. Many rely on private processors to find end users. Of the 18 profiled communities, only Clifton and Crockett market their own materials. Municipal recycling coordinators and private processors are finding different end uses for the same materials and using a variety of strategies to keep materials moving to those who can manufacture new products from them.

In all of our record-setting communities, recovery of yard trimmings and various paper grades

are key elements of their high recovery levels. Locating markets for compost or mulch and mixed paper enable communities to include yard debris and multiple paper grades in their waste reduction programs.

Processing yard trimmings into compost, mulch, or other soil amendments and marketing these products has not been a problem for any of these record-setters. Many of the communities (such as Chatham, Crockett, and Worcester) own municipal compost sites and frequently use compost and mulch in local parks and on city property as well as give these away free to residents. Clifton shares a compost site with a neighboring town. Madison uses a county facility. The City of Ann Arbor sells its city-produced compost and mulch. In 1996, the city grossed about $3.50 in sales revenues for each ton of yard trimmings collected. (Gross program costs were $41 per ton.) In San Jose, Dover, and Visalia, private contractors process and market yard trimmings. They likewise retain revenues from the sale of these products. Loveland has a unique arrangement with its processor. The city and its processor equally share all processing and marketing expenses and revenues. Finished compost from Loveland's yard debris program is marketed as "Loveland's Own Compost." It sells retail and wholesale, bulk and bagged. All finished compost is sold. In 1996, the city about $6 per ton for yard trimmings collected. (The earnings partially offset the city's expenditures of less than $11 per ton for processing the material.)

Nearly all of our record-setters collect mixed paper. Mixed paper from some of these communities, including Falls Church, Fitchburg, Bellevue, Worcester, and Dover, is marketed by national companies. These companies have access to national and international markets and benefit from economies of scale, making it profitable to process and market materials with low resale value. Communities in regions with a strong recycling-based industry, such as New Jersey, are able to forge individual agreements with local companies. Clifton's recycling coordinator has secured mixed paper markets locally. While recycling-based manufacturing is not as prevalent in Texas, Crockett's Solid Waste Director worked hard to locate markets for materials collected in the city. He has entered into a private agreement with a paper company in Houston to accept all paper collected in Crockett's recycling program.

Most community recycling programs accept glass bottles and jars, but few accept pane glass, heat-resistant glass, or ceramic materials. Ann Arbor's program is unique in accepting these materials. The city-owned MRF, operated by a contractor, accepts these materials and markets them as aggregate to a company in Dearborn, Michigan. By expanding the city's processing capability and contracting with an independent company that operates many MRFs, Ann Arbor has been able to add materials to its recycling program and boost diversion.

Communities can boost waste diversion by recovering items no longer wanted by their owners but fit for use by others. Saint Paul and Fitchburg divert durable items, such as small appliances, textiles and clothing, books, and toys, as part of their regular curbside recycling programs.

Communities can boost waste diversion by recovering items no longer wanted by their owners but fit for use by others. Saint Paul and Fitchburg divert durable items, such as small appliances, textiles and clothing, books, and toys, as part of their regular curbside recycling programs. Both cities have partnered with local charities: Saint Paul with Goodwill Industries and Fitchburg with the Saint Vincent De Paul Society. The charities receive items collected at curbside for sale in their shops. On a smaller scale, the recycling program in Ann Arbor accepts textiles that are marketed to a textile recovery company for reuse and recycling. San Jose also includes textiles in its curbside recycling program. The textiles are marketed to rag dealers, a used clothing store, and a homeless shelter.

As the packaging industry has changed, new challenges have arisen for communities aiming to maximize waste diversion. Polycoated paper, aseptic packages, and many types of plastics have proven difficult to recycle and markets are often hard to locate. Communities wishing to recover these materials often must ship them to far away markets and deal with volatility. Crockett's Solid Waste

Director, in response to public demand, started collecting all plastics before he had secured a market for them. He stockpiled more than ten tons of the material before finally locating a market for the material in late 1997. He is hoping his perseverance in locating the market will pay off and the city will forge a long-term relationship.

Other communities collecting plastics in addition to #1 and #2 polymers include Ann Arbor, Bellevue, Chatham, Fitchburg, Leverett, Portland, San Jose, Visalia, and Worcester. Ann Arbor, Chatham, Crockett, Dover, Loveland, and Portland recycle aerosol cans. Ann Arbor, Bellevue, Chatham, Dover, Leverett, Portland, San Jose, Visalia, and Worcester recycle milk and juice cartons and aseptic packages. In these communities, with the exception of Crockett, the marketing of these materials is handled by contractors and the communities themselves do not locate the markets. The role of the communities is often one of requiring the collection of a material in contracts or requesting the processor accept them. Community requirements and requests can spur technological innovation and market creation for materials. The record-setting communities collecting non-traditional materials may be clearing a path for other communities to have access to stable markets for these materials.

State and local disposal bans have spurred market development for some materials. For example, many states have banned oil filters from disposal in landfills and/or incinerators. Community collection programs provide residents with non-disposal options for handling the filters. Ann Arbor, Bellevue, Crockett, Dover, and Seattle collect used oil filters for recycling. Three of these communities (Ann Arbor, Bellevue, and Seattle) are in states that ban disposal of the filters. Technology to recover oil in the filters has developed to handle the banned material; little recovery was accomplished before bans were enacted. Landfill bans of yard trimmings are another example. These bans have led to the development of a composting infrastructure at the local and regional levels.

Notes:

[1]Participation levels presented are those measured and reported by the communities.

[2]Lansana, 1992, "Distinguishing Potential Recyclers from Nonrecyclers: A Basis for Developing Recycling Strategies," *Journal of Environmental Education* 23(2): 16-23; and De Young, 1988-89, "Exploring the Difference Between Recyclers and Non-recyclers: The Role of Information," *Journal of Environmental Systems* 18(4): 341-351.

[3]Madison's recycling tonnage more than doubled from 1990 to 1991. The city also added corrugated cardboard and mixed containers in 1991 but the amount of these materials recovered did not account for the entire increase in recovery that occurred.

[4]Cuthbert, 1993, "Variable Disposal Fees Reduce Waste," *American City and County* June 1993: 47; Jenkins, 1991, *Municipal Demand for Solid Waste Services: The Impact of User Fees*, Dissertation, The University of Maryland, Economics Department, and 1993, *The Economics of Waste Reduction*, Edward Elgar Publishing Company, Brookfield, Vermont; Miranda, 1993, "Managing Residential Municipal Solid Waste: The Unit-pricing Approach," *Resource Recycling* November 1993: 37-40; and Stone and Harrison, 1991, "Residents Favor User Fees," *BioCycle* August 1991: 58-59.

[5]EPA has developed information and resources on implementing PAYT programs. Its PAYT Helpline is available at 888-EPA-PAYT (888-372-7298). Further information is available on the EPA Web site at www.epa.gov/payt.

[6]Jenkins, 1993, *The Economics of Waste Reduction*, Edward Elgar Publishing Company, Brookfield, Vermont; and Miranda, Everett, Blume, and Roy, 1994, "Market-Based Incentives and Residential Municipal Solid Waste," *Journal of Policy Analysis and Management* 13: 681-698.

[7]Saint Paul also provides recycling service to all households, including MFDs., but ILSR could not calculate a residential waste reduction level for the city since Ramsey County does not track trash according to origin by location (Saint Paul versus other county communities) or sector (residential versus commercial).

[8]DeYoung, 1990, "Recycling as Appropriate Behavior: A Review of Survey Data from Selected Recycling Education Programs in Michigan," *Resources, Conservation and Recycling* 3: 253-266; Duggal, Saltzman; and Williams, 1991, "Recycling: An Economic Analysis," *Eastern Economic Journal* 17: 351-358; and United States Environmental Protection Agency Office of Solid Waste and Emergency Response. *Decision-Maker's Guide to Solid Waste Management, Second Edition.* EPA530-R-95-023. August 1995.

[9]Jaus, 1984, "The Development and Retention of Environmental Attitudes in Elementary School Children," *Journal of Environmental Education* 15(3): 33-36.

KEYS TO INSTITUTIONAL/COMMERCIAL PROGRAM SUCCESS

Institutional and commercial waste (ICW) is often a significant portion of municipal solid waste, even in small cities and suburbs. The U.S. EPA estimates ICW comprises between 35 to 45% of total MSW generated in the country.[1] Six of our communities — Bergen County, Clifton, Portland, Ramsey County/Saint Paul, San Jose, and Seattle — include ICW in their reported waste reduction levels. In these communities, recovered ICW represents 23% to 42% of all municipal solid waste generated.[2] Unlike most residential waste, ICW is usually not collected as part of community-operated or community-contracted waste management programs. In most communities, businesses and institutions directly pay private companies to collect ICW. Municipalities have been slower to target this waste stream for recovery compared to residential waste but cannot reach high recovery of the total MSW stream unless they do.

Figure 2 shows the importance of ICW recovery in reaching high MSW reduction levels. High recovery levels can be achieved both in communities that provide trash and recycling services to commercial and institutional customers and those where private companies provide commercial and institutional waste services. Table 13, page 30, presents data for ICW generated and recovered for our six ICW record-setters and summarizes their ICW recovery programs. Many of our residential waste reduction record-setters also target ICW for recovery, but their programs are not recovering close to or above 50% of ICW.

Our ICW record-setters are using the following strategies to spur the development of private sector waste reduction programs:

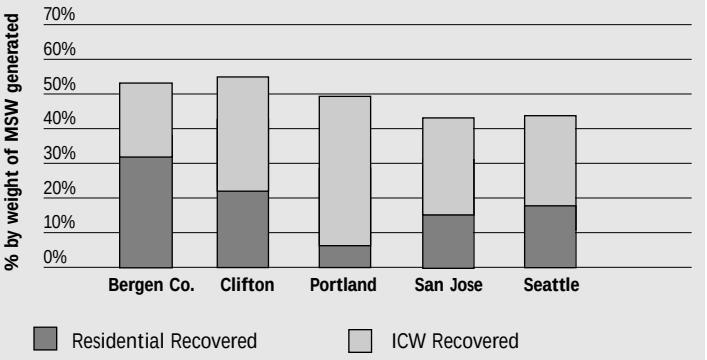
- mandating that businesses and institutions recover a wide range of recyclable and compostable materials, prohibiting disposal of specific materials such as yard trimmings, requiring businesses to submit reports on amount of materials recovered, and/or enforcing program requirements by inspecting businesses to see if they are meeting requirements or employing other enforcement mechanisms;
- requiring haulers to provide a minimal level of recycling services for a wide range of materials and/or requiring them to charge volume-based trash fees;
- instituting economic incentives targeted at businesses and private haulers, such as charging reduced or no tipping fees at recycling drop-off sites, charging lower franchise fees, and offering tax relief for haulers who recycle ICW;
- providing technical assistance, such as waste audits, disseminating listings of drop-off sites and private recycling services, and assisting businesses and haulers with marketing recovered materials by informing them of different marketing options or allowing them to bring materials to public processing centers; and
- providing municipal pick-up of a wide range of commercial/institutional recyclables and/or convenient drop-off depots that accept materials generated by the commercial and institutional sector.

State and Local Mandates

By requiring businesses and institutions to recycle, communities can encourage the establishment of a private sector recycling infrastructure. Of the six ICW record-setters, four require businesses to recycle.

In Bergen County, the county's Long-Term Solid Waste Management Plan requires commercial and institutional establishments to recycle corrugated cardboard, high-grade paper, mixed paper (newspapers, magazines, phone books,

FIGURE 2: THE CONTRIBUTION OF INSTITUTIONAL/ COMMERCIAL WASTE RECOVERY TO MSW REDUCTION



Note: Ramsey County is excluded as MSW generation figures cannot be broken down into residential versus commercial.

Source: Institute for Local Self-Reliance, 1999.

TABLE 13: INSTITUTIONAL/COMMERCIAL SECTOR RECOVERY ACTIVITIES

	Year	ICW Generated (tons)	ICW Recovered (tons)	ICW Waste Reduction (%)	Total Businesses	Mandatory	Economic Incentives
Bergen Co., NJ	1995	392,215	245,195	63%	30,900	yes	High tip fees ($103/ton)
Clifton, NJ	1996	56,714	38,561	68%	3,100	yes	High tip fees ($112/ton)
Portland, OR	1996	794,091	410,091	52%	50,000	yes	High tip fees ($63/ton)
St. Paul, MN[1]	1996	NA	NA	NA	7,800	yes	
San Jose, CA	1996	881,860	367,871	42%	27,000	no	Haulers charged reduced franchise and other fees for recyclables
Seattle, WA	1996	379,166	181,562	48%	45,000	no	Tax incentives for recycling haulers. Reduced tip fees charged for recyclables (including yard debris) at city facilities

Key: ICW = institutional and commercial waste NA = not available

Note: All of these communities offer waste reduction and recovery technical assistance, such as waste audits, consultations, workshops, and marketing assistance, to the institutional/commercial sector.

[1]ICW waste generated and recovered in St. Paul is not available as private haulers operating in the city also operate in the county and elsewhere. Neither the county nor St. Paul track ICW separately from other MSW generated.

Source: Institute for Local Self-Reliance, 1999.

paperboard, books, kraft paper bags, and mail), glass beverage containers, aluminum cans, ferrous scrap, and white goods. The county requires businesses to document and report the amounts of materials recovered.

The institution of economic incentives that reward recovery over disposal, such as reduced tipping fees for delivering recyclable and compostable materials to drop-off sites, tax incentives, and reduced franchise and other fees, encourage businesses to recycle and haulers to offer collection of recyclable materials.

Clifton, another New Jersey community, has passed an ordinance requiring commercial and institutional establishments in Clifton to "source separate, collect, transport, and market" materials for which markets are secured — currently 22 categories. Private contractors serving both residents and commercial establishments are required to report to the city the quantities of material they recycle. The recycling ordinance allows levying fines for non-compliance.

Effective January 1996, Portland required its businesses to source-separate recyclable materials in order to achieve a recovery level of at least 50% of their waste. The businesses are free to recycle whichever materials they choose. City staff began enforcing the ordinance in June 1996 by conducting unannounced business inspections. If warranted, staff make recommendations on improvements and offer free technical assistance. To date, no business contacted has refused to work toward compliance and no penalties have been issued. Surveys of Portland businesses have shown 29% of businesses reported they did not recycle in 1993 as compared to only 7% in 1996.

Saint Paul, where more than half of Ramsey County's population resides, requires commercial establishments to recycle at least three materials. The ordinance is enforced on a complaint basis only.

State policies have also helped spur recycling in the commercial and institutional sectors. For example, Minnesota prohibits all waste generators and handlers, including those in the business and institutional sectors, from placing leaves, grass clippings, garden debris, and tree and shrub waste with mixed MSW and disposing these in a landfill or incinerator. The state also prohibits tires, lead-acid batteries, used oil, major appliances, and rechargeable batteries from placement in mixed MSW.

Economic Incentives

Instituting economic incentives that reward recovery over disposal, such as reduced tipping fees

for delivering recyclable and compostable materials to drop-off sites, tax incentives, and reduced franchise and other fees, encourage businesses to recycle and haulers to offer collection of recyclable materials. High tipping fees for trash can also act as an economic incentive for recovery, although no communities have artificially raised tip fees for this purpose.

Seattle uses both reduced tipping fees and tax incentives to encourage commercial recycling. The city charges no tip fee for loads of recyclables delivered to its transfer stations. The per ton tip fee for a load of yard debris is 25% lower than the tip fee charged for trash delivered to these facilities. In addition, the city charges trash haulers a tax on collection revenues, but excludes collection of commercial recyclables from this tax.

In San Jose, financial incentives encourage waste reduction in the commercial and institutional sectors. Trash haulers pay the city fees for trash collected (in fiscal year 1997, $1.64 per cubic yard of trash in franchise fees and $1.77 per cubic yard of trash in source reduction and recycling fees). In contrast, recycling collection companies do not pay per ton fees for recyclables. The trash fees are a direct incentive for businesses to recycle and reduce their solid waste. City staff manage the franchises, ensure that franchised haulers remit proper fees, periodically audit haulers, and tabulate monthly data from haulers and recyclers on the amount of materials collected.

In Bergen County and Clifton, New Jersey, local mandates encourage businesses to recycle, but trash disposal fees, which at times have been above $100 per ton, may be a greater incentive. By recycling, local businesses not only comply with local laws but also achieve substantial savings on avoided disposal costs.

Technical Assistance and Outreach

All of our six ICW record-setters provide their commercial and institutional sector with some form of technical assistance.

Bergen County developed a waste audit manual for businesses and sent a copy to companies with more than 100 employees. Businesses were asked to complete the audit and return it to county staff. The staff used the audits to determine where its efforts were most needed. County staff provide on-site visits to businesses that request them.

Clifton's recycling coordinator has helped many businesses develop programs that meet or exceed the city requirements. When mandatory recycling first began, the recycling coordinator helped locate markets for materials, performed informal waste audits to help reduce waste, and provided advice on complying with the recycling ordinance.

All of our six ICW record-setters provide their commercial and institutional sector with some form of technical assistance.

In Portland, staff also help companies devise recycling programs to meet local recycling requirements. City staff have identified businesses needing assistance through inspections of business facilities.

San Jose staff likewise provide technical assistance to businesses by helping them implement in-house recycling programs, performing "waste assessments," and identifying end users for recycled materials. Businesses receive a packet that includes information on how to start recycling, waste reduction ideas, waste characterization analysis tools, a directory of recyclers, and a list of commercial solid waste services.

The Seattle Public Utilities and the Greater Seattle Chamber of Commerce sponsor the Business and Industry Recycling Venture (BIRV). This program encourages waste prevention, recycling, and purchasing of recycled-content products within Seattle's business community. BIRV offers businesses a hotline, informational materials, and technical assistance; and conducts presentations and seminars.

Notes:

[1]U.S. Environmental Protection Agency. *Characterization of Municipal Solid Waste in the United States: 1996 Update.* EPA/530-R-97-015. May 1997.

[2]The recovery level for ICW in Ramsey County/Saint Paul can not be calculated as ICW is not tracked separately from residential waste or total MSW.

KEYS TO COST-EFFECTIVENESS

Are our record-setting programs cost-effective? Have net solid waste management costs per household remained the same or decreased since waste reduction programs were implemented or expanded? Are per household cost increases due to rising trash disposal tip fees? Have waste reduction programs cushioned communities from future cost increases in solid waste management?

To evaluate the cost-effectiveness of our record-setting communities, we have looked at costs by addressing these questions. Thirteen of 14 communities, for which comparative year cost data exist, pass one of the two criteria for cost-effectiveness as outlined in the introduction, pages 10-11. In the other community, Loveland, per household costs increased 35% from 1989 to 1996 while the community went from zero to 56% waste reduction. Per ton disposal fees in Loveland were only $10 in 1996, the lowest of all the communities profiled. Loveland worked hard to implement recycling and yard debris programs at the lowest cost possible. However, because of the low tip fee for disposal, the net costs for these programs are slightly higher than the net costs for direct disposal. (For details on cost calculations, see the sidebar "Capital and Operating & Maintenance Costs" on page 9.)

Many factors make these communities' waste management programs cost-effective. One common theme is that these communities consider waste reduction and disposal to be two equally important parts of an overall waste management strategy. Recycling and composting are not add-ons; rather, they form an integral part of the overall waste management program. Communities' commitment to waste reduction allows them to save money on disposal and reallocate waste management funds so that each part of the waste stream is handled appropriately and cost-effectively.

Net Program Costs Per Household

In order to evaluate the effect waste reduction programs have on waste management costs over time, we compared total solid waste management costs for two or more years for each community for which these data were available. Table 14, on page 33, compares 1996 net solid waste management costs per household served to a "before year" for 14 communities for which these data were available. It also shows 1996 residential waste reduction levels as compared to the "before year."[1] For all communities included in the report except Bergen County, the "before year" represents a year either before the community's waste reduction program began or before a major program expansion.[2] Net solid waste management costs include program operation and maintenance costs and the annualized value of capital costs, and take into account materials revenues. (See the individual profiles and Appendix B for information specific to each community.) The "before year" costs further take into account the cost of inflation by converting cost figures into 1996 dollars using the gross domestic product (GDP) deflator.

For nine of our 14 record-setters for which cost data are available, net program costs per household served have remained the same or decreased: Chatham, Crockett, Dover, Falls Church, Fitchburg, Leverett, Portland, San Jose, and Seattle.[3]

Chatham's solid waste management costs dropped from $1.1 million in 1991 to $632,000 in 1996. When inflation is taken into account, during the same period, net program costs per household decreased from $457 to $228.

Dover's net residential waste management costs dropped from $1.0 million in 1990 to $798,000 while adding more than 1,000 customers. Per household costs decreased more than 40%; dropping from $122 in 1990 to $73 in 1996. During the same period, residential waste reduction increased from 3% to 52%, while residential waste generation per household decreased 24%. (See page 39 for a discussion on Dover's decrease in per household waste generation.)

Prior to implementing recycling and composting programs in 1992, Crockett paid a private company to collect and dispose of its trash. In 1991, the cost (in 1991 dollars) to the city was nearly $200,000 or $64 per household for residential service. Per household costs were $72 when adjusted to constant 1996 dollars. In 1996, total residential solid waste costs were $250,000, but were offset by $24,000 in revenues from the sale of recyclables. Net solid waste management costs were $69 per household in 1996, less than the 1991 per household costs.

In FY93, San Jose provided trash and limited recycling services only to residents of single-family homes. Per household costs averaged $207. By FY97 the city had expanded its waste reduction programs to target more materials and had begun providing trash and recycling services to residents of both single- and multi-family residences. FY97 per household costs averaged $187 for all households and $210 per household for single-family homes.

For Falls Church, Fitchburg, Leverett, Portland, and Seattle, per household costs for residential waste management have also stayed the same or decreased. The most dramatic reduction in costs occurred in Falls Church where costs dropped from $372 to $215 per household from FY90 to FY97.

Effect of Tip Fee Increases on Net Costs

Of the five communities where per household waste management costs increased (Ann Arbor, Clifton, Loveland, Madison, and Visalia), three would have experienced no per household cost increases if trash tip fees had not increased since the waste reduction program began or expanded. (See Table 15, page 34, for "before year" and 1996 tip fees.) Costs in Visalia would have increased less than 5% if trash tip fees had not increased from $30 to $33 per ton. All five of these communities use landfills for which they pay a per ton fee. The increase in tip fees resulted from higher per ton fees charged at these disposal sites, not from increased costs resulting from the loss of economies of scale at community-owned facilities.

In FY89, Ann Arbor's residential waste management cost $60 ($73 in 1996 dollars) per household. Tip fees at the landfill used by the city were $13 per ton ($16 in 1996 dollars). By FY96, per household costs for waste management rose to $78 per household and tip fees were $27 per ton. If the landfill tip fee in FY96 had only risen at the rate of inflation (as determined by the gross domestic product deflator) and all other costs stayed the same, per household costs would have been $72, roughly equivalent with FY89 costs.

Increases in trash tip fees have had a more dramatic effect in Clifton. Per household costs for residential waste management rose from $153 in 1987 to $178 in 1996. During this same time period, per ton tip fees for trash more than tripled in constant dollar

TABLE 14: NET SWM COSTS PER HOUSEHOLD, BEFORE AND AFTER

	"Before Year" Net SWM Costs[1] (Year)	($/HH)	1996 Net SWM[2] Costs ($/HH)	Res. Waste Reduction (%) (Before Year)	(Current Year)
Ann Arbor, MI	FY89	$73	$78	16%	52%
Chatham, NJ[3]	1991	$457	$228	63%	65%
Clifton, NJ	1987	$153	$178	12%	44%
Crockett, TX	1991	$72	$69	0%	52%
Dover, NH	1990	$122	$73	3%	52%
Falls Church, VA	FY90	$372	$215	39%	65%
Fitchburg, WI	1992	$126	$108	35%	50%
Leverett, MA	FY87	$84	$53	0%	53%
Loveland, CO	1989	$63	$85	0%	56%
Madison, WI	1988	$163	$175	18%	50%
Portland, OR[4]	1992	$241	$211	29%	40%
San Jose, CA[5]	FY93	$207	$210	33%	55%
Seattle, WA	1987	$155	$155	19%	49%
Visalia, CA	FY94	$190	$202	2%	50%

Key: FY = fiscal year HH = households NA = not available
Res. = residential SWM = solid waste management

Note: Net SWM costs are shown in constant 1996 dollars and take into account operating and maintenance costs, annualized costs of capital, and materials revenues. The costs include recycling, composting, and trash service costs. Households represent the number of households served by both the waste reduction and trash programs. Costs presented are not meant to be comparable among communities. The information is presented to illustrate changes in costs over time in the individual communities. See Appendix B for more information on how costs were calculated for each community. Bellevue, Saint Paul, and Worcester are not included because costs before recycling began are not available. Bergen County and Ramsey County are not included as costs for waste reduction and trash collection and disposal are largely incurred at the local level. The County functions are largely data analysis, technical assistance, and enforcement, rather than provision of basic waste management services.

[1]"Before Year" represents a year either before waste reduction program implementation or before major program change or expansion (such as advent of PAYT trash fees).

[2]Current year is FY96 for Ann Arbor, FY97 for Falls Church, Leverett, and Visalia, and 1996 for all others.

[3]1991 costs reflect (1) the annual flat fee of $350 households paid to a local hauler for trash collection and disposal before PAYT fees were instituted and (2) costs for the community recycling and composting programs.

[4]Represents fees households paid to private haulers and not costs incurred by Portland.

[5]FY97 cost and waste reduction data presented for service to single-family residences only in order to make data more comparable to FY93. San Jose did not offer city waste management services to residents of multi-family dwellings until FY94. FY97 average solid waste management costs for all households was $187 and the total residential waste reduction level was 45%.

Source: Institute for Local Self-Reliance, 1999.

TABLE 15: TIP FEES, BEFORE AND AFTER ($/TON)

Community	"Before Year" Trash Tip Fees[1]	1996 Trash Tip Fees[1]
Ann Arbor, MI	$16	$27
Bellevue, WA	$57	$66
Bergen County, NJ	$131	$103
Chatham, NJ	$141	$102
Clifton, NJ	$35	$112
Crockett, TX	$10	$13
Dover, NH	$75	$46
Falls Church, VA	$29	$45
Fitchburg, WI	$31	$36
Leverett, MA[2]	NA	$58
Loveland, CO	$5	$10
Madison, WI	$16	$34
Portland, OR	$72	$63
San Jose, CA	$29	$28
Seattle, WA	$60	$45
Visalia, CA	$30	$33
Worcester, MA	$37	$31

Key: NA = not available
Note: All costs represent dollars per ton. All costs have been converted to 1996 dollars using the Gross Domestic Product Deflator. Ramsey County, MN, is excluded because data are not available.
[1]Represents average tip fee paid at landfills, incinerators, or transfer stations for trash disposal.
[2]Prior to 1992 Leverett owned and operated its own landfill. The town did not track tonnages of material disposed at the facility, therefore; it is impossible to calculate per ton disposal costs for trash prior to 1992.

Source: Institute for Local Self-Reliance, 1999.

value from $36 per ton to $112 per ton. If the tip fee in 1996 had only been $36 per ton and all other costs stayed the same, per household costs would have been $99. Therefore, the increase in per household costs can wholly be accounted for through the increase in trash tip fees. In fact, if tip fees had remained stable at the 1987 level, 1996 per household costs would have decreased significantly.

Of the 14 communities where cost data were complete, 13 passed one of our two criteria for determining cost-effectiveness.

A similar, though less dramatic, effect of increases in trash tip fees occurred in Madison. Madison's per household waste management costs rose 8% from $163 in 1988 to $175 in 1996. During this same time period, average per ton tip fees paid by the city for trash disposal increased from $16 to $34. If disposal tip fees had remained constant at the 1988 level, per household costs for solid waste management would have totaled only $161 in 1996.

In FY94, Visalia's residential waste management program cost $190 per household. By FY97 per household costs had risen to $202. During the same period, tip fees paid by the city rose from $30 to $33 per ton. If tip fees had remained constant at $30, per household costs for waste management would have averaged only $199 in FY97, less than 5% greater than per household costs before the city instituted its waste reduction programs.

Although trash tip fees paid by Loveland more than doubled from 1989 to 1996, this increase can not account for the entire increase in per household waste management costs during the same period. Per household waste management costs increased from $63 to $85 from 1989 to 1996 while trash tip fees went from only $5 per ton to $10 per ton. Increases in tip fees account for less than $3 of the per household cost increase. The effect of tip fee variation is minimal because Loveland pays the lowest tip fee of all the profiled communities. If tip fees had been just $25 per ton in 1989 ($30 in 1996 dollars), per household costs for solid waste management would have dropped between 1989 and 1996.

Waste Reduction Cushions Communities Against Cost Increases

Another question we posed regarding program cost-effectiveness considered whether the implementation of waste reduction programs cushioned communities from future cost increases in solid waste management. We did not consider any waste reduction program cost-effective based on this criterion alone but believe waste management planners should consider evidence of this sort when making program decisions. The following evidence of cushioning against future cost increases is both quantitative and qualitative.

Data from Madison illustrate quantitatively how waste reduction programs reaching high diversion levels can cushion a community from increases in total waste management costs. Madison reconfigured its waste management system as a result of increased diversion, shifting trash collection resources to its waste reduction program. Assuming the city's waste reduction program had not reached 50% diversion, this reconfiguration

would not have been possible. If 1988 disposal costs were projected to actual 1996 disposal costs, 1988 per household costs would have increased to $187 per household. Actual per household costs for residential waste management were $175 in 1996; therefore, increased diversion and the changes in resource allocation made as a result helped cushion Madison from increases in waste management costs potentially greater than those experienced.

Loveland's and Dover's diversion programs have cushioned these communities from potential future cost increases in waste management. County staff estimate remaining landfill capacity at the Larimer County Landfill, where Loveland's trash is disposed, at eight years, after which a new facility will have to be sited and constructed. Disposal at the the new landfill will most likely cost more than the current facility in order to incorporate a liner, leachate collection system, and methane gas management system. If Loveland maintains its 1996 waste reduction level of 56%, future tip fee increases will have less than half of the effect than would be experienced if the city had no waste reduction program.

Potential savings to Dover as a result of its waste management program played an integral part in the city's decisions to implement and continue these programs. Dover's former municipally owned landfill is on the Superfund National Priority List and the city has been assessed 70% liability for its clean-up. Dover city planners believe aggressive waste diversion decreases the potential for future public liability in the event of necessary clean-up of its current disposal site.

In summary, of the 18 community waste reduction programs profiled in this report, data were available to evaluate cost-effectiveness for 14. See Table 16 for a summary of the results of our cost-effectiveness evaluation. No cost data were available for Bergen and Ramsey Counties. Nor were the data available for Bellevue and Worcester complete enough to evaluate these programs fully. Of the 14 communities where cost data were complete, 13 passed one of our two criteria for determining cost-effectiveness. The other community, Loveland experienced a total waste management program cost increase after implementing its aggressive waste reduction program. This cost increase cannot be explained wholly by increases in trash disposal tip fee increases.

For seven of the communities, qualitative or quantitative evidence indicates their waste reduction programs have cushioned them against trash management program cost increases that have occurred or are reasonably anticipated to occur in the future.

Factors Affecting Waste Reduction Program Cost-Effectiveness

What contributes to the cost-effectiveness of the programs examined? Can curbside recycling programs be cost-effective in bottle bill states? Have net solid waste program costs per household decreased in many of these cities as a result of revenue gained from sale of recovered materials? Are waste reduction programs cost-effective only in communities that must pay high tip fees for trash disposal? What other factors influence cost-effectiveness of these waste reduction programs?

TABLE 16: SUMMARY OF COST-EFFECTIVENESS EVALUATION

	Net Program Cost per HH Remained the Same or Decreased?	Increased Tip Fees are Solely Responsible for Increased Net Costs?	Waste Reduction Cushioned Community Against Cost Increases?	Final Classification as Cost-Effective[1]
Ann Arbor, MI	No	Yes	Yes	Yes
Bellevue, WA	No data	No data		Undecided
Chatham, NJ	Yes	NA		Yes
Clifton, NJ	No	Yes	Yes	Yes
Crockett, TX	Yes	NA		Yes
Dover, NH	Yes	NA	Yes	Yes
Falls Church, VA	Yes	NA		Yes
Fitchburg, WI	Yes	NA		Yes
Leverett, MA	Yes	NA	Yes	Yes
Loveland, CO	No	No	Yes	No
Madison, WI	No	Yes	Yes	Yes
Portland, OR	Yes	NA		Yes
San Jose, CA	Yes	NA		Yes
Seattle, WA	Yes	NA		Yes
Visalia, CA	No	Yes	Yes	Yes
Worcester, MA	No data	No data		Undecided

Key: NA = Not applicable

Notes: Bergen County, New Jersey, and Ramsey County (including Saint Paul), Minnesota, are not included because data were not available to evaluate program cost-effectiveness by any of the above criteria.

[1]According to the methodology used in this report, community waste reduction programs are considered cost-effective if the answer to either of the first two questions is "Yes." The other criterion provides further information about the success of the waste reduction programs but are not sufficient to adequately evaluate program cost-effectiveness.

Source: Institute for Local Self-Reliance, 1999.

Five of our record-setters (Ann Arbor, Portland, San Jose, Visalia, and Worcester) offer curbside recycling to their residents and are in states with container deposit laws. Four of these communities (Ann Arbor, Portland, San Jose, and Visalia) have cost-effective waste reduction programs; data were not available to determine if Worcester's program is cost-effective. Critics of container deposit systems have stated these systems interfere with curbside recycling programs by removing high-value aluminum from the residential waste stream, thereby reducing revenues earned from materials collected. Our record-setters show that container deposit systems and cost-effective waste reduction programs are not mutually exclusive.

The waste reduction programs considered cost-effective are not just those that must pay high tip fees for trash disposal.

Materials revenues do affect program economics but eliminating revenues would not change the cost-effectiveness determination for most of the profiled programs. Of the 14 communities for which cost data were available, five (Dover, Falls Church, Fitchburg, San Jose, and Visalia) receive no revenues from materials sales. Loveland did not pass our cost-effectiveness tests. Seattle data did not provide revenue figures. Of the remaining seven communities, six would still pass one of our cost-effectiveness criteria if revenues were set to zero. Only Madison, Wisconsin, where material revenues averaged nearly $10 per household in 1996, would no longer pass our cost-effectiveness tests if these revenues were eliminated.

Cost-effective waste reduction programs considered are not just those that must pay high tip fees for trash disposal. Among the communities profiled, tipping fees for trash disposal range from more than $100 per ton in Clifton, New Jersey, to less than $15 per ton in Crockett, Texas, and Loveland, Colorado. Eight (of 17 for which data were available) of the communities pay tip fees below $40 per ton. (See Table 15, page 34 for tip fee information.) Six, of the seven of these programs for which data are available, pass our cost-effectiveness tests. One community, Loveland, failed the cost-effectiveness tests according to our criteria.

Many factors contribute to program cost-effectiveness for our communities. Collection and processing systems vary widely from one community to the next. Each system collects different types and amounts of materials, requires distinct set-out procedures, and employs different processing techniques. In some communities, public works crews collect materials. In others, private companies under contract with the city provide services. While there is no simple formula for determining which system is more advantageous, there are some relationships between program types and costs.

Our record-setters have improved collection efficiencies, reduced landfill disposal costs, implemented cost-competitive waste reduction programs, generated materials revenues, and produced less trash in order to reduce or stabilize solid waste management costs. Specific techniques include:

- maximizing diversion levels and the amount of material recovered to reduce disposal costs;
- collecting and composting source-separated yard trimmings;
- taking advantage of private sector or regional processing facilities;
- maximizing materials revenues through favorable agreements with processors, operating a local MRF, or through directly marketing segregated materials to end users;
- implementing pay-as-you-throw trash fees;
- utilizing drop-off programs in rural areas where curbside programs may not be cost-effective, or to supplement curbside programs;
- utilizing appropriately designed dual-collection systems (especially viable for communities where the MRF is near or adjacent to the disposal facility); and
- integrating waste reduction programs and systems into the existing solid waste management system (rather than viewing them as add-on systems).

Maximizing Diversion Levels

High diversion levels can reduce costs in two major ways: (1) by significantly reducing landfill or other disposal costs, and (2) by eliminating some trash routes and their associated costs.

As mentioned earlier, tip fees for trash do not necessarily have to be high in order for waste reduction programs to be cost-effective. On the other hand, tip fees do have a direct effect on total program cost. In the profiled communities, trash tip fees alone account for 12% to 78% (median value 34%) of total trash costs and from 6% to 65% of total solid waste management costs. As more material is recovered rather than disposed, communities can reduce this expense, reaping considerable savings.

Additional savings can be generated by restructuring trash collection systems. When communities begin to divert or reduce significant portions of their waste streams, trash collection systems can be reconfigured as a result of handling less trash, thereby avoiding collection costs. Falls Church, Virginia, substituted its second-day trash collection with weekly recycling collection. Madison, Wisconsin, eliminated several trash routes. (See Integrating Waste Reduction in the Existing SWM System, page 40, for more information on how maximizing waste reduction can reduce costs.)

Yard Debris Collection and Composting

Yard trimmings collection costs vary widely among our record-setters, but tend to be lower than recycling collection costs. See Table 17, page 38, for cost comparisons between each community's recycling and yard debris management programs. Yard trimmings are more homogenous than the various types of recyclables; they can be compacted; and they can be collected in one vehicle. Thus, yard trimmings collection systems can be very efficient. Moreover, many of our record-setters only offer curbside collection in the spring, summer, and/or fall, avoiding the additional costs of year-round service. By targeting yard trimmings, communities can reduce per ton costs for waste reduction programs and overall solid waste management costs.

Composting costs also tend to be lower than the processing costs of recyclables and trash disposal fees. Many communities are avoiding composting costs by relying on county or private facilities that charge minimal or no tipping fees. For those that are composting their yard trimmings at local facilities, the cost of processing yard trimmings ranges from $2 per ton in Worcester to $25 per ton in Loveland.

Backyard composting and grasscycling are often the least-cost method of diverting yard trimmings from disposal. With grasscycling, residents save time in bagging grass clippings and may avoid user fees for yard debris collection. Communities avoid the costs of collection and processing or disposal. Community savings are usually somewhat offset by the costs of a modest education program. Backyard composting programs generally cost both the resident and the community more than grasscycling but less than community-wide collection and processing programs.

High diversion levels can reduce costs in two major ways: (1) by significantly reducing landfill or other disposal costs, and (2) by eliminating some trash routes and their associated costs.

In most of our record-setting communities, composting has had a dramatic and beneficial impact on net waste reduction costs. This does not mean that communities should abandon their curbside recycling programs and simply focus on composting. Rather, the advantage of an integrated and comprehensive approach is in decreasing overall waste reduction and solid waste management costs as well as in extending the life of local landfills and conserving natural resources.

Recyclables Processing

Costs for processing recyclables and revenues received from materials sales affect overall waste reduction costs. Some of our record-setters avoid the costs of building and operating their own MRF by using private sector or regional processing facilities. Loveland can tip recyclables for free at a county MRF. Madison and Visalia have forged favorable agreements with private processors. In Madison, the city receives 80% of materials revenues.

Ann Arbor and Crockett own their own MRFs. Ann Arbor contracts out operation of its MRF. The city receives 35% of sales revenue above a trigger price of $40 per ton. In Crockett, the city operates the MRF and retains all revenues from the sale of materials.

In Bellevue, Chatham, Dover, Fitchburg, San Jose, Seattle, and Worcester, fees paid to contractors include collection and processing of recyclables. For

TABLE 17: RECYCLING AND COMPOSTING GROSS COSTS PER TON

	Recycling			Composting			Waste Reduction
	Collection	Processing	Total [1]	Collection	Processing	Total [1]	Total
Ann Arbor, MI	$73	$14	$102	$29	$22	$50	$77
Bellevue, WA[2]	$129	incl.	$139	$102	incl.	$102	$118
Chatham, NJ	$38	incl.[3]	$39	$34	$6	$48	$45
Clifton, NJ	$46	<$1	$55	$21	$5	$35	$42
Crockett, TX	$14	$100	$189	$14	$21	$78	$120
Dover, NH	$67	incl.	$75	$19	$7	$27	$60
Falls Church, VA	$41	incl.	$62	$68	$10	$80	$73
Fitchburg, WI	$81	incl.	$117	$56	incl.	$78	$101
Leverett, MA	$7	$0[4]	$51	--	--	--	$51
Loveland, CO	$112	$0[5]	$128	$34	$11	$53	$80
Madison, WI	$115	$42	$160	$103[6]	$10[7]	$79	$107
Portland, OR[8]	$124	incl.	$196	$84	incl.	$132	$176
St. Paul, MN	$81	incl.	$115	NA	NA	NA	NA
San Jose, CA[9]	$62	incl.	$206	$89	incl.	$96	$143
Seattle, WA[10]	$91	incl.	$121	$91	$12	$142	$129
Visalia, CA	$61	$29	$114	$53	$16	$87	$96
Worcester, MA	$49	incl.	$54	$31	$2	$40	$47

Key: incl. = included with collection NA = not available -- = not applicable

Note: All costs are in dollars per ton and represent gross costs. Materials revenues are not included. Collection and processing costs reflect curbside and drop-off costs. Costs presented are not meant to be comparable among communities, rather the information is useful in evaluating each community's individual programs. Bergen County not included because data not available.

[1]Total recycling costs and total composting costs include administrative, overhead, and publicity/education costs, which are not reflected in collection nor processing costs.

[2]Recycling and composting collection costs represent contractor costs to provide service as reported to the city. These contractor costs do not correspond with the fees paid by residential customers to the contractor. Total costs represent contractor costs and city expenditures for contract oversight, administration, and education programs.

[3]Chatham pays its contractor $23.81 per household served. This fee, which in 1996 equalled $38 per ton recycled, includes collection, processing, and marketing of recyclables.

[4]Recyclables delivered to state-developed MRF in Springfield, MA, which charges no tip fee. Hauling costs to the MRF were $31 per ton.

[5]Recyclables delivered to county-owned MRF, which charges no tip fee.

[6]Collection costs for curbside collection only.

[7]Processing costs also include drop-off collection costs.

[8]Collection and processing costs reflect payments by individual households to haulers for services. ILSR added a 70¢ per household recycling revenue credit to estimate costs excluding revenues. See profile for more detail. Total costs represent collection and processing costs, and hauler and city administration/overhead/education.

[9]The difference between total per ton recycling costs and the per ton cost of collection (including processing) reflects the marketing incentive fee payments that the city pays its contractors for every ton actually marketed to an end user.

[10]Seattle's presented recycling costs are net costs, not gross costs. The city reported only actual payments to contractors which include credits for material revenues. Compost collection costs include costs to handle materials at city transfer stations and to transport materials to processing facilities.

Source: Institute for Local Self-Reliance, 1999.

most of these communities, contractors retain all revenues. Chatham splits revenues 50:50 with its contractor.

Clifton is unique in avoiding the costs of processing altogether. It collects segregated materials at curbside (residents even color-sort glass). Once collected, materials are stored at the city's Department of Public Works yard in roll-off containers provided by end users with whom Clifton has directly forged agreements. In 1996, Clifton incurred no processing costs (just the equivalent of 19¢ a ton for marketing) but received more than $13 per ton on average in materials revenues.

Pay-As-You-Throw Trash Fees

Those communities with pay-as-you-throw (PAYT) trash fees, have seen trash disposal per household significantly decrease. In Bellevue, trash disposed dropped from 20,900 tons per year in 1989 to 15,700 tons per year in 1996 even though the number of households served increased 33% during the same period. In Worcester, average trash landfilled per household dropped from 5.0 pounds per day in 1992 to 2.9 pounds per day in 1996 — a

42% reduction. In Portland, average trash can weights dropped. In two of our eleven PAYT communities — Dover and Loveland — total waste generated per household has decreased by 10% or more. This means that less waste needs to be collected for recovery and for disposal, which in turn leads to decreased trash costs. In Dover, on a per household basis, waste generation decreased 24% and costs decreased by 40%. The city's recycling coordinator credits the PAYT system with these reductions. PAYT trash fees also have been shown to encourage use of drop-off sites, which often tend to have lower per ton operating costs than curbside programs, thereby contributing to savings. Residents have a financial incentive to take recyclables and yard trimmings not collected in the curbside program to drop-off sites that will accept these materials.

Drop-off Collection

While curbside collection is critical to maximizing participation and therefore recovery levels, drop-off is generally cheaper for the community.[4] (See Table 18 for a comparison of drop-off versus curbside collection costs.) Generally the more materials collected at drop-off, the lower average per ton costs for waste reduction.

Staffing at drop-off sites does have an effect on per ton collection costs. For example, Ann Arbor and Dover have staff present at their multi-material drop-off facilities and per ton collection costs are $41 and $24 per ton in these cities. These costs are well below the cities' curbside collection costs, but higher than the collection costs per ton paid by communities with unstaffed drop-off facilities.

TABLE 18: DROP-OFF VS. CURBSIDE COLLECTION COSTS

	Per Ton Recycling Collection Costs			Per Ton Composting Collection Costs		
	Curbside	Drop-off	Total	Curbside	Drop-off	Total
Ann Arbor, MI	$75	$41	$73	$28	$37	$29
Bellevue, WA[1]	$126	$316	$129	$102	--	$102
Chatham, NJ	NA	NA	$39	$39	$14	$34
Dover, NH[2]	$77	$24	$67	$68	$0[3]	$19
Falls Church, VA[2]	$52	$5	$41	$68	--	$68
Fitchburg, WI[4]	$96	$7	$81	$117	$15	$56
Leverett, MA	--	$7	$7	--	--	--
Loveland, CO[4,5]	$106	$236	$112	$86	$8	$34
Madison, WI[6]	$111	$157	$115	$103	$30	$79
San Jose, CA[7]	$62	--	$62	$89	--	$89
Seattle, WA[8]	$91	--	$91	$79	--	$79
Visalia, CA[9]	$61	NA	$61	$61	$8	$53

Key: NA = not available -- = not applicable

Note: Some communities are excluded as curbside versus drop-off tonnage and costs are not available. Costs presented are not meant to be comparable among communities, rather the information is useful in evaluating each community's individual programs.

[1]Special recycling drop-off events accept many non-conventional materials such as fluorescent lights and ballasts which have high processing costs. Cost for curbside and drop-off include processing costs and represent contractor costs to provide service as reported to the city. These contractor costs do not correspond with the fees paid by residential customers to the contractor.

[2]Costs for recycling collection include processing costs.

[3]Drop-off collection costs $0 because drop-off site is unattended. Contractor collects and hauls material from the drop-off; these costs are included with material processing charges.

[4]Composting costs include both collection and processing.

[5]Drop-off recycling costs also include costs for household hazardous waste program.

[6]Recycling drop-off facility accepts only appliances and scrap metal. Composting drop-off costs also include processing for all yard trimmings collected at both curbside and drop-off.

[7]Costs for curbside collection include processing costs.

[8]Seattle's presented recycling collection costs represent net payments to contractors. The city reported only actual payments to contractors which include credits for material revenues. Compost collection costs include costs to handle materials at city transfer stations and to transport materials to processing facilities.

[9]Visalia does not track curbside collection costs for recyclables, yard debris, and trash separately. The city assumes per ton collection costs are the same for each material.

Source: Institute for Local Self-Reliance, 1999.

Dual-Collection

One way two of our record-setters have integrated recycling completely into their solid waste management systems is through use of dual-collection vehicles, which collect recyclables and trash in separate compartments on one truck. Loveland and Visalia use dual-collection systems, which differ significantly from each other. Loveland's vehicles have three compartments: a 10-cubic-yard compactor for trash and two side-loading compartments for commingled food and beverage containers and for mixed paper. Visalia's fully automated dual-collection system uses a unique 110-gallon split container in which residents place their trash in one side and their commingled recyclables in the other. Split compactor trucks pick up and empty the container, trash falling into one compartment, and recyclables into the other. Dual-collection works for these communities because their processing facilities for recyclables are adjacent or very close to their transfer stations or disposal facilities for trash.

In Loveland, two-person crews use dual-collection vehicles to collect recyclables and trash at the same time.

Prior to implementing its dual-collection program, Loveland had no recycling services.

Under the former system, each trash route served 450 homes per day. Now each serves 950 homes per day. Per household costs are higher under Loveland's current system than they were before the changes, but residents receive more services. Yet, if tip fees had been just $25 per ton in 1989 ($30 in 1996 dollars), per household costs for solid waste management would have dropped between 1989 and 1996. Costs likely would have been higher had the city chosen an alternative system for collection of recyclables. According to studies performed by the city prior to choosing dual-collection, the city spends $100,000 per year less on its dual-collection system as compared to what costs would have been had the city chosen to use separate trucks for trash and recycling collections.

Waste reduction programs do not have to pay for themselves through fees and revenues in order to be cost-effective.

Visalia's fully automated dual-collection system was designed to maintain the same route productivity collecting trash and recyclables as the former fully automated trash system — the same time, number of stops, number of employees, and number of vehicles. It succeeded. A $3.5 million lease/purchase agreement was arranged to finance the new dual-collection vehicles and split containers. Staff calculated that residential collection rates would need to be increased to $1.20 per month to fund the lease/purchase agreement. The city's source separated yard debris collection program cost approximately $4 per household per month. These increases were offset, however, by savings in tip fees. Landfill tip fees are $31 per ton, while tip fees for composting are $15 per ton and recycling processing fees are $28 per ton. The new program saved approximately $300,000 per year in tip fees, which resulted in an actual rate increase to each household of only $3.20 per month.

Integrating Waste Reduction into the Existing SWM System

Many recycling critics maintain that recycling is an add-on cost to solid waste management. The experience of a majority of our record-setters dispels this myth. By diverting close to half or more than half of their residential waste streams, our record-setters no longer treat recycling as an add-on to their existing systems. Waste reduction has been fully integrated into the waste management system and has become the primary way many of these communities manage household discards. Communities that maximize the amount of material diverted from disposal often have low per ton recycling and composting costs. A truck must travel the same route length regardless of how many residents participate in the program. Recycling collection systems become more cost-effective when the amount of materials collected at each stop is maximized.

When trash significantly decreases, waste reduction programs can be more fully integrated into existing solid waste systems. They no longer require additional costs and labor, but now become a primary way to collect residential materials. Labor and trucks are shifted. Trash routes are reduced. Revenues are generated. Source reduction and reuse decrease the amount of wastes generated.

Most items in solid waste budgets do not represent rigid costs. Capital costs spent on facilities such as incinerators and landfills and payments required under the terms of put-or-pay contracts are often rigid. In contrast, labor can be reassigned. Trash trucks are often replaced every few years and have resale value. Short-term contracts can be renegotiated to reflect system changes. By reallocating resources, many cities have integrated waste reduction with no increase in solid waste costs.

In Madison, the DPW's budget has risen during the last decade, but so has the population and the number of households served. The net cost of overall solid waste services has increased from $163 (in 1996 dollars) per household in 1988 to $175 per household in 1996. During this same period, tip fees more than doubled in real dollars (to equal the national average disposal tip fee of $34 per ton) accounting for all of the cost increase. High diversion levels decreased the number of trash collection routes needed (from 26 to 20) and helped to hold landfill tip fees in check. If we normalize for population growth, Madison reduced the number of trucks in its trash fleet by 30% because of recycling and composting.

Falls Church reduced trash collection from twice a week to once weekly in 1991, just one year after the city started multi-material curbside recycling. As a

result, the city cut the number of trash crew members from ten to seven. Worcester was also able to reduce trash routes when the city's recycling and composting programs diverted materials from disposal.

As communities increase materials recovered, waste reduction programs no longer operate as add-ons but rather can begin to off-set and enhance a city's trash collection and disposal infrastructure making the overall system more efficient and cost-effective. Improved market conditions for recyclables, resulting from increased demand for recycled goods, would also serve to lower net costs. Waste reduction programs do not have to pay for themselves through fees and revenues in order to be cost-effective. As waste reduction levels increase, communities can reconfigure their waste management systems, shifting resources from trash to materials recovery programs in order to create cost-effective, integrated programs. This shifting of resources can be easier to accomplish if communities are not tied into capital-intensive or long-term arrangements, i.e., ownership of landfills and incinerators, and long-term contracts, especially put-or-pay contracts.

Notes:

[1]ILSR requested 1996 waste management program data from participating communities. As some communities (Ann Arbor, Falls Church, San Jose, and Visalia) track data on fiscal year basis, they were not able to provide calendar year data. These communities provided data for a time period that included a portion of 1996. Ann Arbor data covers FY96. Falls Church, San Jose, and Visalia provided FY97 data. The most recent year for which Bergen County had data was 1995; figures presented represent that year.

[2]The "before year" used for Bergen County was 1993. This year is the earliest year for which county staff had accurate data for both trash and waste reduction tonnages.

[3]In this report the statement average per household costs have "remained the same" indicates costs are within 5% of the cost with which the comparison is being made.

[4]Three of our communities (Bellevue, Loveland, and Madison) have higher per ton costs for recyclable materials collected at drop-off facilities. Ann Arbor has a higher per ton cost for yard debris at drop-off facilities. In each of these cases, special circumstances explain why drop-off costs are high. Bellevue does not maintain a year-round drop-off facility. The city sponsors two special recycling events yearly at which staff accept oil filters, household and lead-acid batteries, tires, household goods (textiles, working small appliances, usable furniture), white goods, scrap metal, #6 plastic food containers, scrap lumber, antifreeze, fluorescent lamps and ballasts, and ceramic bathroom fixtures for recycling. Drop-off costs also include processing costs, which for many of these nonconventional items are high. Loveland's recycling drop-off collection costs also include costs for the city's household hazardous waste program. Madison accepts only appliances and scrap metal for recycling at its drop-off facility. The city tracks costs for the drop-off site with costs for its curbside collection program for bulky material. ILSR estimated costs for the drop-off program based on the total per ton cost of the entire program, most likely over-estimating actual costs for the drop-off program. Ann Arbor did not track the costs for its joint recycling and yard debris drop-off site by material type. ILSR assumed collection costs per ton were equal regardless of material type.

TIPS FOR REPLICATION

Collection

Collect as wide a variety of materials as possible, including mixed paper.

Collect yard trimmings for composting.

Use drop-off sites to augment curbside collection.

Consider commingled set-out. Residents prefer the convenience of commingling materials for collection.

Distribute bins to all participants.

Education

Focus on education that teaches residents how to use your particular system.

Remember raising overall environmental awareness can boost enthusiasm for waste reduction programs.

Reaching children can be a way to educate entire households.

Target educational efforts at new residents and at all ethnicities.

Continuously remind and educate the population about waste reduction.

Spend the extra money to make promotional materials attractive.

Support education programs with market research to most efficiently target resources.

Keep promotional materials simple and use culturally sensitive language and messages.

Repeat messages in a variety of media.

One-to-one outreach can be very effective.

Program Planning

Build broad program support during the planning stages by seeking public input, selling the program to those active in the community (such as service and civic clubs), and building political support.

Make program participation as convenient as possible. Keep the program easy and user-friendly.

Investigate dual-collection, especially when faced with an aging trash fleet.

Consider pilot programs to collect data (put reporting requirements in contracts).

Do your own homework to fit your program to your community. Do not simply attempt to replicate another community's program without considering your community's similarities and differences.

Be willing to accept some or all of the risk of secondary materials prices.

Base some of your trash hauler's payment on tons collected so as less trash needs to be disposed, savings accrue.

Learn from others' experiences. Find out what other communities have accomplished and how they did it.

Policies

Implement a pay-as-you-throw trash system (and include small container options such as a 15-gallon bag or a mini-can to encourage residents to generate as little trash as possible).

Set up a cost structure that encourages recycling and waste reduction for businesses and haulers.

Encourage source reduction (such as through backyard composting, mulch mowing, and pay-as-you-throw trash fees).

Encourage reuse.

Pass a local ordinance requiring residents, businesses, and institutions to participate in waste reduction activities or requiring haulers to offer their customers (residential and commercial) a minimal level of recycling services.

Enforce mandatory programs to boost both the quantity and quality of participation.

Offer recycling services to multi-family households, require haulers to provide these services, or require that multi-family building owners/managers provide recycling services to their tenants.

Ongoing Programs

Be prepared for resistance to change. Be very clear about the "whys" of a program change to increase buy-in. Anticipate likely questions.

Recruit and reward citizen volunteers, who have many skills and can help maintain community motivation.

Be accessible to residents and business recyclers.

Talk to your customers. Solicit input and give feedback on program progress.

Seek committed staff and administration to ensure program success.

Commit to and concentrate on high-quality customer service.

Listen to your line employees. Workers know the system and its strengths and weaknesses.

Get your hands dirty. Management can gain insight concerning problems and opportunities by working on collection routes and poking around in containers.

Create a relationship with haulers that is conducive to continuous improvement.

Secure stable markets for reusable items and recyclables.

Know your markets. While certain commodities may be present in great enough quantities to make collection appear attractive, lack of markets can disrupt the system.

Not collecting a material is better than collecting it for recycling and then landfilling it.

Avoid adding a material to the recycling program and then taking it away, especially if the trash system is pay-as-you-throw.

Talk with other recyclers when faced with problems. Most likely someone else has encountered a similar problem and can offer advice.

Share your experience.

Know what everything costs.

Collect and analyze data to document success.

Be conservative when reporting recycling and composting tonnages and program costs.

Never stop striving to improve; there's always room for improvement.

Be creative.

PROFILES OF COMMUNITY RECORD-SETTERS

The community profiles, pages 47 to 162, provide comprehensive in-depth information about each community. They each follow a similar structure.

First page: summarizes waste reduction programs and key drivers for high diversion levels and cost-effectiveness. At the top, we show waste reduction level and on what it is based; that is, residential solid waste or municipal solid waste. The first chart, Residential Waste Generation Per Household Per Day, compares **residential** waste generated per household per day for two or more years and shows the breakdown among recycling, composting, and disposal. The Program Summary table summarizes and compares 1996 **residential** waste generated and diverted and net solid waste program costs for **residential** programs to a previous year (before waste reduction programs were implemented or before a major program expansion or change). (Unless otherwise noted, costs for years other than 1996 have been converted to 1996 dollars using the GDP deflator.) Basic demographic data are also provided on the first page.

Second page: starts with a table detailing 1996 materials recycled, composted, and disposed. The table also shows percent waste reduction and pounds per day of residential waste generated. Notes to these tables clarify what figures include and exclude and how some figures are calculated or determined.

Third page: generally is a side bar summarizing collection systems for curbside collection of recyclables, curbside collection of yard trimmings, and drop-off collection. Program start-up date, household served, materials targeted, set-out and collection methods, participation rates, enforcement measures are all included here.

State and Local Policies: summarizes state and local policies, legislation, ordinances, and regulations that play a role in these communities' high waste reduction levels. Information on pay-as-you-throw trash fees are included in this section.

Source Reduction and Reuse Initiatives: describes any initiatives in place to encourage source reduction and reuse. Backyard composting, mulch mowing, reuse efforts, and impact of pay-as-you-throw trash fees on waste generation are discussed here.

Recycling Program: this section generally summarizes residential recycling program: residential diversion levels, service provider, and processing technique.

Commercial Recycling Program: included for MSW record-setters, and describes recycling in the institutional/commercial sector.

Composting Program: summarizes collection and processing systems for yard trimmings.

Education, Publicity and Outreach: describes each community's outreach efforts.

Costs: summarizes cost data. Employment and wage data, where available, are included here too. One table lists equipment costs (item, cost, for what it is used, and the year it was purchased). Two other tables detail operating and maintenance costs (annual costs, the tonnage these costs cover, per ton costs, and per household costs). The first O&M table focuses on waste reduction program costs. The second O&M table details total solid waste management costs (disposal, waste reduction, and total costs). Notes to each table clarify cost data. A bar chart compares per ton operating costs for trash collection and disposal to waste reduction costs (collection, processing, and marketing). Waste reduction costs are shown two ways: gross per ton costs, and net per ton costs (which take into account materials revenues). Where available, this chart compares 1996 data with data from previous years.

Funding and Accounting Systems: describes how waste reduction and trash services are funded and mentions the accounting system each community uses to track expenditures.

Future Plans and Obstacles to Increasing Diversion: mentions future plans and obstacles communities face to increasing diversion levels.

Tips for Replication: lists tips our community contacts have for other communities interested in replicating their success.

Contact: lists our primary contact(s) for information provided in each profile.

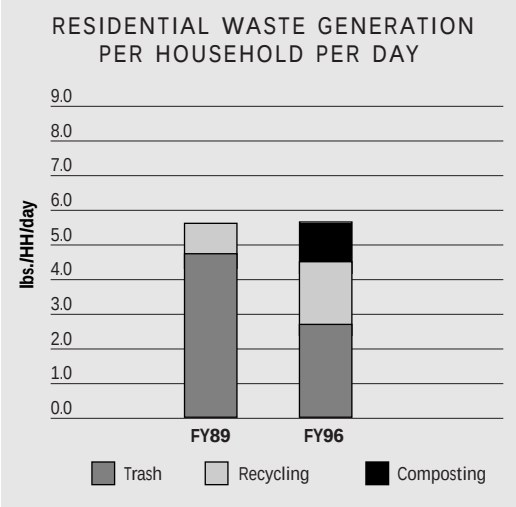
Text notes are at the end of each profile.

ANN ARBOR, MICHIGAN

Residential Waste Reduction

52%

Recycling in Ann Arbor began when a community-based nonprofit opened a drop-off station in 1970. A few years later a volunteer group called Recycle Ann Arbor began the city's first curbside recycling program. Today Recycle Ann Arbor contracts with the city to collect 24 types of recyclables weekly from all residents. The City Department of Solid Waste provides trash collection and seasonal weekly curbside collection of four types of yard debris. A comprehensive drop-off site (operated by Recycle Ann Arbor, under contract with the city) accepts materials collected at curbside along with three additional categories of materials including building materials and tires. Michigan also has a bottle bill that recovers an estimated 5% of the waste stream. In FY96, Ann Arbor residents reduced their waste by 52%; 30% through recycling and 23% through composting.



Source: Institute for Local Self-Reliance, 1999.

Contributing factors to Ann Arbor's waste diversion level are a state ban on landfilling yard debris, curbside collection of 24 types of recyclables coupled with a mandatory ordinance, multi-family dwelling recycling service, and the bottle bill. The state ban spurred Ann Arbor to develop a compost site, draft an ordinance requiring residents to separate "compostables" from trash, and start curbside service for these materials. The ordinance encourages residents to participate. As 52% of households are multi-family, the city recognized the importance of providing this sector with waste reduction services. Multi-family buildings receive recycling carts and can divert the same materials as do single-family homes, with the exception of motor oil and batteries. The bottle bill provides an incentive to recover designated containers.

From FY89 to FY96 per household net solid waste management costs rose from $73 to $78. During the same period per ton trash tip fees rose more than 70%. Cost-effectiveness of Ann Arbor's programs is enhanced by city ownership of its MRF, the relatively low cost of yard debris diversion, and contracting with a nonprofit for recycling services. The city's ownership of the MRF reduces the processing fee it pays compared to the fees charged at private facilities. Yard debris diversion is the least expensive of Ann Arbor's solid waste management activities at only $50 per ton. Recycle Ann Arbor bids competitively for the city's recycling contract and has consistently been awarded the contract.

PROGRAM SUMMARY

	FY89	FY96
Tons Per Year	44,806	47,943
Disposal	37,425	22,839
Diversion	7,381	25,104
Percent Diverted	16%	52%
Recycled	16%	30%
Composted	0%	23%
Average lbs./HH/day	5.61	5.71
Disposal	4.68	2.72
Diversion	0.92	2.99
Annual Disposal Fees		
Disposal	$588,993	$618,841
Net Program Costs/HH	$72.96	$77.61
Disposal Services	$63.68	$42.17
Diversion Services	$9.29	$35.44

Notes: 43,774 households served in FY90; 46,000 in FY96. 1989 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 112,000 (1994)
HOUSEHOLDS: 22,000 single-family and duplexes; 24,000 multi-family
BUSINESSES: approximately 3,000
LAND AREA: 16 sq. mi.
HOUSEHOLD DENSITY: 2,875 / sq. mi.
AVERAGE PER CAPITA INCOME: $17,786 (1989)
MEDIAN HOUSEHOLD INCOME: $33,334 (1989)
COMMUNITY CHARACTER: Urban college town with 131 parks. Industries include research, healthcare, publishing, automotive and software. Largest employers include The University of Michigan, GM, Chrysler, Ford, University Microfilms, Inc., Border's, Gelman Sciences, Parke Davis, and Edwards Bros.
COUNTY: Washtenaw

RESIDENTIAL WASTE REDUCTION

	Tons (FY96[1])
Recycled[2]	14,182
Newspapers	6,595
Corrugated Cardboard	1,797
Glass	1,416
High-Grade Paper	783
Tin/Steel Cans	278
Appliances	451
Scrap Metal	190
Mixed Plastics	151
HDPE	149
Magazines	85
Boxboard	35
Textiles	29
PET	25
Other Paper	13
Aluminum Cans	12
Household Batteries	6
Oil Filters	1
Automobile Batteries	<1
Deposit Containers[3]	2,339
MRF Rejects[4]	-173
Composted/Chipped[5]	10,922
Leaves	6,016
Curbside Yard Debris	4,011
Other Yard Debris	895
Total Waste Reduction	25,104
MSW Disposed[5,6]	22,839
Trash	22,666
MRF Rejects	173
Total Generation	47,943
Percent Reduced	52.4%
Lbs. Waste/HH Served/Day	5.71

Note: Numbers may not total due to rounding. Figures represent all residential waste. Building materials are excluded. ILSR reduced amount of materials collected through drop-off by 50% to account for non-Ann Arbor residents using sites. Ann Arbor reported the drop-off tonnage includes a negligible amount from the commercial sector.

[1]Fiscal year extends July 1, 1995 to June 30, 1996.

[2]Tonnage for each category of material processed at the MRF is based on incoming weights of commingled materials and outgoing weight ratio of material at MRF facility.

[3]ILSR calculated bottle bill tonnage using 66.8 pounds per capita of bottle bill recovery in Michigan (figure supplied by the Container Recycling Institute), of which 60% was counted in the residential sector.

[4]Based on reported MRF reject rate of 1.5%.

[5]City estimated tonnage composted and disposed using a density of four cubic yards per ton until September 1995. Actual tonnage used thereafter.

[6]Disposal includes estimated tonnage for multi-family dwellings based on city staff estimate of 40% of trash collected in front-loading trucks is collected from multi-family dwellings.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

Michigan's bottle bill was instituted in 1976. The bill's main provision was a 10¢ return deposit on soft drink and beer containers. This program diverts glass, aluminum, and PET from disposal.

A 1988 "Clean Michigan" bond funded waste reduction efforts throughout the state. Ann Arbor used its $900,000 portion to purchase recycling bins and vehicles, develop a compost site, and create educational displays.

The state banned landfill disposal of yard debris in 1993. Phase-in of the ban was complete in 1995.

Michigan counties are responsible for creating five-year waste management plans, coordinating area-wide SWM program development, and setting minimum recycling collection guidelines.

The Ann Arbor Solid Waste Commission has set yearly material recovery goals. The goal for FY96 was 44%; for FY2000, it is 60%. City rules and regulations, first enacted in 1990 and since revised, require residential recyclables and compostables be source-separated from trash.

Source Reduction & Reuse Initiatives

The city runs a quarter-acre composting demonstration site, the Home Compost Education Center, located near city center at the Leslie Science Center Park. This site features more than a dozen working compost bins of various designs. According to city studies, 40% of homes in Ann Arbor do some sort of home composting.

Recycle Ann Arbor runs a Re-Use Center, which accepts and resells used building materials.

Recycling Program

In FY96, Ann Arbor diverted 30% of its waste through recycling and bottle bill recovery. Recycle Ann Arbor has provided residential curbside collection citywide since 1985. In 1996, the city and Recycle Ann Arbor signed a new two-year contract. Residents receive two bins for recycling collection and sort designated recyclables into three main categories. They can also drop off their recyclables.

In addition to its residential services, the city offers trash and recycling service to businesses. The city's "RecyclePlus" program collects green-bagged recyclables, cardboard, and trash from businesses receiving its services.

Materials collected for recycling are delivered to the city-owned MRF, which opened August 1995. Resource Recovery Systems, Inc. designed, constructed, and operates the MRF. Twelve new materials were added to Ann Arbor's recycling program as a result of the facility coming on-line.

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: Recycle Ann Arbor (non-profit organization)

Start-up Date: Limited program began in mid-1970s; 1985 monthly curbside; citywide weekly implementation 1991

Mandatory: Yes, for all materials

Households Served: All city households served

Materials Accepted: Milk and juice boxes, steel and aluminum cans, aluminum scrap, scrap metal, glass jars and bottles, glass dishes and heat-resistant glass, ceramics, #1-3 plastic bottles, aerosols, paperback and phone books, paperboard, textiles (including clothing, linens, paired shoes; excluding nylons, non-shoe leather, dirty rags), OMG, ONP, RMP (including office and shredded paper, file folders, envelopes, mail, greeting cards, paper bags), OCC, household batteries, motor oil, oil filters, and white goods

Collection Frequency: Weekly

Set-out Method: Single-family homes: mixed paper and fibers in tan 11-gallon bin; boxboard in kraft bag or another boxboard container; textiles in sealed plastic bag; and mixed glass, metals, ceramics, and containers in green 11-gallon bin. Batteries and drained oil filters in separate plastic bags next to bins. Motor oil in milk jugs next to recycling bins. Multi-family residences: Same sort in two 105-gallon wheeled carts located next to dumpsters.

Collection Method: Semi-automated cart collection at apartments, two-compartmented trucks for single-family dwellings (most not packers, newest truck is); one-person crews. Paper and textiles go in one hopper; other commingled recyclables go in another. Batteries are put in the cab; jugs of motor oil go on racks under trucks.

Participation Rate: 93% of private homes recycle at least once a month (October 1995 survey by Recycle Ann Arbor)

Participation Incentives: Convenience, mandatory

Enforcement: Sticker and leave contaminated materials, can refuse to collect trash containing recyclables, city code provides for fines up to $500 for failure to comply with ordinance and associated rules but to date no fines have been issued

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: 1990

Service Provider: City of Ann Arbor Department of Solid Waste

Households Served: Single family dwellings

Mandatory: Yes

Materials Collected: Leaves, grass clippings, brush, holiday trees, other garden trimmings

Collection Frequency: Canned, bagged, or bundled materials: Weekly, seasonally, April 1 through November 30; loose leaves collected from street during November and December, with each street getting two passes; holiday trees for two weeks in January

Set-out Method: In cans marked with "Compostable" sticker or in paper yard debris bags; brush can be bundled; loose fall leaves are swept into the street; holiday trees left at curb along residential recycling routes and at centralized points at multi-family locations.

Collection Method: One-person crews collect materials using side-loader trash trucks. Front-end loaders dump loose leaves into dump or packer trucks.

Participation Rate: NA

Participation Incentives: Convenience, mandatory

Enforcement: City code provides for fines up to $500 for failure to comply, to date no fines have been issued

DROP-OFF COLLECTION

Number of sites: One: Drop-off Station adjacent to the Resource Recovery Center (prior to December 1996, two drop-offs operated; one at the Resource Recovery Center run by the City of Ann Arbor, and one at another location run by Recycle Ann Arbor)

Staffing: Yes

Service Provider: Recycle Ann Arbor

Materials Accepted: All materials collected in curbside programs, hardcover books, polystyrene, packing peanuts, yard debris, foam egg cartons, car batteries. Materials accepted for a fee include: clean wood ($12/cubic yard), freon-containing appliances ($25 each), tires ($3 or $8 each), automotive fluids (excluding motor oil, $1/gallon), building materials and bulky items ($16/cubic yard)

Participation Incentives: Mandatory for materials collected at curbside. Residents can drop off (non-freon) appliances free of charge. Saturday & Saturday hours. Inexpensive compost sales.

Sectors Served: Residential (some businesses occasionally use the drop-sites; the amounts they bring are negligible)

EQUIPMENT COSTS

Item	Cost	Use	Year Incurred
1 Front-Load Trash Truck[1,2]	$135,798	Trash Collection	1995
MRF[3]	$5,200,000	Recycling	1994-95
1 Front-Load Trash Truck[1]	$126,035	Trash Collection	1993
2 Side Loading Trash Trucks[1,4]	$189,798	Trash/Yard Debris Collection	1992
1 Trommel Screen[3]	$157,550	Composting	1992
1 Front-Load Trash Truck[1]	$115,330	Trash Collection	1991
1 Front-Load Trash Truck[1]	$121,611	Trash Collection	1991
8 Lo-Dal Recycling Trucks[5]	$696,370	Recycling	1991
1 Scarab Windrow Turner[3]	$126,792	Composting	1991
5 Side Loading Trash Trucks[1]	$474,495	Trash/Yard Debris Collection	1991
1 Tub Grinder[3]	$193,091	Composting	1991
3 Side Loading Trash Trucks[1]	$274,644	Trash/Yard Debris Collection	1990
2 Side Loading Trash Trucks[1]	$177,460	Trash/Yard Debris Collection	1989
1 Front-Load Trash Truck[1]	$101,911	Trash Collection	1988
GMC Delivery Truck[1]	$18,660	Recycling	1988
Ford Stake Body Truck[1]	$38,592	Bulky Waste/Appliances	1987
1 John Deere Loader[1]	$80,000	Composting	1987
1 Side Loading Trash Truck[1]	$81,900	Trash/Yard Debris Collection	1987
2 Side Loading Trash Trucks[1]	$157,192	Trash/Yard Debris Collection	1986

[1]Purchased outright using money from General Fund.
[2]All front-load trucks have a Mack truck body with a 34-cubic-yard Lo-Dal packer.
[3]Purchased/built using Environmental Bond funds.
[4]All side-loading trash trucks have 17 cubic yards of capacity.
[5]Recycling trucks purchased by city using state grant funds. Trucks leased to Recycle Ann Arbor.

Source: Institute for Local Self-Reliance, 1999.

Steel is magnetically sorted; all other materials are manually sorted. The reject rate at the MRF is 1.5% by weight. The city receives 35% of sales revenue above a trigger price of $40 per ton.

Composting Program

In FY96, Ann Arbor diverted 23% of residential waste through composting. Residents are required to separate yard trimmings from trash. April through November, city crews weekly collect yard trimmings. In the fall, the city collects loose leaves raked to the street. Residents also can take yard debris to a drop-off site adjacent to the Resource Recovery Center.

Yard debris is composted on the Resource Recovery Center site. Here, material is ground with a tub grinder and composted in mechanically turned windrows. Finished compost is screened and sold to individuals and businesses. In the last few years, all compost and mulch has been sold.

Education, Publicity, and Outreach

One full-time employee coordinates publicity and outreach for all the city's waste programs.

City publications include the twice yearly "WasteWatcher" (sent to every household), a quarterly newsletter (sent to multi-family building managers), and numerous fact sheets and pamphlets. New residents receive "move-in" packets explaining trash, recycling, and composting programs. Information is also spread through cable television, at information kiosks, on the city's Internet site, at city-sponsored community events, through Washtenaw County's "EarthBeat" radio program, in a weekly "Recyclers' Guide" column in the local newspaper, and through phone hotlines.

Ann Arbor's new MRF includes an education center, which has a viewing area of the processing area and interactive displays. Seasonal tour guides and volunteers staff the education center.

The city contracts with the local nonprofit Ecology Center to do education programs in schools; they give more than 100 presentations each year.

Costs

In FY96, the city spent $3.7 million for trash, recycling, and yard debris services — about $81 per

household served. Of this, about 52% was spent on trash collection and disposal, 33% on recycling, and 15% on yard debris collection and recovery. Materials revenues reduced this by $148,000 to $3.6 million (or $78 per household served).

On a per-ton basis, overall waste reduction was $77 ($71 with revenues). Recycling costs $102 per ton ($93 with materials revenues), and yard debris recovery, $50 ($47 with materials revenues). In contrast, trash collection and disposal cost $86 per ton.

When the cost of inflation is taken into account, average annual per household costs for trash management rose from $73 in FY89 to $78 in FY96.

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$1,226,613	12,044	$101.85	$26.67
Curbside Collection[1]	$845,619	11,091	$76.24	
Drop-off Collection[2]	$24,411	592	$41.26	
Curbside Appliance Collection	$10,163	361	$28.15	
Processing[3]	$173,708	12,044	$14.42	
Administration[4]	$129,252	12,044	$10.73	
Education/Publicity[5]	$43,460	12,044	$3.61	
Composting Gross Costs	$551,395	10,922	$50.48	$11.99
Curbside Collection[6]	$287,697	10,152	$28.34	
Drop-off Collection	$28,644	770	$37.20	
Processing	$157,415	7,029	$22.40	
Administration[4]	$58,102	10,922	$5.32	
Education/Publicity[5]	$19,536	10,922	$1.79	
Waste Reduction Gross Costs	$1,778,007	22,966	$77.42	$38.65
Materials Revenues	($147,714)	22,966	($6.43)	($3.21)
Recyclables	($109,261)	12,044	($9.07)	
Compost	($38,453)	10,922	($3.52)	
Net Waste Reduction Costs	$1,630,293	22,966	$70.99	$35.44

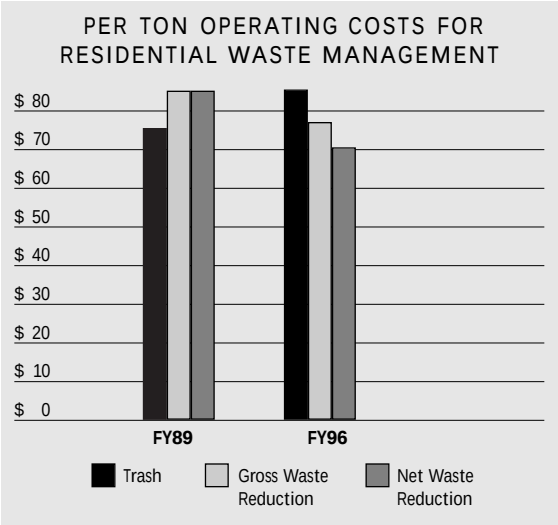
Note: Figures may not total due to rounding. Recycling tonnage figure above is different than figure in table, page 48, as figure above includes MRF rejects and 28 tons of motor oil, and excludes deposit containers.
[1]The cost figure reflects the city's payment to Recycle Ann Arbor and includes the overhead and administration costs of that organization. Ann Arbor's contract with Recycle Ann Arbor is based on a per household charge for SFDs, a per cart charge for MFDs, and a flat fee for servicing the drop-off center.
[2]Costs for scrap metal and appliances collected at drop-off site were assumed to be constant from FY95.
[3]Represents tip fees paid to Resource Recovery Systems for processing of city's recyclables. Capital costs for facility were paid out of Environmental Bond and paid back out of the city's general fund. The city receives lease payments from Resource Recovery Systems which offset this debt.
[4]Administration costs tracked for the Solid Waste Department. These costs have been pro-rated based on percentage of budget spent on each function.
[5]Solid Waste Department education/publicity costs have been pro-rated based on percentage of budget spent on recycling, composting, trash.
[6]Collection costs include labor costs including fringe benefits and vehicle costs including depreciation.

TOTAL SOLID WASTE COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Trash Gross Costs	$1,939,780	22,666	$85.58	$42.17
Collection[1]	$1,047,811	22,666	$46.23	
Disposal	$618,841	22,666	$27.30	
Administration[2]	$204,401	22,666	$9.02	
Education/Publicity[3]	$69,727	22,666	$3.03	
Waste Reduction Gross Costs	$1,778,007	22,966	$77.42	$38.65
SWM Gross Costs	$3,717,787	45,631	$81.47	$80.82
Materials Revenues	($147,714)	22,966	($6.43)	($3.21)
Total SWM Net Costs	$3,570,073	45,631	$78.24	$77.61

Note: Figures may not total due to rounding. Overhead/administrative costs above the Division level are not included.
[1]Collection performed by single person crews. Side-loading trucks used for SFD collection, front-loaders for MFD collection. Commercial waste collection performed on same routes as MFD collection. Ann Arbor assumes 40% of the front-loader collection is residential and costs have been pro-rated. Trash disposed at BFI landfill in Salem, MI, 20 miles from downtown Ann Arbor and 25 miles from the MRF. Collection costs include labor costs including fringe benefits and vehicle costs including depreciation.
[2]Administration costs tracked for the Solid Waste Division. These costs have been pro-rated based on percentage of budget spent on each function.
[3]Education/Publicity costs tracked for entire Solid Waste Division. These costs have been pro-rated based on percentage of budget spent on each function.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

During the same period, per ton trash tip fees rose more than 70%. Improved collection efficiencies, reduced total disposal costs, and yard debris diversion are primarily responsible for keeping the increase at a minimum.

The Solid Waste Department employs 18 full-time equivalent collectors and support workers and an additional three full-time equivalent seasonal workers for yard debris recovery. Hourly wages average $12 to $15 per hour for composting and trash services.

Funding & Accounting Systems

Principle funding for program operating costs comes from the city's general fund. This funding is supplemented by grants, user fees, and material revenues. Washtenaw County receives host community funds from the BFI landfill located within its boundaries. These funds are distributed to local communities based on population and meeting basic recycling program criteria. In FY95 Ann Arbor received $117,592 from these funds, which it used to finance solid waste services. The Solid Waste Department charges disposal fees for appliances and building materials, compostable material delivered to the city compost site by non-residents, and for special trash collections. Sale of recyclables and compost also generates revenue.

In 1990 Ann Arbor voters approved a $28 million environmental bond. The bond funded development and implementation of an Integrated SWM Strategy (construction of the MRF, recycling collection expansion to all residents, and initial closure and remediation of the city's landfill). The city's general fund is repaying the bond issue at 6% interest over 17 years.

Future Plans and Obstacles to Increasing Diversion

Obstacles to increasing the city's diversion level are the high turnover rate for residents and the need to educate residents about new materials added to the collection program.[1] The high turnover rate, especially among University of Michigan students, results in the need for constant education.

Ann Arbor is studying the feasibility of composting food discards with a view toward adding residential food recovery if the project is successful. The city is composting food discards from University of Michigan dining facilities at its compost facility. A county grant is funding this project.

Other plans include expanding commercial recycling, adding new materials to the recycling program including injection molded HDPE, fluorescent tubes, and carpeting, and targeting outreach to multi-family dwellings in order to increase participation in waste reduction programs.

Tips for Replication

Keep the program easy and user-friendly.

Include public input.

Look for ways to cooperate with other entities.

Use conservative projections for tonnages and market prices.

Notes:

[1]In 1995 twelve additional materials were added to the list of those collected. Ann Arbor's recycling coordinator believes many residents are still not recycling some or all of those items.

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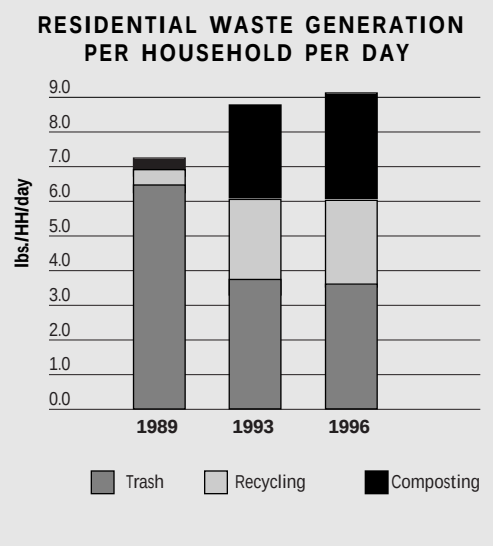
BELLEVUE, WASHINGTON

Residential Waste Reduction **60%**

Bellevue began its first recycling program in 1989. Strong citizen participation and program expansions resulted in a 60% residential waste reduction level in 1996; 26% diversion through recycling and 34% through composting. Bellevue contracts with a local company to provide residential waste services. Homes with up to 10 units have weekly curbside trash and recycling collection and, for most of the year, twice monthly yard debris collection. Residents can also drop off their materials at county transfer stations, which accept trash and yard debris on a fee basis and recyclables for free.[1]



Source: Institute for Local Self-Reliance, 1999.

Key drivers of Bellevue's waste reduction program include a pay-as-you-throw (PAYT) fee structure for trash, a convenient recycling program offering recycling on the same day as trash for most participants, and free provision of recycling bins to all participants, collection of 25 materials for recovery (including mixed paper), and composting. Since Bellevue instituted incentive-based trash rates in 1990, residents have downsized their average level of service. In 1989, 13% of residents subscribed to trash service with weekly collection of one 30-gallon can and 53% subscribed to the three-can level. By the end of 1996, 62% of trash customers subscribed to one-30-gallon can or mini-can (19 gallons) service and 12% to three-can or greater service. During the same period, per household trash disposal decreased from 6.52 to 3.69 pounds per day. At least 90% of households served in the program receive same-day collection of trash, recyclables, and yard debris. The city's contractor provides recycling bins to all participating households and weekly collects 20 materials at curbside for recycling and composting; residents can recycle nine additional materials through twice yearly drop-off collection programs. Bellevue's composting program diverts one-third of the city's waste stream.

The cost-effectiveness of Bellevue's waste management system is enhanced by the low cost of waste reduction, especially composting, in comparison to disposal. In 1996, disposal cost $174 per ton; recycling, $139 per ton; and composting, $102 per ton. Per ton disposal tip fees rose from $57 to $66 from 1989 to 1996; increased diversion has helped contain costs. Bellevue's waste management system handled much more material in 1996 than in 1989, both on a gross tonnage basis and per household served. Most of the additional material handled is yard debris.[2] The relative low cost of composting has helped cushion Bellevue from potentially vast increases in waste management costs.

PROGRAM SUMMARY

	1989	1996
Tons Per Year	23,396	39,186
Disposal	20,900	15,719
Diversion	2,496	23,467
Percent Diverted	11%	60%
Recycled	6%	26%
Composted	5%	34%
Average lbs./HH/day	7.30	9.18
Disposal	6.52	3.69
Diversion	0.78	5.50
Annual Disposal Fees		
Disposal	$1,191,847	$1,033,362
Net Program Costs/HH	NA	$235.64
Disposal Services	NA	$116.68
Diversion Services	NA	$118.97

Notes: 17,556 households served in 1989; 23,372 in 1996. 1989 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding. 1989 program costs not available as residents paid contractors directly and rates paid are not public information.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 103,700 (1996)
HOUSEHOLDS: 44,387 (1996); 26,026 single-family households (1-10 units), 18,361 multi-family units
BUSINESSES: 16,900 total (1996), over 10,000 in-home businesses
LAND AREA: 30.6 sq. miles
HOUSEHOLD DENSITY: 1,451 households/sq. mi.
AVERAGE PER CAPITA INCOME: $23,816 (1989)
MEDIAN HOUSEHOLD INCOME: $43,800 (1989), $47,489 (1996)
COMMUNITY CHARACTER: Wealthy suburban community on east side of Lake Washington. Principle employers are Microsoft, Boeing, Nordstrom, PACCAR, Puget Sound Energy, and Safeway. Some manufacturing, mostly office-based businesses.
COUNTY: King

RESIDENTIAL WASTE REDUCTION

	Tons (1996)
Recycled	10,107
Mixed Paper	4,241
Newspaper	3,612
Glass	1,513
Tin	276
Collection Day Drop-off	158
Aluminum	149
HDPE	88
PET	87
Other Plastics	25
White Goods	12
Scrap Metal	8
MRF Rejects[1]	-62
Composted/Chipped	13,360
Curbside Collection[2]	13,360
Total Waste Reduction	23,467
MSW Disposed	15,719
Landfilled	15,657
MRF Rejects[1]	62
Total Generation	39,186
Percent Reduced	59.9%
Lbs. Waste/HH Served/Day	9.19

Note: Figures include waste from 23,372 single-family households in city programs and exclude 10-15% of single-family households that do not participate in municipal trash, recycling, and composting programs. Also excluded are materials delivered to private and county facilities. All weights are scale weights.

[1]As reported by Fibres International, 0.62% by weight is the monthly average of Bellevue recyclables processed at MRF rejected as nonrecyclable.

[2]18,845 households subscribed to the yard debris collection program.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

In 1989, the Washington State Legislature passed the "Waste Not Washington Act." The Act set a waste management hierarchy for the state with the priorities being: (1) waste reduction; (2) recycling with source-separation of materials preferred; (3) energy recovery, incineration, or landfilling of separated waste; and (4) energy recovery, incineration, or landfilling of mixed waste. The Act also set a state recycling goal of 50% by 1995. This goal was not met but the state has shown consistent progress toward 50% waste reduction; the state calculated recycling rate was 39% in 1995, up from 30% in 1989.

The Act required county governments to prepare solid waste management plans that incorporated waste reduction and recycling. The state provided local governments over $25 million in grant funds to revise their waste management plans and to implement waste reduction and recycling programs. The Clean Washington Center was formed later in 1991 to focus on markets for recyclable materials.

King County adopted its own waste reduction goals of 35% by 1992, 50% by 1995, and 65% by 2000. Bellevue actively participated in the development of, and has adopted the 1992 King County Comprehensive Solid Waste Management Plan. In keeping with the Plan, Bellevue has entered into an agreement to deliver trash to King County facilities and requires its contractor to do so.

Bellevue adopted a PAYT trash rate structure in 1977. The system was revised in 1990 to incorporate incentives for decreased disposal (see table, page 56). The city contracts with Eastside Disposal to offer waste management services to residents. Eastside Disposal must charge all Bellevue customers the rates set out in its contract.

The city has no mandatory recycling requirement for residents. By contract, Eastside can not dispose of collected yard debris or recyclables, must recycle white goods, and recyclables must be marketed.

Source Reduction & Reuse Initiatives

Bellevue encourages source reduction through home composting. In 1996, Bellevue held a home composting bin sale where the city sold 750 bins with a $60 value for $10. In 1997 it sold an additional 1200 for $15. The city also holds educational and composting workshops. As a further incentive to compost, since around 1990, customers not using the yard debris collection service (excluding those subscribing to mini-can trash service) receive a $1.68 monthly credit on their trash bills. In 1996, more than 4,500 took advantage of this credit program.

Bellevue, in partnership with the Alliance of American Veterans, accepts reusable household items at its special collection day events. The Alliance accepts any usable household item including books, clothing, furniture, functioning appliances, and toys. Collected items are offered for sale at the Alliance's store.

Recycling Program

In 1996 Bellevue recycled 26% of single-family household waste. Paper products accounted for more than 75% of the material recycled. Per its contract with the city, Eastside Disposal must supply each participating household with a set of three

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: Eastside Disposal

Start-up Date: September 1989. Polycoated paper and HDPE were added in May 1992.

Mandatory: No

Households Served: 23,372 (1996). Residences with 10 or fewer units are eligible to participate.

Materials Accepted: Tin cans, aluminum cans and foil, glass containers, PET bottles, HDPE bottles, polycoated paper including milk cartons and drink boxes, non-ferrous scrap, mixed paper (mail, magazines, phone books, paperboard, kraft bags), OCC, ONP, white goods

Collection Frequency: Weekly for most materials, white goods by appointment. Contract requires at least 90% of served households receive collection of trash, yard debris, and recycling on same day and no customers may have more than two weekly collection days.

Set-out Method: Bin for glass, plastics, metals, polycoated paper, another for mixed paper, third for newspaper. Bins stackable, container bin should be on top. Cardboard can be flattened, bundled, and set next to bins. White goods must have doors removed and be placed within five feet of the curb.

Collection Method: Contract requires all three recycling bins be collected simultaneously. Eastside collects materials in semi-automated three-compartment trucks with single-person crews. Eastside uses Crane Carrier chassis fitted with Heil Recycler full-trough 40-cubic-yard bodies. One- or two-person crews collect white goods (equipment varies).

Participation Rate: 90% of eligible households signed up for service

Participation Incentives: Lower disposal fees through increased diversion

Enforcement: Improperly prepared materials can be tagged and left at curb by Eastside.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: September 1989

Service Provider: Eastside Disposal

Households Served: 18,845 (1996). Service offered to residents in buildings with four or fewer units.

Mandatory: No

Materials Collected: Grass clippings, brush, leaves, and other yard debris, garden debris including uncooked vegetables and fruits, holiday trees

Collection Frequency: Twice monthly except Dec-Feb. when collection is once monthly. Contract requires at least 90% of served households receive collection of trash, yard debris, and recycling on same day and no customers may have more than two weekly collection days. Bulky items collected on an on-call basis.

Set-out Method: Toters or 32-gallon trash cans marked “yard debris” or biodegradable containers such as kraft paper bags or cardboard boxes. During Dec-Feb may have up to 20 30-gallon units of debris for each collection; 10-unit max rest of year. Branches bundled. Bare holiday trees cut to less than four feet, bundled.

Collection Method: Single-person crews collect material in semi-automated 20-cubic-yard Crane Carrier rear-load compactors. Two-person crews collect bulky materials using a rear-load compactor truck.

Participation Rate: NA

Participation Incentives: Lower disposal fees through increased diversion

Enforcement: Improperly prepared materials can be tagged and left at curb by Eastside.

DROP-OFF COLLECTION

Number of sites: Factoria Transfer Station, 4 PM - 1 AM Monday-Friday. Two city-sponsored special drop-off collection days for recycling yearly. Fibres International operates a private drop-off facility at its MRF.

Staffing: Bellevue special collection days: Yes

Service Provider: King County Solid Waste Division for Factoria site, City of Bellevue and Eastside Disposal for special collection days, Fibres International operates its own drop-off facility

Materials Accepted: Yard debris, all recyclables accepted in curbside program, oil filters, household and lead-acid batteries, tires, household goods (textiles, working small appliances, usable furniture), scrap metal, #6 plastic food containers, scrap lumber, antifreeze, fluorescent lamps and ballasts, ceramic bathroom fixtures

Participation Incentives: Free recycling of materials that are often difficult to recycle. Lower disposal fees through increased diversion

Sectors Served: Special collection: open to all residents of King County. Transfer Station and Fibres International drop-off sites accept materials from any source.

Automated yard debris collection in Bellevue

stackable recycling bins and replace them if lost or damaged other than through customer negligence. Eastside sells collected materials to Fibres International for processing and marketing. Both companies share the risks and benefits of market price swings.[3] (Bellevue adjusts rates paid to haulers every three years to compensate for market fluctuations, sharing risk with its contractors in this manner.) Fibres International processes the incoming material, at its Bellevue facility, in three streams. Newspaper is typically baled after little or no processing. Laborers manually remove cardboard from the mixed paper stream and both commodities are baled. The third stream of commingled materials receives the most processing. Ferrous materials are removed by magnetic separation. Eddy currents and air classifiers remove plastics and aluminum. Laborers sort remaining materials manually.

Bellevue holds two special recycling collection days each year, in April and October. This drop-off program collects hard to recycle items including textiles, porcelain plumbing fixtures, scrap lumber, fluorescent and incandescent bulbs, oil filters, lead-acid and household batteries, tires, household goods, scrap metal, and plastics in addition to materials collected at curbside. Residents must pay fees for the recycling of some items at these events. A variety of vendors recycle the materials from these special collection days.

Eastside Disposal picks up white goods at curbside by appointment usually for a $25 fee.[4]

Composting Program

In 1996, Bellevue diverted 34% of its residential waste through composting. Eastside Disposal provides residents twice monthly curbside collection of yard and garden debris from March to November and once monthly collection December to February. Upon request, residents receive, at no charge, one 90-gallon yard debris toter. Additional toters are subject to a $1.68 per month rental fee. Residents may set out up to 10 units (one unit = 30-32 gallons) of yard debris each collection day. Eastside Disposal provides bulky yard trimmings collection on an on-call basis.[5]

Eastside Disposal collects and delivers materials to the Cedar Grove composting facility in Maple Valley, Washington (15 miles from Bellevue). Cedar Grove also composts produce trimmings, chipped wooden pallets, and waxed cardboard with the yard debris. At Cedar Grove, incoming material is shredded and piled on concrete pads and composted in static aerated piles. Finished compost is sold through local retail outlets in the Puget Sound area.

Bellevue residents can also deliver yard debris to King County transfer stations, for a fee (passenger cars, $10.75 minimum, $68 per ton).

Education, Publicity, and Outreach

The centerpiece of Bellevue's outreach effort is the Neighbors for Recycling (NFR) Program. Bellevue trains the Program's volunteer participants to do educational outreach in the community. Volunteer activities include staffing information booths at community events, shopping malls and individual stores; making presentations on recycling at apartment complexes; developing and distributing information sheets and posters; helping city staff at Special Recycling Collection Days; and giving school presentations on waste management issues.

City staff produce printed materials, staff booths at fairs and trade shows, and make presentations to

RESIDENTIAL SERVICE LEVELS AND FEES

Level	Monthly Fee[1]	# Customers[2]
Mini-Can (19-Gallon)	$7.13	2,943
One 30-Gallon Can	$12.91	6,406
Two 30-Gallon Cans	$18.10	1,270
Three 30-Gallon Cans	$22.76	49
Four 30-Gallon Cans	$28.85	10
32-Gallon Toter	$13.45	5,214
60-Gallon Toter	$20.38	4,795
90-Gallon Toter	$26.10	2,772
Yard Debris Only	$4.97	55
Recycling Only	$3.17	72

Notes: For all service levels except mini-can, a $1.68/month credit is available to customers who don't generate yard debris. Extra cans of trash cost $3.13 per pick-up. Hauler provides one 90-gallon yard debris toter per customer upon request; additional toters are available for a $1.68 monthly rental fee.

[1]Fee schedule effective 4/97. Reflects price increase over 1996 rates due to Consumer Price Index adjustment and increase in King County tip fee. Trash service level fees include weekly trash and recyclables collection, once or twice monthly yard debris collection, litter control services, and 4.5% utility tax.

[2]Enrollment as of December 1996.

service and trade organizations. City brochures include "The Ins and Outs of Recycling," "Composting at Home Made Easy," and "Where to Recycle White Elephants." City staff publish and distribute two newsletters and make recycling posters available in Spanish, Russian, Vietnamese, Chinese, Cambodian, Korean, and Japanese.

Bellevue's Web site features information on solid waste programs.

Eastside Disposal provides a public speaking program for schools and other gatherings upon request, a staffed phone line for a minimum of nine hours on weekdays, plant tours and route visits, a yard debris collection calendar in brochure form, and covers the costs of printing and distributing every three years a packet of city developed materials describing available services. The company has started a project to produce a video on waste reduction, recycling, and composting for libraries, home viewing, and TV cablecast.

Costs

The City of Bellevue handles very little of the funds for municipal waste management. Rather, under contract, Eastside Disposal collects service fees directly from customers. The rates charged for each

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$1,414,789	10,169	$139.13	$60.53
Curbside Collection and Processing[1]		9,999	$125.74	
Drop-off Collection[2]		158	$316.46	
White Goods Collection[3]		12	$333.33	
Administration[4]		10,169	$3.37	
Education/Publicity[5]		10,169	$7.20	
Composting Gross Costs	$1,365,745	13,360	$102.23	$58.44
Curbside Collection and Processing[1]		13,348	$101.86	
Bulky Yard Debris Collection[1]		12	$125.00	
Administration[4]		13,360	$0.35	
Waste Reduction Gross Costs	$2,780,535	23,529	$118.17	$118.97
Materials Revenues	($0.00)	23,529	($0.00)	($0.00)
Net Waste Reduction Costs	$2,780,535	23,529	$118.17	$118.97

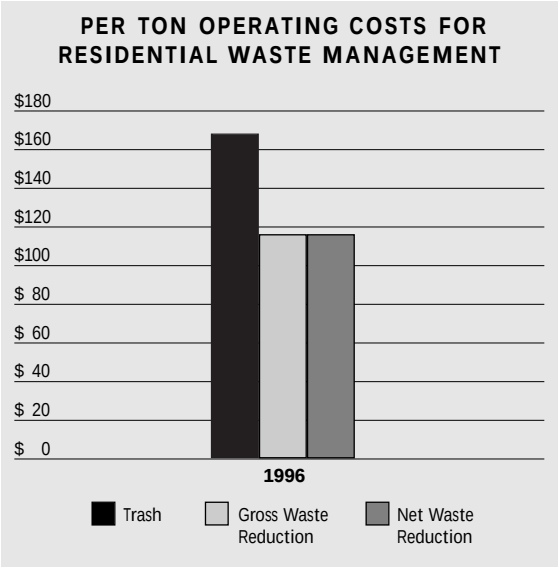
Note: Figures may not total due to rounding. Tonnages above do not match those on page 54 as MRF rejects are included above. Bellevue's contract with Eastside Disposal for recycling and yard debris services is effective April 1, 1994 to March 31, 2004.
[1]Contractor reported costs of program.
[2]Contract stipulates Eastside Disposal service special collection day at no charge to city. Costs represent contractor reported costs of providing program.
[3]White goods collected on an on-call basis. Costs represent $25 fee charged to customers for 160 collection visits.
[4]Represents Utilities Department expenditures for administration staff salary, benefits, and overhead.
[5]Represents Utilities Department expenditures for education staff salary, benefits, overhead, and production of educational materials.

TOTAL SOLID WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs[1]	$2,726,947	15,657	$174.17	$116.68
Trash Collection[2]		15,657	$107.57	
Tip Fees		15,657	$66.00	
Administration[3]		15,657	$0.59	
Waste Reduction Gross Costs	$2,780,535	23,529	$118.17	$118.97
SWM Gross Costs	$5,507,481	39,186	$130.55	$235.64
Materials Revenues	($0.00)	23,529	($0.00)	($0.00)
Total SWM Net Costs	$5,507,481	39,186	$130.55	$235.64

Note: Numbers may not total due to rounding. Disposal tonnage above does not match that on page 54 as MRF rejects are excluded above.
[1]Costs represent contractor's cost of providing service and city administration costs.
[2]Eastside Disposal collects trash weekly. Bellevue's contract with Eastside Disposal for trash services is effective April 1, 1994 to March 31, 2004. Eastside Disposal reported total costs of trash collection and disposal. ILSR calculated collection costs by subtracting tip fee at King County transfer station (located in Bellevue) for 15,657 tons of material disposed.
[3]Represents Utilities Department expenditures for administration staff salary, benefits, and overhead. Trash education and publicity not separable from administrative costs and are included in these figures.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

service level are set by contract and shown in the table on page 56. Of total expenditures, about 50% was spent on trash collection and disposal, 26% was spent on recycling, and 25% was spent on yard debris collection and recovery.

On a per-ton basis, trash cost $174, recycling $139, and yard debris recovery, $102.

Funding & Accounting Systems

Bellevue residents pay Eastside Disposal directly for their waste management services. Eastside Disposal makes a monthly payment ($26,394 in 1996) to the city to cover the city's administrative costs.[6] These funds are held in an enterprise fund and tracked using cash flow accounting.

Bellevue also receives grant funds from the state and county to fund its programs. These funds are maintained in separate accounts and tracked using accrual accounting.

Future Plans and Obstacles to Increasing Diversion

Bellevue's Solid Waste Administrator believes increasing diversion in the single-family residential sector would be difficult. The program already collects most discard streams that have a high enough price or make up a large enough component of the waste stream for collection to be cost-effective. Bellevue has shifted planning and education attention from the single-family sector, which had a 1996 MSW recovery rate of 60%, to the multi-family and commercial sectors, where MSW recovery in 1996 was 25%.

Tips for Replication

Collect mixed paper.

Commit to and concentrate on high-quality customer service. Bellevue Utilities Department has service representatives answering its phones. Customers appreciate the personal service and rate the city's service very highly.

Spend the extra money to make promotional materials attractive.

Continuously remind and educate the population about waste reduction.

Raising overall environmental awareness will boost enthusiasm for waste reduction programs. Bellevue's population, and people in the Pacific Northwest, in general, have a strong environmental ethic that has contributed significantly to the high diversion level.

Implement a PAYT rate structure for trash.

Notes:

[1]Approximately 10% of eligible household do not subscribe to services offered by Eastside Disposal, the municipal contractor. These residents most likely use county drop-off sites. Figures for trash, recycling, and yard debris recovery by Bellevue residents at these facilities are not separable from figures for waste delivered by other county residents and therefore are not included. Effective April 1, 1997, fees at county transfer stations for material delivered in passenger cars were trash, $13 per trip; and yard debris, $10.75 per trip. The county charges for materials delivered in other vehicles according to weight at the rates of $79.63/ton for trash and $68/ton for yard debris.

[2]The apparent increase in per household waste generation can be accounted for in two ways. First, until 1989, it was legal to burn yard debris in Bellevue. Material burned never entered the MSW stream. Second, in 1993, Bellevue annexed land with 6,000 homes. These homes have much larger than average lots and contributed to a per household increase in yard debris generation.

[3]The details of this agreement are proprietary information.

[4]The hauler sometimes charges more than $25 if the pick-up is distant from the hauler.

[5]Bulky yard debris includes piles of brush exceeding the prescribed size limit; any bag, bundle, can, or item over 60 pounds; tree parts over four inches in diameter; or any item that will not fit in the toters.

[6]The monthly payment was initially set at $25,000 per month in 1994 and has been increased by 100% of the CPI each year since.

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BERGEN COUNTY, NEW JERSEY

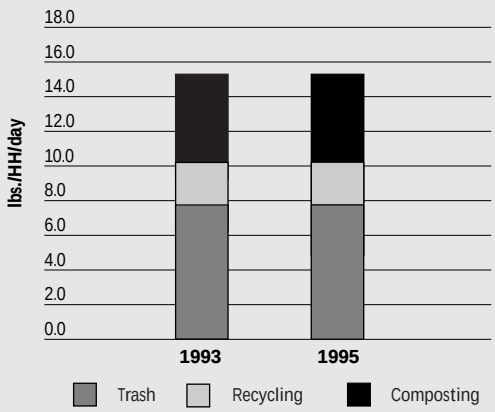
Municipal Solid Waste Reduction

54%

In 1995, Bergen County diverted 54% of its municipal solid waste, 21% through composting and 33% through recycling.

Bergen County consists of 70 municipalities. Each community must provide its own trash, recycling, and yard trimmings collection services. The county's principal waste management functions include providing funding, technical assistance, education programs and resources, and data management. These functions are performed by staff of the Bergen County Utilities Authority (BCUA). The county also owns a waste transfer station and a yard trimmings processing facility. Communities had been required to deliver their trash to the county-owned transfer station under the state's flow control policy, but flow control has ended as a result of a constitutional challenge. The county's waste management system is currently undergoing changes in response to this legal decision.

RESIDENTIAL WASTE GENERATION PER HOUSEHOLD PER DAY



Source: Institute for Local Self-Reliance, 1999.

The keys to Bergen County's high waste diversion rate include mandatory recycling in the residential and commercial sectors, historically high disposal fees, the existence of well-established markets for recovered materials (especially paper), extensive education and outreach programs, technical assistance programs, funding support for development and implementation of waste reduction programs, and availability of a yard debris management facility.

Community recycling coordinators in Bergen County report waste reduction programs are cost-effective in their communities. Reasons cited for the cost-effectiveness of waste reduction efforts in Bergen County are reduced labor and disposal costs for trash as a result of waste diversion, low or reduced hauling and tip fees for recyclables as compared to trash, revenues generated from sale of recyclables offsetting program costs, and reduced need for purchase of compost and mulch for use in city projects.

Note: We tried to compare waste generation and reduction to a previous year before significant program changes or expansions. We used 1993 for Bergen County as it is the earliest year for which complete data were available. No significant program changes occurred between 1993 and 1995.

RESIDENTIAL PROGRAM SUMMARY

	1993	1995
Tons Per Year[1]	693,840	693,840
Disposal	353,315	353,815
Diversion	340,525	340,025
Percent Diverted	49%	49%
Recycled	16%	17%
Composted	33%	32%
Average lbs./HH/day	15.21	15.21
Disposal	7.74	7.75
Diversion	7.46	7.45
Annual Disposal Fees		
Disposal	NA	NA
Avoided Disposal	NA	NA
Net Program Costs/HH	NA	NA
Disposal Services	NA	NA
Diversion Services	NA	NA

Notes: Figures above represent residential sector only. ILSR estimated households served in 1993 and 1995 at 250,000, the number of dwellings in buildings with four or fewer units. Numbers may not add to total due to rounding.

[1]In order to account for waste bypassing the county transfer station in 1995, ILSR assumed total 1995 generation to be equal to 1993 generation and added an estimated tonnage to disposal. See note 2 on waste reduction table on the next page for more detail.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 825,380 (1995)

HOUSEHOLDS: 330,473 (1996); 250,000 SFDs (estimate, four or fewer units per building), 80,000 MFDs (estimate, five or more units)

BUSINESSES: 30,859 (1998)

LAND AREA: 238.7 sq. mi.

HOUSEHOLD DENSITY: 1,384 per sq. mile

AVERAGE PER CAPITA INCOME: $24,080 (1989)

MEDIAN HOUSEHOLD INCOME: $49,249 (1989)

COMMUNITY CHARACTER: Suburban. Populations of communities in the county range from 22 in Teterboro to over 37,000 in Teaneck and Hackensack. Major employers include Sharp Electronic Corp., Nabisco Inc., ARA Leisure Services, and Bergen Pines County Hospital.

WASTE REDUCTION (1995)

	Residential Tons	Commercial Tons	Total Tons
Recycled/Reused[1]	116,677	237,515	354,192
Newspaper	53,172	17,430	70,602
Commingled Containers	25,819	55	25,874
Corrugated Cardboard	11,101	101,185	112,287
Mixed Paper	10,362	29,288	39,650
White Goods	4,907	5,924	10,831
Glass	4,836	6,244	11,080
Aluminum	1,922	415	2,337
Ferrous Metal	1,202	10,647	11,849
Non-Ferrous Scrap	944	7,303	8,247
Plastics	719	7,893	8,612
High-Grade Paper	628	23,391	24,019
Tin Cans	579	495	1,075
Clothing	280	440	720
Magazines	126	3	128
Batteries	71	262	332
Anti-freeze	6	43	49
Oil Filters	1	0	1
Food Discards	0	26,497	26,497
Composted/Chipped	223,348	7,680	231,028
Leaves	151,079	523	151,602
Yard Trimmings	46,456	1,941	48,397
Brush and Chips	25,813	5,216	31,030
Total Waste Reduction	340,025	245,195	585,221
MSW Disposed[2]	353,815	147,020	500,835
BCUA Transfer Station	243,663	76,053	319,715
Bulky Items[3]	26,905	17,937	44,842
Other Disposal (est.)	83,247	53,031	136,277
Total Generation	693,840	392,215	1,086,055
Percent Reduced	49.0%	62.5%	53.9%
Lbs. Waste/HH Served/Day	15.21		

Notes: Tonnages reflect total tons of material reported to county as recycled by communities. ILSR calculated household generation per day assuming households in buildings with four or fewer units were served in residential programs.

[1]ILSR excluded reported tire recycling of 2,610 tons because county staff could not verify tires had been recycled as opposed to incinerated.

[2]Trash disposal figures represent material generated in Bergen County and delivered to the BCUA transfer station. The amount of Bergen County trash delivered to the transfer station decreased from 303,608 tons of residential trash and 135,765 tons of commercial trash in 1993 to only 243,663 tons of residential trash and 76,052 tons of commercial trash 1995. Total waste generation for Bergen County in 1993 was 1,086,055 tons; total recovery equalled 563,837. County staff believe the reduction in disposal was due to trash generated in the county being delivered to other disposal facilities after flow control ended and the slight increase in recovery, not an actual reduction in generation. In order to account for waste diverted from the county transfer station, ILSR assumed total 1995 generation to be equal to 1993 generation and added an estimated tonnage to disposal.

[3]Bulky items can include both residential and commercial municipal solid waste items such as furniture and appliances plus non-municipal solid waste such as construction and demolition materials, tree parts, and railroad ties. The county does not have data on the proportion of materials originating in each sector or the proportion of materials that are MSW vs. non-MSW. ILSR split the total reported bulky tonnage 60:40 between the residential and commercial sector based on the estimated proportion of the total waste stream in each sector for the country as reported in the U.S. EPA *Characterization of Municipal Solid Waste in the United States: 1996 Update*.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

New Jersey had legislated "flow control" of MSW. All municipal trash generated in New Jersey communities was directed to specified county or regional utility authorities for disposal. The state intended this system to allow utility authorities to create integrated waste management systems, guarantee them economies of scale, and ensure revenue levels through tip fees. Flow control has been declared unconstitutional.

New Jersey's "Statewide Source Separation and Recycling Act" (P.L. 1987, c.102), enacted in 1987, set a mandatory state recycling goal of 25% by 1990, required counties to develop plans for the recovery of leaves and three additional materials, and to hire a recycling coordinator. In 1990, the state revised its goal to 60% of total waste (50% of MSW) by 1995. The goal was again revised to 65% recycling of the state's total waste stream by December 31, 2000.

The Bergen County Long-Term Solid Waste Management Plan requires commercial and institutional establishments to recycle corrugated cardboard, high-grade and mixed paper, glass beverage containers, aluminum cans, ferrous scrap, white goods, and construction and demolition debris. The county requires businesses to track and report the amounts of materials recovered. The plan requires residential sector recycling of newspaper, glass beverage containers, food and beverage cans, ferrous scrap, white goods, leaves, and grass clippings.

All communities in Bergen County have enacted mandatory recycling ordinances. Some mandate recycling of materials in addition to those required by the county, such as magazines, plastics, high-grade paper, and nonferrous scrap.

Most Bergen County municipalities provide residential trash services or hire and pay for a contractor to collect their residents' trash. Residents of seven communities must contract directly with trash haulers. Only four of the 70 municipalities – Midland Park, Old Tappan, Teaneck, and Washington Township – have pay-as-you-throw trash systems.

Source Reduction & Reuse Initiatives

Beginning in 1994, $750,000 from BCUA's $5 million annual Municipal Recycling Assistance Program (MRAP, see the recycling section for more information about this program) have been earmarked to fund source reduction programs. Communities receiving funds have instituted a

variety of programs including waste audit programs, school programs, surveys, advertising and awareness campaigns, backyard composting and grasscycling programs, and municipal recycled-product procurement programs. Communities have also used these funds to purchase waste-reducing equipment such as mulching mowers, electric hand dryers, cloth shopping bags, compost bins, double-sided printers and copiers, and plain paper fax machines.

The BCUA staff maintain a worm composting bin used for demonstrations, composting material from the office, and starting bins. Worms are given to schools and other organizations interested in starting their own vermicomposting programs.

The BCUA has developed numerous publications concerning source reduction. County staff have developed and distributed two publications, "*Grass: Cut It and Leave It*" and "*Backyard Composting*," aimed at diverting yard debris from the waste stream. The "*Comprehensive Guide to Waste Reduction*" provides residents information on how to reduce all types of discards. The "*Recycling and Source Reduction Procurement Guidelines for Government/Public Agencies*" and "*Recycling and Source Reduction Procurement Guidelines for Businesses*" provide businesses and institutions with information on source reduction. Bergen County staff developed and use the "*Bergen County Business Guide to Buying Recycling and Reducing Waste*" as a manual at seminars they conduct for businesses.

Residential Recycling Program

In 1996, Bergen County diverted 49% of its residential waste from disposal. Seventeen percent was recycled and reused. The BCUA primarily funds programs and provides technical assistance to communities upon request. County municipalities must implement their own recycling programs. The cornerstone of the county program is the MRAP, which began in 1990 and has a yearly budget of $5 million. Communities receiving funds from 1990 to 1993 were required to spend the entire sum on recycling and/or composting. Communities have spent the money on projects such as purchasing equipment (balers, recycling bins, chippers), marketing programs, hiring and funding recycling staff, collection programs, advertising, and recycling computer software.

Sixty-nine of the 70 communities in the county offer curbside recycling to their residents. The other community, Ho-Ho-Kus, has a drop-off recycling center. Each community designs its own programs; service providers, collection frequency, and materials accepted vary from town to town. Most supplement the curbside collection with a drop-off facility, although 24 towns do not. The towns of Ramsey and Tenafly contract with private companies for recycling collection. Municipal crews collect recyclables in Ridgewood, Glen Rock, Englewood, Bergenfield, and Paramus. Bergenfield and Paramus collect materials every week, alternating commingled containers one week, paper the next. Englewood collects all materials each week. Tenafly collects newspaper every week but commingled materials only twice a month. In addition to the designated materials included in the county plan, Glen Rock recycles drink boxes, but only at its drop-off center. Ridgewood collects books and aluminum scrap at curbside. Ramsey, Ridgewood, and Bergenfield accept clothing at their drop-off sites.

No MRFs are located in Bergen County. Commingled materials are transported to processors outside the county, generally to facilities in neighboring New Jersey or New York counties. Some communities, such as Allendale and Glen Rock, collect material separated into categories or do their own processing and marketing.

While Bergen has no processing facilities, some end-users and brokers of recovered materials are located in the county. Both Garden State Paper and Marcal Paper use recovered paper in their Bergen County manufacturing facilities. Numerous small scrap dealers broker metals for recycling.

Commercial Recycling Program

In 1995, Bergen County businesses diverted 63% of commercial and institutional municipal solid waste from disposal. The success of waste diversion programs in this sector is due to strong local markets for recovered paper, high disposal costs, the mandatory recycling ordinance, and county-provided technical assistance.

Bergen County owns this compost site located at the county's old landfill.

BERGEN COUNTY RESIDENTIAL RECYCLING PROGRAMS

Community	Commingled or Separated Collection	Drop-off Center	Recycling Hauler	Trash Hauler	Community	Commingled or Separated Collection	Drop-off Center	Recycling Hauler	Trash Hauler
Allendale	S		Town	Contract	Montvale	C	Y	Contract	Contract
Alpine	C		Contract	Contract	Moonachie	C	Y	Town	Contract
Bergenfield	C	Y	Town	Town	New Milford	C	Y	Town	Contract
Bogota	C	Y	Town	Contract	North Arlington	C		Contract	Town
Carlstadt	C	Y	Town	Town	Northvale	C	Y	Contract	Contract
Cliffside Park	C	Y	Town	Town	Norwood	C		Contract	Contract
Closter	S	Y	Town	Contract	Oakland	C		Contract	Contract
Cresskill	C	Y	Town	Contract	Old Tappan	C		Contract	Contract
Demarest	C		Contract	Contract	Oradell	S	Y	Contract	Contract
Dumont	C		Contract	Contract	Palisades Park	C	Y	Town	Contract
East Rutherford	S	Y	Town	Town	Paramus	C	Y	Town	Town
Edgewater	S		Town	Contract	Park Ridge	C	Y	Contract	Contract
Elmwood Park	C	Y	Contract	Contract	Ramsey	C		Contract	Contract
Emerson	C		Contract	Contract	Ridgefield	C	Y	Town	Town
Englewood	C	Y	Town	Town	Ridgefield Park	C	Y	Town	Town
Englewood Cliffs	C	Y	Town	Contract	Ridgewood	C	Y	Town	Town
Fair Lawn	C	Y	Town	Contract	River Edge	S	Y	Town	Contract
Fairview	C		Town	Town	River Vale	C		Contract	Contract
Fort Lee	C	Y	Town	Contract	Rochelle Park	C	Y	Contract	Contract
Franklin Lakes	C		Contract	Contract	Rockleigh	C		Town	Contract
Garfield	C	Y	Town	Contract	Rutherford	C	Y	Town	Town
Glen Rock	S	Y	Town	Town	Saddle Brook	C		Contract	Contract
Hackensack	C	Y	Town	Town	Saddle River	C		Contract	Contract
Harrington Park	S	Y	Town	Contract	South Hackensack	C		Contract	Contract
Hasbrouck Hghts.	C	Y	Town	Town	Teaneck	C	Y	Town	Contract
Haworth	C		Contract	Contract	Tenafly	C	Y	Contract	Contract
Hillsdale	C	Y	Town	Contract	Teterboro	C		Town	Contract
Ho-Ho-Kus	No Program	Y	N/A	Contract	Upper Saddle River	C		Contract	Contract
Leonia	C	Y	Town	Town	Waldwick	C	Y	Contract	Contract
Little Ferry	C	Y	Town	Contract	Wallington	C	Y	Contract	Contract
Lodi	C		Contract	Contract	Washington Twnshp.	C		Contract	Contract
Lyndhurst	S	Y	Town	Contract	Westwood	S	Y	Town	Contract
Manwah	S	Y	Town	Contract	Wood-Ridge	C	Y	Contract	Contract
Maywood	C		Town	Contract	Woodcliff Lake	S	Y	Town	Town
Midland Park	C		Town	Contract	Wyckoff	C	Y	Contract	Contract

Source: Institute for Local Self-Reliance, 1999.

Bergen County is home to two paper mills using recovered paper as feedstock that create constant demand for recovered paper. Office-based businesses, in particular, can divert a significant portion of their waste stream from disposal through these mills. Nearly 70% by weight of all material recovered in commercial recycling programs in Bergen County is paper and cardboard. High disposal fees ($54 per ton at the BCUA transfer station in February 1998, but MSW tip fees were over $100 per ton from January 1990 until November 1997) provide businesses with a financial incentive to recover materials for recycling even if they receive no revenue from their sale. Local mandatory recycling ordinances provides businesses with further impetus to recycle.

The county developed a waste audit manual for businesses and sent a copy of it to all county companies with more than 100 employees. Businesses were asked to complete the audit and return it to county staff. The staff used the audits to determine where its efforts were most needed. County staff provide on-site visits to businesses that request them. Businesses made most requests for site visits in the late 1980s and early 1990s as they first developed and implemented recycling programs. Current recycling activities are more focused on expanding programs and the county reports most requests from the business sector are for information and technical assistance not requiring site visits.

Each community in Bergen County is responsible for overseeing the commercial recycling program within its own jurisdiction. All enforcement of the mandatory recycling ordinance is handled at this level.

Composting Program

In 1995, Bergen County residents recovered 32% of their waste through composting; businesses recovered 2%.

New Jersey treats brush, leaf, and grass clipping processing facilities differently. Brush-only processing sites can operate without a permit. It is relatively easy to obtain a permit to operate a composting site in which less than 10% of the material processed is grass clippings. Permits for compost sites accepting only grass clippings or both grass and leaves, called vegetative waste compost sites, are more difficult to obtain and more expensive. As a result, many communities compost their own leaves but few compost vegetative waste.

Most communities in Bergen County provide yard debris collection and/or processing services to their residents. Nine communities do not have a grass clippings program; four do not have a leaf program. Because yard debris is banned from disposal, residents of these communities must compost materials in their backyards, hire a private company to take it away, or haul it to a disposal site themselves. Some communities, such as Glen Rock and Ramsey, collect fall leaves at curbside; residents must deliver other yard debris to drop-off sites.

Some communities process their own yard debris while others deliver their materials to private contractors. Ramsey solicits separate bids for the processing of grass clippings, leaves, and brush and contracted with three separate companies in 1998. Englewood shares a site with the neighboring town of Leonia, where leaves are processed by municipal staff but grass clippings from both communities are composted by private companies.

Bergen County owns a yard debris composting site in the town of Lyndhurst, which is operated under lease by Nature's Choice. The facility occupies 25 acres on top of the old county landfill. County communities can deliver yard trimmings and brush to this site. Each town must negotiate its own tip fee with Nature's Choice, who returns a portion of the fee to the county according to the lease agreement. The county receives 50¢ a cubic yard for brush and grass clippings delivered to the site and 25¢ per cubic yard for leaves. Nature's Choice composts grass clippings and leaves in turned windrows and grinds brush into mulch. The company sells finished material in bulk.

Education, Publicity, and Outreach

Bergen County runs a multi-faceted education and outreach program that includes advertising, publications, promotional items, education programs, a hotline, and a lending library.

Bergen County supports countywide advertising and publicity campaigns including recycling pages in the local phone book and public service announcements. The county also produces newsletters entitled *The Recycling Bin* and *The Recycling Update*. Other county publications include a *Comprehensive Guide to Waste Reduction*, *Recycling Market Directory*, and *The Apartment Recycling Manual*. The county produces numerous fact sheets about waste reduction topics including vermicomposting, backyard composting, and recycling of specific materials, such as aluminum, renderings, and glass.

The county has distributed promotional items including decals, magnets, coloring books, litter bags, and miniature worm bins.

Bergen County conducts public education programs about environmental shopping and worm composting. The shopping program includes guided tours of a grocery store to illustrate the effect shopping choices can have on the environment. The county also presents information about recycling and source reduction in county classrooms, for civic groups, and in business and institutional seminars.

The county sponsored a week-long environmental summer camp program. Highlights of the camp included a tour of a waste incinerator and a recycling center.

The county maintains a recycling and waste reduction hotline. Hotline staff provide waste management information and referrals.

The county maintains a lending library of materials on solid waste management and environmental education resources which county residents and businesses can use.

Costs

The BCUA's budget for solid waste management includes its transfer station costs, hauling costs, tip fees, landfill closure costs, recycling and source reduction financial assistance programs, education and publicity costs, staff and administration costs, and debt service. In 1995, the BCUA spent $43.6 million in operating expenses (for purchased services, administration, depreciation, and staff leave benefits) and $7.6 million for interest,

debt service, and amortization costs for the solid waste system. The Authority's expenditures represent only a portion of the costs of waste management in the county. Each community operates a waste management program, which is for the most part paid with community funds.

Average costs of trash, recycling, and composting in Bergen County are not available. In seven communities, residents pay waste haulers directly. In the remaining communities, community funds pay for trash services. In no communities do residents have to pay directly for recycling or composting services although some communities do charge for recycling freon containing appliances. Residents must pay for services if they choose not to use municipal programs or desire extra services.

In a limited survey of community recycling coordinators from Bergen County, all six respondents claimed their waste reduction programs saved money or cost no more than disposal. When asked if they believe their towns' recycling and composting programs are cost-effective, the recycling coordinators from Ramsey, Ridgewood, Bergenfield, Paramus, and Tenafly all replied in the affirmative. Englewood's recycling coordinator believes the programs break even, costing the city no more than disposal alone. Reasons cited for the cost-effectiveness of the programs include reduced trash costs as the result of diversion (Ramsey), lower labor costs as a result of waste reduction (Ridgewood), saving on compost purchases for city projects (Tenafly), free hauling and no tip fees for processing recycling (Paramus), and revenues from material sales off-setting program costs (Ridgewood, Ramsey, Bergenfield, Paramus, and Tenafly).

Funding & Accounting Systems

Funding for the county's MRAP was raised through its Solid Waste Investment Tax. From 1990 to 1996, the county distributed $35 million to municipalities through this program.

The tip fee at the transfer station ($54 per ton in February 1998) has been set so it covers the facility's operating and maintenance costs, waste transport costs, and tip fees. Prior to the end of flow control, tip fees at the BCUA transfer station also included debt service on the facility, county landfill closure costs, recycling and household hazardous waste costs, and county administration costs and was $26 per ton higher. As of March 1998, the BCUA was exploring other mechanisms than tip fees to recover these expenses.

Future Plans and Obstacles to Increasing Diversion

The end of flow control in New Jersey is anticipated to have a profound effect on the county's waste management system. Substantial reductions in tip fees have already occurred. County staff believe reduced disposal costs will lead to some local governments questioning the cost-effectiveness of waste reduction. They believe the county's municipal recycling and solid waste staff are convinced of the value of these programs but municipal governing bodies, looking for cost-cutting measures, may focus on immediate savings to be garnered while tip fees are low. No changes in the county recycling and yard debris recovery requirements are planned. Communities can legally only cut programs that exceed county requirements.

As part of the county's continuing outreach program, in 1998, county staff plan to produce and distribute a new flyer informing businesses about the numerous available programs to support commercial and institutional waste reduction.

Tips for Replication

Support community innovation with small grants.

Make programs mandatory.

Design a user friendly program where recycling is as easy as disposal.

Provide bins for curbside recycling participants.

Be accessible to community and business recyclers.

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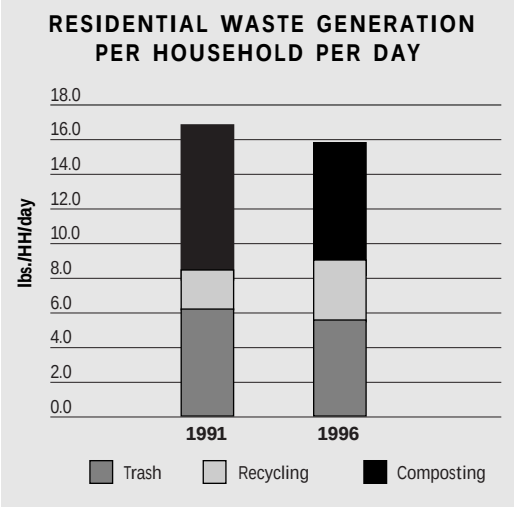
CHATHAM, NEW JERSEY

Residential Waste Reduction **65%**

The Borough of Chatham is a wealthy tree-lined suburban community in northern New Jersey. Most residents live in single-family homes. This borough produces more waste per household than the national average but it also diverts nearly two-thirds of it from disposal (22% through recycling and 43% through composting). A local company collects and disposes trash twice weekly under contract with the borough. Another contractor provides curbside collection twice a month for 21 types of recyclables. Residents deliver yard trimmings to a mulch site and the borough collects fall leaves.



Source: Institute for Local Self-Reliance, 1999.

Waste reduction drivers include convenient leaf collection and composting, a curbside recycling program that collects many materials (including mixed paper, metal clothing hangers, and latex paint cans) and pay-as-you-throw (PAYT) trash fees. Most materials are commingled in one bin. The composting program diverts more material than the borough either recycles or landfills — most of this in fall leaves. The borough collects bagged leaves weekly during the fall and loose leaves, two or three times each fall. The per-bag trash fees further encourage residents to decrease trash set-out.

The cost-effectiveness of Chatham's waste system is enhanced by the PAYT trash system, the low costs of composting, and low recycling program costs offset by a generous revenue sharing agreement with the processor. Between 1991 and 1996, net program costs per household have decreased from $457 to $228.

Before switching to the PAYT trash system in November 1992, each Chatham household paid the previous trash hauler a flat annual fee of $350 for trash collection and disposal, equivalent to more than $300 per ton. The trash bag costs are now set to cover tip fee disposal costs; total per ton trash costs were $157 in 1996. Composting collection and processing costs average $48 per ton; recycling collection and processing, $39 per ton. Also, the recycling contractor returns half of materials revenues to the community. In 1996, these revenues defrayed recycling collection costs by 60%. Chatham's recovery rate surpassed 60% under both the old private trash collection system and the new publically contracted system but per household costs dropped dramatically when the new system was implemented.

PROGRAM SUMMARY

	1991	1996
Tons Per Year	8,581	8,007
Disposal	3,155	2,817
Diversion	5,426	5,190
Percent Diverted	63%	65%
Recycled	13%	22%
Composted	50%	43%
Average lbs./HH/day	16.85	15.81
Disposal	6.20	5.56
Diversion	10.66	10.25
Annual Disposal Fees		
Disposal	$444,314	$284,476
Net Program Costs/HH	$456.62	$227.76
Disposal Services	$392.81	$158.02
Diversion Services	$63.81	$69.74

Notes: 2,750 households and 35-40 small businesses (2,790 total) served in1991; 2,775 (2,735 HH, 40 businesses) in 1996. 1991 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 8,007 (1990); 8,289 (1997)
HOUSEHOLDS: 3,285 (1996); 2,735 dwellings of three units or less, 550 multi-family dwellings
BUSINESSES: Approximately 300
LAND AREA: 2.41 square mi.
HOUSEHOLD DENSITY: 1,363 per sq. mile
AVERAGE PER CAPITA INCOME: $31,947 (1989)
MEDIAN HOUSEHOLD INCOME: $62,129 (1989)
COMMUNITY CHARACTER: Suburban, light industry
COUNTY: Morris

RESIDENTIAL WASTE REDUCTION

	Tons (1996)
Recycled[1]	1,741
Newspaper	1,009
Glass	340
Other Paper	130
Corrugated Cardboard	117
White Goods	81
Plastic Containers	26
Steel Cans	24
Aluminum Cans	16
Tires[2]	15
Household Batteries	0
MRF Rejects[3]	-17
Composted/Chipped[4]	3,449
Leaves (curbside)	2,761
Brush and Tree Parts (drop-off)	376
Grass Clippings (drop-off)	312
Total Waste Reduction	5,190
Disposed	2,817
Landfilled[1]	2,800
MRF Rejects	17
Total Generation	8,007
Percent Reduced	64.8%
Lbs. Waste/HH Served/Day[5]	15.81

Note: Figures above exclude 550 multi-family dwellings (with four units or more); private haulers service these households.

[1]Figures include materials from 35-40 small retail establishments.

[2]Tire tonnages reported to town by automotive retailers that collect and privately recycle tires. The borough does not know whether these tires are recycled or burned. Excluding tires would not change waste reduction level.

[3]MRF operator reports a 1% by weight reject rate.

[4]Measured in cubic yards and converted using state conversion factors of 1.80 cubic yards per ton for grass clippings, 8.0 cubic yards per ton for brush, and 2.86 cubic yards per ton for leaves.

[5]Per capita waste generation is high compared to the national average. Partial explanation is the large yards in the community and the affluence of its residents. Residents produce more than seven pounds per household per day of yard debris. They also recycle more than two pounds of newspapers per household per day.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

New Jersey's "Statewide Source Separation and Recycling Act" (P.L. 1987, c.102), signed into law on April 20, 1987, sets a mandatory state recycling goal of 25% by 1994, requires counties to develop recycling plans to provide for the recovery of leaves and three additional materials, and to hire a recycling coordinator. Financial assistance for implementation of mandated recycling programs was raised from a $1.50 per ton tax on tip fees at in-state disposal facilities. In 1990, the state revised its recycling goals to 60% of total waste and 50% of municipal solid waste by 1995.[1] The goal was again revised to 65% recycling of the state's total waste stream by December 31, 2000.

A local Chatham ordinance provides that it is "unlawful to combine designated, unsoiled recyclables with other solid waste." In addition, the ordinance prohibits solid waste collectors from collecting solid waste that contains visible signs of designated recyclable materials. The borough's first recycling ordinance was enacted in 1986 and additions and revisions were made in 1988, 1991, and 1996.

In November 1992, Chatham instituted per-bag trash fees. Residents must place their trash in special blue 30- or 15-gallon bags or the borough's trash hauler will not collect it. The bags cost $1.25 and $0.65 respectively and are available at local retailers. The borough also levies a flat fee of $75 per household per year to finance its solid waste management system.

There is no local ordinance requiring residents to place their trash in the blue bags but the borough's contract with Luciano, a private hauler, specifies that the contractor only collects trash set out in blue bags.

Source Reduction and Reuse Initiatives

The small borough relies on Morris County programs and publications to spread source reduction information.[2] For example, county "Cut It and Leave It" brochures, available at the Town Hall, explain how to grasscycle.

Residents have organized an independent "Renaissance Book" program at the public library, through which individuals donate books. About 80% are reused; the rest recycled.

Recycling Program

In 1996, Chatham recycled 22% of its residential waste stream. The borough's PAYT fees for trash disposal provide residents with a financial incentive to recycle. The curbside program accepts 21 categories of materials; the drop-off 19, excluding household batteries and white goods. The borough contracts with Advanced Recycling Technology Systems, Inc. (ARTS), a recycling company in Linden, 17 miles from Chatham, to provide twice monthly curbside collection and to service its drop-off center. At the drop-off site, the company collects 20-cubic-yard roll-off containers when full and leaves empty ones in their place. ARTS also

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: Luciano for white goods, Advanced Recycling Technology Systems, Inc., Linden, NJ, for all other materials

Start-up Date: Curbside commingled collection began 1992

Mandatory: Yes, for all materials collected

Households Served: 2,735 single-family dwellings and homes up to four units and about 35-40 small retail businesses

Materials Accepted: ONP, paperboard, OCC, brown paper bags, mail, OMG, paperback books, phone books, computer paper, wrapping paper, glass bottles and jars, aluminum cans, metal food cans, #1, #2, and #3 plastic bottles, metal clothes hangers, empty latex paint cans, paper juice boxes, milk cartons, aluminum foil, aerosol cans, household batteries, white goods

Collection Frequency: Monthly for white goods, twice monthly for all other materials

Set-out Method: White goods set at curb with other bulk items; newspaper is bundled; cardboard and brown paper bags are flattened and bundled; magazines are bundled; other paper is placed in reusable container(s); batteries in clear bag(s) placed at curb; other materials commingled in reusable container(s)

Collection Method: White goods: Collected with all bulk items by contractor who uses varying equipment and crew sizes. Other recyclables: Collection done in three separate trucks each with a three-person crew: one for newspaper (Mack truck with a 32-cubic-yard Leach packer), one for corrugated and magazines (International truck with 19- or 21-cubic-yard Eager Beaver body), and one for commingled materials (Mack truck with a 32-cubic-yard Leach packer)

Participation Rate: 80% (estimate by ARTS)

Participation Incentives: Reduced trash disposal fees through increased recycling, possibility of fines for non-compliance

Enforcement: Contaminated recyclables left at curbside with "rejection slip" attached detailing the reason for rejection. Ordinance allows random inspection of trash and allows for fines greater than $25 and up to $1000 for the first offense if convicted. No fines have been levied under the ordinance.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: 1994 for bagged leaf collection, community has composted leaves from streets since at least 1970s

Service Provider: Chatham Borough DPW

Households Served: 2,688

Mandatory: Yes

Materials Collected: Leaves

Collection Frequency: Two or three passes through community each autumn for unbagged leaves, seasonal weekly collection for leaves bagged in borough bags during fall leaf season. Both programs run approximately mid-October to mid-December.

Set-out Method: Bagged in kraft bags or raked loose into street

Collection Method: Loose leaves vacuumed or collected with salad-tong truck into five-cubic-yard dump trucks by five- to seven-person crews; two-person crews collect bagged leaves in 20-cubic-yard packer truck.

Participation Rate: NA

Participation Incentives: Decreased trash fees through increased diversion, free bags for leaves given to residents at mulch site and Department of Public Works

Enforcement: Enforcement has not been necessary as resident participation has conformed to program standards

DROP-OFF COLLECTION

Number of sites: Two Chatham sites; one for recyclables (open Saturday mornings only), one for yard trimmings (open April-December, Wednesdays 1-4 PM and Saturdays 12-4 PM); residents can also use two county drop-off sites for yard trimmings

Staffing: Chatham sites are staffed by individuals performing community service assignments

Service Provider: Advanced Recycling Technology Systems, Inc., Linden, NJ, under contract with the borough for recycling drop-off; Chatham Borough for yard trimmings site

Materials Accepted: All materials collected at curbside except household batteries and white goods plus brush and grass clippings

Participation Incentives: Reduced trash fees through increased recycling, free wood chips, processed mulch, and firewood available at mulch area and county sites

Sectors Served: Residents and landscapers serving Chatham residents. Chatham estimates three-quarters of material delivered by residents, one-fourth delivered by landscapers but originating from Chatham homes.

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
30-Yard Dumpster	~$2,500	Recycling	1995
2 Leaf boxes	$4,000	Composting	1992
Leaf Vacuum	$16,000	Composting	1992
30-Yard Dumpster	~$2,500	Recycling	1992
Ford Packer Truck w/ 20-cubic-yard Compactor	$45,000	Composting	1990
John Deere Front-end Loader[1]	$75,000	Composting	1989
Claw Attachment for Front-end Loader	$10,000	Composting	1987
2 Leaf boxes	$4,000	Composting	1987
Royer Compost Screen	$45,000	Composting	1986
2 Leaf Vacuums[2]	$32,000	Composting	1982

Note: All costs and purchase dates are estimates provided by Town Administrator. Most items purchased out of recycling or solid waste utility funds and paid in full at time of purchase. Front-end loader, compost screen, and packer truck purchased from borough capital fund.
[1]Also used for public works functions other than waste management.
[2]Cost reflects current replacement value. Original purchase price not available.

Source: Institute for Local Self-Reliance, 1999.

processes and markets the recyclables. Chatham pays ARTS $23.81 per household per year for services. Revenue from the sale of recyclables is split 50:50.

ARTS staff use three separate trucks to collect recyclables; one for commingled containers, one for newspaper, and one for corrugated cardboard and magazines. ARTS chose to use the separate truck collection system in order to minimize contamination.

Residents provide their own containers for set-out of recyclables.

At the ARTS MRF, a magnetic separator removes metals, an air classifier separates plastics and aluminum, and an eddy current then removes the aluminum from the plastics. The remaining materials are manually sorted. Newspaper is dumped on a sorting floor where kraft bags are manually removed. The reported reject rate at the MRF is 1% by weight.

The borough's trash collection contractor, Luciano, collects white goods on the monthly bulky waste collection days and delivers them to recyclers.

Composting Program

Composting accounts for nearly two-thirds of residential waste reduction. Residents receive leaf collection from mid-October to mid-December, and can participate two ways. During this period, borough staff collect bagged leaves weekly from the curb and the street, making two or three passes on each street. Fall leaf collection accounted for 80% of all yard trimmings recovered in 1996. During the remainder of the year, residents must deliver their leaves, grass clippings, and brush to the borough mulch area or use county sites. Chatham pays a fee for county staff to use county windrow-turning equipment to compost leaves at its mulch area. Chatham hauls grass clippings to a private contractor, Rotundi, for composting. Rotundi is located within Chatham and grants the community free tipping of grass clippings as a host fee. Borough staff transport brush to a Morris County Utilities Authority site approximately 10 miles from Chatham for mulching. The county charges a tip fee of $3.90 per cubic yard. The county gives finished mulch to county residents free of charge.

Education, Publicity, and Outreach

The borough's yearly calendar is the principal source of information about solid waste management. The calendars are mailed to each household yearly and detail procedures for preparation of trash, leaves, grass clippings, brush, and recyclables. It also lists the dates for leaf and recycling collections and includes the hours of operation for the recycling drop-off and mulch area. The borough also includes flyers in residents' annual tax bills detailing these programs. Whenever a

program change is implemented and at the start of the fall leaf program, Chatham runs advertisements in local newspapers. The borough also makes brochures about waste management topics, such as "Cut It & Leave It" and environmental purchasing, available at the Town Hall.

Costs

In 1996, the borough and its residents spent about $674,000 for trash, recycling, and yard debris services — about $243 per household served. Of this, about 65% was spent on trash collection and disposal, 10% was spent on recycling, and 25% was spent on yard debris collection and recovery.

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$68,073	1,758	$38.72	$24.53
Curbside and Drop-off Collection[1]	$67,073	1,758	$38.15	
Admin./Education/Publicity/Depreciation	$1,000	1,758	$0.57	
Composting Gross Costs	$167,014	3,449	$48.43	$60.19
Curbside Leaf Collection[2]	$95,000	2,761	$34.41	
Leaf Bags	$12,000	2,761	$4.35	
Drop-off Collection[2]	$9,400	688	$13.66	
Leaf Processing[3]	$15,500	2,761	$5.61	
County Mulching	4,000	376	$10.63	
Grass Clippings Composting[4]	$0	312	$0.00	
Admin./Education/Publicity/Depreciation	$31,114	3,449	$9.02	
Waste Reduction Gross Costs	$235,087	5,207	$45.15	$84.72
Materials Revenues	($41,566)	5,207	($7.98)	($14.98)
Net Waste Reduction Costs	$193,521	5,207	$37.17	$69.74

Note: Recycling tonnage figure differs from figure in table on page 66 as MRF rejects are included above. Chatham employs no staff who have solid waste management activities as their main job function. In addition to the administrative costs shown above, many employees devote small portions of their time to administration but cost figures are not available.

[1]Represents the borough's contract with ARTS, which began January 1, 1994, and extends to the end of 1998, and includes collection and processing. The city pays ARTS $23.81 per household to provide curbside services to 2,735 households. The city pays ARTS a flat fee for servicing the recycling drop-off site.

[2]Labor costs only. Other costs, such as vehicle costs and employee benefits, are carried by other borough departments and cannot be calculated.

[3]Fee paid to county for rental of windrow turner, the staff to operate it, and cost of site permit and rental.

[4]Service granted free as in-kind community host fee.

TOTAL SOLID WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$438,501	2,800	$156.59	$158.02
Trash Collection and Hauling[1]	$142,800	2,800	$51.00	
Tip Fees[2]	$284,476	2,800	$101.59	
Trash Bag Costs[3]	$7,225	2,800	$2.58	
Administration	$1,500	2,800	$0.54	
Education/Publicity	$2,500	2,800	$0.89	
Waste Reduction Gross Costs	$235,087	5,207	$45.15	$84.72
SWM Gross Costs	$673,587	8,007	$84.12	$242.73
Materials Revenues	($41,566)	5,207	($7.98)	($14.98)
Total SWM Net Costs	$632,021	8,007	$78.93	$227.76

Note: Chatham employs no staff who have solid waste management activities as their main job function. In addition to the administrative costs shown above, many employees devote small portions of their time to administration but cost figures are not available.

[1]Lump sum contract fee paid to hauler by Chatham for twice weekly trash collection and hauling. Contract began in 1996 and extends to 2000.

[2]Residents, not the borough, pay for tip fees through trash bag purchases. During 1996, the tip fees at Morris County transfer stations were $110 per ton through July and $89.90 per ton for the remainder of the year. ILSR calculated tip fees paid by multiplying monthly disposal tonnage as reported by hauler by the tip fee for that month. The nearest Morris County transfer station is approximately 10 miles from Chatham.

[3]ILSR calculated an estimate of fees residents paid for trash bags. Chatham's borough administrator reported the average large bag weighs 25 pounds and the average small bag, 12 pounds. ILSR assumed residents used an equal number of small and large bags and calculated the average cost paid by residents per ton of trash in this scenario would have been $104.17 per ton. Bag costs were calculated by subtracting tip fees paid from the total fees paid for bags and disposal.

Source: Institute for Local Self-Reliance, 1999.

Source: Institute for Local Self-Reliance, 1999.

Materials revenues reduced this to $632,000 (or $228 per household served).

On a per-ton basis, trash costs $157, more than three times more than waste reduction at $45 per ton. Recycling costs $39 per ton ($15 with materials revenues), and yard debris recovery, $48. When the cost of inflation is taken into account, average per household costs for waste management services have decreased from $457 in 1991 to $228 in 1996.[3]

Chatham employs no staff who have solid waste management activities as their main job responsibility. ARTS drivers earn $12-15 per hour, and collectors, $8-11 per hour.

Funding & Accounting Systems

A $75 per household fee paid by Chatham residents and county and state funds finance waste management services. The borough receives half the revenue from the sale of its recyclables. The revenue from trash bag sales is paid to the borough's contractor to cover disposal of residential trash.

The borough maintains a solid waste utility fund. All residents' fees, state and county grants, and recycling revenues are deposited in this fund. This fund is tracked using modified accrual accounting.

Future Plans and Obstacles to Increasing Diversion

Chatham is considering adding textiles to curbside recycling collection.

The Town Administrator is considering eliminating the recycling drop-off site, reducing trash collection to weekly, and increasing recycling collection to weekly. He foresees having a difficult time persuading residents to agree to these changes. Twice weekly trash collection is the norm for communities in this region of New Jersey and residents are resistant to what they may perceive to be a reduction in services for their money.

The biggest obstacle to increased diversion is reaching renters with information on the borough's waste reduction programs. The flyers enclosed in tax bills go to the property owner, not the tenant. State law requires renters to notify their community government upon moving in but this law is often ignored.

Tips for Replication

Make program participation convenient. Chatham switched to commingled collection of containers because of residents' preferences.

PAYT systems encourage trash reduction.

Notes:
[1]"Total waste" includes construction and demolition materials, industrial waste, and medical waste in addition to MSW.
[2]The costs presented in this profile are for the community only and do not include county costs of producing and distributing these materials.
[3]Costs were normalized to 1996 dollars using the GDP deflator for state and local government expenditures.

Trash must be set out in the hauler's special blue bag(s) or collection crews will not collect it.

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CLIFTON, NEW JERSEY

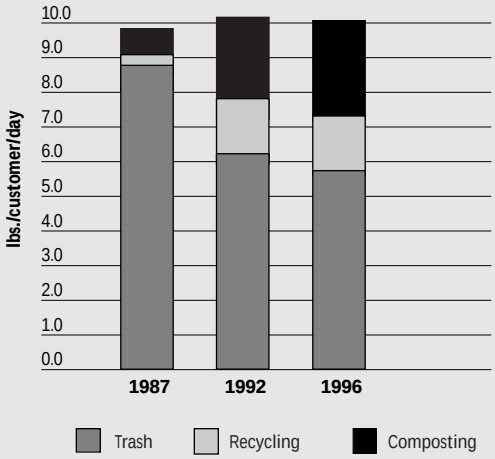
Municipal Solid Waste Reduction

56%

In 1996, Clifton diverted 56% of its municipal solid waste from disposal. Clifton diverted 44% of city-collected material and an impressive 68% of materials generated by businesses and institutions not served by city waste management programs.

Clifton's public sector waste management system serves 28,000 residential customers and 1,300 small businesses in the city's downtown area. Eleven categories of recyclables are collected at curbside; the city recycling center accepts thirteen categories of material (nine of which are also collected curbside). Residents are required to recycle other categories of materials, such as textiles, but do so through private recyclers. Municipal trash customers also receive seasonal curbside collection of leaves and yard debris and year-round on-call collection of brush.

PUBLIC SECTOR WASTE GENERATION PER CUSTOMER PER DAY



Note: Residential waste generation per household is not available as Clifton serves businesses on its residential routes. Figures above thus reflect pounds of waste generated per customer (28,000 households and 1,300 businesses) per day.

Source: Institute for Local Self-Reliance, 1999.

Clifton's private sector waste diversion success is driven by high waste disposal fees, state and local recycling mandates, and strong local markets and infrastructure for recycling. All Clifton businesses and institutions must recycle 22 materials and are eligible to receive technical assistance from the city. Tip fees in New Jersey have traditionally been among the highest in the nation. Waste diversion offers many businesses a less expensive alternative to disposal. Recycling-based manufacturing is prevalent in New Jersey, providing markets for materials the state and city require be recovered.

PUBLIC SECTOR PROGRAM SUMMARY

	1987	1996
Tons Per Year	49,310	54,211
Disposal	43,540	30,363
Diversion	5,770	23,848
Percent Diverted	12%	44%
Recycled	4%	16%
Composted	8%	28%
Average lbs./HH/day	9.83	10.14
Disposal	8.68	5.68
Diversion	1.15	4.46
Annual Disposal Fees		
Disposal	$1,532,786	$3,387,052
Net Program Costs/HH	$153.38	$177.73
Disposal Services	$144.98	$147.64
Diversion Services	$8.40	$30.08

Notes: Figures above reflect public sector collection from 26,200 households and 1,300 businesses served in 1987; 28,000 households and 1,300 businesses in 1996. 1987 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

Clifton's public waste management program costs increased from $153 per household in 1987 to $178 in 1996.[1] During the same time period, per household costs for trash disposal were held relatively constant even though trash disposal tip fees increased from $35 per ton to over $100. Trash program savings were achieved by decreasing per household disposal amounts by 35% and negotiating collection contracts in which per ton costs decreased 46% from 1987 to 1996. Waste reduction program cost-effectiveness is enhanced by program design that allows direct marketing of recyclables thereby avoiding processing fees and increasing materials revenues. Fees for twice weekly public sector trash collection and disposal exceed $140 per ton; waste reduction programs cost the city $37 per ton.

DEMOGRAPHICS

POPULATION: 75,000 (1996)
HOUSEHOLDS: 31,000 (1996) 25,500 single-family homes and duplexes, 5,500 in dwellings with 3 or more units.
BUSINESSES: 3,100 (1999)
LAND AREA: 12 square mi.
HOUSEHOLD DENSITY: 2,583 per square mile
AVERAGE PER CAPITA INCOME: $18,950 (1989)
MEDIAN HOUSEHOLD INCOME: $39,905 (1989)
COMMUNITY CHARACTER: Urban, suburban. Major industries include Hoffman-La Roche pharmaceuticals, Public Service Electric & Gas, and Union Camp paper manufacturing.
COUNTY: Passaic

1996 WASTE REDUCTION

	Public Sector[1] tons	Private Sector tons	Total tons
Recycled[2]	8,449	33,366	41,815
Corrugated Cardboard	685	16,235	16,920
Mixed Paper	12	10,735	10,747
Newspaper	4,903	4,386	9,289
Glass Containers	1,386	813	2,199
Textiles[3]	833	0	833
White Goods	172	219	390
Steel/Tin Cans	217	138	355
Tires[4]	20	302	323
Scrap Aluminum	1	306	307
Plastic Containers	79	103	182
Aluminum Cans	69	58	127
Lead-acid Batteries	2	56	58
Scrap Metal	51	0	51
Anti-freeze	0	16	16
Pallets	14	0	14
Computers/Copiers	3	0	3
Oil Filters	1	0	1
Composted/Chipped	15,399	5,195	20,594
Grass Clippings	5,535	718	6,253
Brush/Trees	2,128	1,519	3,647
Leaves[5]	7,256	33	7,289
Food Discards	0	661	661
Wood Debris	480	2,265	2,745
Total Waste Reduction	23,848	38,561	62,409
MSW Disposed[6]	30,363	18,152	48,516
Total Generation	54,211	56,714	110,925
Percent Reduced	44.0%	68.0%	56.3%
Lbs. Waste/Customer/Day[7]	10.1		

Notes: Numbers may not add to total due to rounding.
[1]Public sector figures include 1,300 small businesses in downtown area. These businesses generate an estimated one-third of the waste stream.
[2]Tons represent material actually marketed to end users and therefore there is no associated reject rate.
[3]Textile tons reported by Clifton Goodwill.
[4]Tires are marketed to a variety of companies. Clifton's recycling coordinator estimates half are burned as fuel and half are re-treaded. This figure is half of tire collection for the year.
[5]Clifton estimated leaf tonnages from actual volume figures using the following conversion factors: leaves collected in open-bodied trucks, five cubic yards per ton; leaves vacuumed, 2.86 cubic yards per ton; and compacted leaves, two cubic yards per ton.
[6]ILSR estimated disposal figures for commercial sector based on past disposal data provided by Clifton: 1991, 19,357; 1992, 23,543; 1993, 21,683; 1994, 17,858; 1995, 10,760; 1996, 8,299 tons. Bypassing of flow control system evident in 1995 and 1996; waste reduction tonnages did not simultaneously increase. 1992 and 1993 figures include C&D materials. Thus ILSR has used 1994 commercial disposal level for 1996. Based on the trend for decreasing disposal from 1992 to 1994, Clifton's recycling coordinator believes true disposal nearer to 16,500 tons but ILSR retained the conservative higher number.
[7]Represents 28,000 households and 1,300 small businesses.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

New Jersey's "Statewide Source Separation and Recycling Act," signed into law on April 20, 1987, set a mandatory state recycling goal of 25% by 1990, required counties to develop recycling plans for recovery of leaves and three additional materials, and to hire a recycling coordinator. In 1990, the state revised its recycling goals to 60% of total waste and 50% of municipal solid waste by 1995. The goal was again revised to 65% recycling of the state's total waste stream by December 31, 2000.

Clifton's local residential recycling ordinance requires every household in the public sector program to source-separate and recycle 18 categories of materials. Another ordinance requires commercial and institutional establishments in Clifton to "source separate, collect, transport, and market" materials for which markets are secured — currently 22 categories of materials, mostly materials targeted in the Passaic County waste plan. Both private contractors serving residents and commercial establishments are required to report to the city the quantities of material they recycle. The recycling ordinances allow levying of fines for non-compliance. As of December 1997, three businesses have been fined under these ordinances.

Source Reduction & Reuse Initiatives

Clifton's recycling coordinator gives talks to civic groups and schools on reuse, environmental purchasing, and recycling. He also offers an annual home composting class (lowest class attendance has been 35 people; highest was 200 people) and has often tied these courses to promotions by private companies. These companies have offered mulching mowers and home compost bins for reduced rates and as prizes in contests they sponsor.

In 1996 Clifton gave away 800 reusable coffee mugs in small coffee shops and at community events. A brochure detailing the benefits of source reduction accompanied each mug. The Environmental Endowment for New Jersey, Inc. funded this program with a $2,000 grant.

Residential/Public Sector Recycling Program

In 1996, Clifton recycled 16% of its public sector waste. Residents must source-separate recyclables into seven streams, each in its own bin or bundle. A local company going out of business donated 15,000 four-gallon pails, which the city distributed to residents for use as recycling bins. City crews collect recyclables at curbside and service the drop-off site. Materials are stored at the DPW yard.

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: City of Clifton DPW

Start-up Date: 1988, for glass, aluminum, and paper. Additional materials were added during the years 1991 to 1993.

Mandatory: Yes, for all materials

Households Served: 28,000 households (23,000 in SFDs and duplexes, 5,000 in MFDs), 1,300 businesses. All residents in buildings/complexes with fewer than 10 units served. Businesses can use city trash and recycling service if trash totals less than eight bags per week.

Materials Accepted: Glass bottles and jars, aluminum cans, food cans, newspapers, magazines, telephone books, mail, paperback books, hardcover books without covers, other mixed paper, white goods, scrap metal. Businesses have weekly cardboard collection.

Collection Frequency: Containers and paper collected every three weeks; white goods (with freon removed if applicable) and scrap metal collected weekly by appointment

Set-out Method: Glass sorted by color and set out in reusable containers, aluminum cans in separate container, food cans in reusable container with labels removed, newspapers in brown paper bags or bundled, other paper products in separate bags or bundles, white goods and scrap metal placed at curb.

Collection Method: Three-person crews collect source-separated recyclables in a five compartment (one compartment each for green glass, brown glass, clear glass, aluminum cans, and food cans) Eager Beaver truck. Three-person crews collect paper in a packer truck. Two-person crews collect appliances and metals in a packer truck. Two-person crews collect OCC from businesses in a packer truck.

Participation Rate: 80-85% based on an educated guess of recycling coordinator

Participation Incentives: Mandatory ordinance

Enforcement: City ordinance provides for two warnings for failure to comply with recycling ordinance. After warnings penalties of $25 for first offense, $100 for second offense, $250 and/or 90 days community service for the third offense, and $1000 fine and/or up to 90 days community service for each subsequent offense. During 1997, waste enforcement staff issued 750 warnings. Ten summonses were issued resulting in seven fines; the other three cases are pending in court.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: Leaf collection began in 1987, grass clippings and other yard debris collection began in 1992

Service Provider: City of Clifton DPW for leaves, brush, and holiday trees; private vendor for other materials (the contract changes yearly, 1996 contractor was Straight and Narrow)

Households Served: 28,000

Mandatory: Yes, for all materials

Materials Collected: Grass clippings, leaves, brush, other yard and garden debris, holiday trees

Collection Frequency: Weekly, late March to early December for yard debris; leaf collection middle October to mid-December, cover city two-three times during collection period, brush collection on-call year-round; holiday trees collected January to mid-February

Set-out Method: Yard debris and grass clippings in biodegradable paper bags or reusable open containers; leaves raked to curb or bagged in biodegradable paper bags; brush piled at curb; holiday trees set out at curb (pick-up on on-call basis after mid-January)

Collection Method: Two-person crews collect brush and holiday trees in open-body trucks, two-person crews vacuum leaves into open-body trucks, also use bucket-loader into open-body or compactor trucks

Participation Rate: NA

Participation Incentives: Mandatory ordinance

Enforcement: Same as recycling program

DROP-OFF COLLECTION

Number of sites: One (start-up in 1988)

Staffing: One part-time employee

Service Provider: City of Clifton DPW

Materials Accepted: Newspapers, magazines, telephone books, mail, paperback books, hardcover books without covers, other mixed paper, glass bottles and jars, aluminum beverage cans, cardboard boxes, food cans, aluminum plates and trays, #1 and #2 plastic bottles. Residents can deliver car batteries for recycling to the City Garage at no cost.

Participation Incentives: Mandatory recycling with enforcement

Sectors Served: Residential, commercial, institutional, and industrial (Recycling coordinator estimates 95% of material collected originates in the residential sector.)

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
2 Chippers	$46,990	Composting	1996
8 Street Vacuums[1]	$162,400	Composting	1996
5 Roll-off Containers (40-cubic-yard)[2]	$12,500	Recycling/Composting	1994-6
Leach Compactor Truck[1,3]	$76,000	Recycling Collection	1995
Tub Grinder[1]	$75,000	Composting	1995
Wildcat Windrow Turner[1]	$150,000	Composting	1992
Royer Screen[1]	$75,000	Composting	1991
Eager Beaver Trailer[4]	$15,000	Recycling Collection	1988
Eager Beaver Truck[1]	$26,000	Recycling Collection	1988
Leach Compactor Truck[3,4]	$72,000	White Goods/Brush Collection	1988
8 Open-Body Trucks[1,2]	$88,000	Composting	1985

[1]Purchased using capital funds
[2]Equipment also used for other DPW functions such as snow removal and salt and sand storage and road application
[3]25-cubic-yard packer
[4]Purchased from state recycling grant funds

Source: Institute for Local Self-Reliance, 1999.

Marketing agreements have been forged with local businesses for the sale of the materials. As per these agreements, the companies provide roll-off containers. They collect full containers and leave empty ones. This arrangement avoids the extra expense of MRF processing.

The city employs nine people who collect recyclables from the curb, multi-family dwellings, and the drop-off center. They also load recyclables into dumpsters for delivery to market.

Commercial Recycling Program

In 1996, Clifton recycled 68% of municipal solid waste generated in the private sector. The city's mandatory recycling ordinance, a strong recycling infrastructure in New Jersey coupled with high disposal costs, and assistance Clifton's recycling coordinator provided to businesses contributed to this success. The city mandates businesses to recycle newspapers, glass bottles and jars, window glass, steel and aluminum cans, high-grade and mixed paper, corrugated cardboard, plastic containers and film, motor oil, scrap metal, textiles, lumber, tires, lead-acid batteries, yard debris, food discards, white goods, tires, and antifreeze.

Three-person DPW crews collect recyclables in a five compartmented Eager Beaver truck. Paper is collected separately in a packer truck.

Clifton is near many companies that use recyclables as raw materials.

When mandatory recycling began, many businesses and institutions turned to the city for help. The recycling coordinator helped many businesses meet or exceed city requirements by locating markets for materials, performing informal waste audits to help reduce waste, and providing advice on complying with the recycling ordinance. Passaic County mandated businesses with over 100 employees perform waste audits and made staff available to assist companies in performing them.[2]

Composting Program

Clifton offers its residents curbside collection of grass clippings, leaves, brush, other yard and garden debris, and holiday trees. These programs divert 28% of the public sector waste stream.

Clifton shares a compost site for leaves and brush with the neighboring City of Rutherford. The site is located on Rutherford-owned land, about two miles from the center of Clifton. Leaves are composted in turned windrows and brush and wood are chipped. Clifton provides the equipment and labor to process the materials. Finished compost and mulch are free to residents.

Grass clippings are stored at the compost site and picked up by Nature's Choice, a local private composter, who sells compost commercially.

Education, Publicity, and Outreach

Every resident receives an annual recycling guide, which includes collection schedules, drop-off hours and accepted materials, and options for materials not accepted by the city. Local sponsors print and distribute the recycling guide at no cost to the city. Newspaper advertisements publicize program changes and the start of spring yard debris collection. Brochures on source reduction, grasscycling, and backyard composting are available. Clifton's recycling coordinator appears on a cable show every six months and gives free home composting classes once a year.

PUBLIC SECTOR WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/Customer/YR
Recycling Gross Costs	$461,397	8,449	$54.61	$15.75
Curbside and Drop-off Collection[1]	$388,003	8,449	$45.92	
Marketing	$1,647	8,449	$0.19	
Administration/Depreciation[2]	$49,661	8,449	$5.88	
Education/Publicity[3]	$22,087	8,449	$2.61	
Composting Gross Costs	$534,657	15,399	$34.72	$18.25
Collection	$327,680	15,399	$21.28	
Grass Clippings Processing	$61,000	5,535	$11.02	
Leaf/Brush/Wood Processing	$15,550	9,864	$1.58	
Administration/Depreciation[2]	$107,514	15,399	$6.98	
Education/Publicity[3]	$22,913	15,399	$1.49	
Waste Reduction Gross Costs	$996,054	23,848	$41.77	$34.00
Materials Revenues	($114,619)	23,848	($4.81)	($3.91)
Recyclables	($112,369)	8,449	($13.30)	
Leaf Mulch	($2,250)	15,399	($0.15)	
Net Waste Reduction Costs	$881,436	23,848	$36.96	$30.08

Note: Figures may not total due to rounding. No overhead costs are included. These costs are paid by the Department of Public Works and are not separable for recycling or composting. All collection and processing costs represent labor, vehicle repair, and office expenses only.

[1]Tons collected at curbside not separable from drop-off center tons. Collection costs include Christmas tree and large item costs. Costs for servicing drop-off center included in curbside costs. Salary of part-time staff member at the drop-off center is $13,000.

[2]Administration costs are salaries only for recycling coordinator and one clerical staff member. Recycling coordinator estimated one-third of his time is spent each on recycling, composting, and trash. ILSR estimated annualized costs for capital equipment used in the program.

[3]Clifton's education and publicity budget for 1996 was $45,000. It is impossible to calculate exact expenditures for recycling and composting as separate programs. ILSR estimated cost for each item based on collection and processing expenditures for each program. Source reduction education is also included in the $45,000.

TOTAL PUBLIC SECTOR WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/Customer/YR
Disposal Gross Costs	$4,325,967	30,363	$142.47	$147.64
Trash Collection[1]	$916,915	30,343	$30.22	
Transfer Station Tip Fees[2]	$3,385,859	30,343	$111.59	
Tire Marketing Costs	$1,193	20	$58.34	
Administration[3]	$22,000	30,363	$0.72	
Education/Publicity[4]	$0	30,363	$0	
Waste Reduction Gross Costs	$996,054	23,848	$41.77	$34.00
SWM Gross Costs	$5,322,021	54,191	$98.21	$181.64
Materials Revenues	($114,711)	54,191	($2.12)	($3.92)
Waste Reduction Revenues	($114,619)	23,848	($4.81)	
Tire Revenue	($92)	30,363	($0.00)	
Total SWM Net Costs	$5,207,310	54,191	$96.09	$177.72

Note: Figures may not total due to rounding.

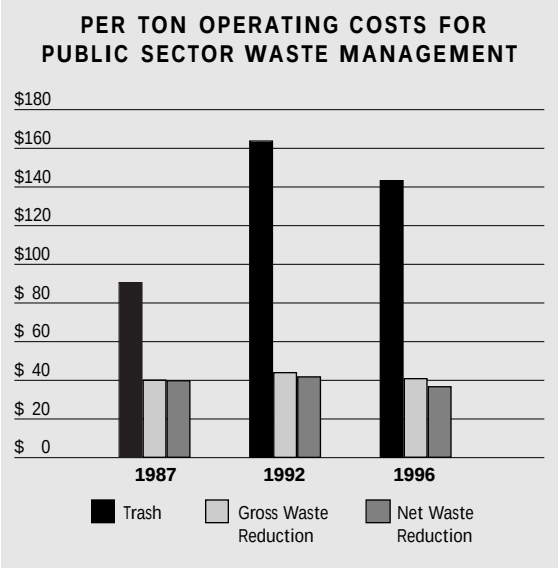
[1]Public sector trash collection performed twice weekly by contractor. Costs include bulky waste collection. Figure represents payment to contractor.

[2]Clifton's trash is delivered to the Pen-Pac transfer station six miles from Clifton.

[3]Administration costs include salaries of Clifton staff only.

[4]Clifton operates no education or publicity efforts aimed specifically at trash collection. The annual recycling guide includes information about the city's trash program but it is printed at no cost to the DPW.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

The recycling coordinator gives presentations to school groups about recycling and related environmental projects and distributes educational materials to classes upon request.

Clifton's "Clean Communities Program" is a broad-based program. It includes recycling education in schools and recycling litter.

Costs

Solid waste management costs cover: (1) contracts for trash services; (2) recycling collection and marketing; (3) yard debris collection and processing; (4) education and publicity; and (5) administration. Trash services accounted for 81% of the $5.3 million spent on SWM in 1996. Per ton costs for these services in the public sector are $142, largely due to high transfer station fees.

Clifton's waste reduction efforts cost much less than disposal; on average $55 per ton for recycling and $35 per ton for composting. In 1996, revenues from the sale of materials generated nearly $115,000, resulting in net solid waste management costs of $5.2 million dollars ($178 per household or business served).

Clifton employs approximately 15 FTE employees in its waste management programs; these employees earn an average of $32,000 per year.

Funding & Accounting Systems

Funding for city-provided trash services for both residences and eligible businesses is generated through the tax base and paid from the general fund. Recycling and composting programs are operated as a self-liquidating utility. The city transfers funds from the general fund and state grant revenues into a dedicated utility fund, which is used to finance the programs. This fund, tracked using cash-flow accounting, pays salaries of recycling and composting staff, vehicle repairs and maintenance, staff training, office supplies and equipment. Vehicle capital costs are paid out of city bond funds and fuel is supplied to vehicles by the DPW.

Future Plans and Obstacles to Increasing Diversion

Recycling contamination has decreased due to recently stepped up enforcement; most contamination still occurs among materials from multi-family dwellings. Enforcement is difficult in this sector because individual offenders cannot be identified.

Clifton's recycling coordinator believes the city's trash disposal figures may be inflated by several hundred tons by waste from surrounding communities, especially those with pay-as-you-throw trash systems, and contractors' waste. He plans to address this problem by aggressively identifying and prosecuting offenders for "theft of service."

Clifton has consulted with private contractors about processing trash to recover more materials. Currently New Jersey's lack of a clear flow control policy would make this difficult to implement.

Tips for Replication

Collect materials source-separated.

Enforcement of mandatory programs can boost both the quantity and quality of participation.

Notes:
[1]Costs per household in 1987 were converted to 1996 dollars using the GDP deflator.
[2]The County requirements were effective 1992 for businesses with >500 employees, 1993 for those with >250 employees, and 1994 for those with >100 employees.

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CROCKETT, TEXAS

Residential Waste Reduction

52%

Prior to 1992, Crockett contracted with a private company for the collection and disposal of all waste generated in the city. No materials were recovered for recycling or composting. The city took over trash management in 1992 in the belief that it could provide trash, recycling, and composting services at a lower cost than it had been paying for trash collection and disposal. In 1996, Crockett recycled 20% and composted 32% of its residential waste stream. This 52% diversion from disposal was achieved while per household costs were held relatively stable.

Source: Institute for Local Self-Reliance, 1999.

Crockett's mandatory, weekly curbside recycling and composting programs and the use of clear bags for trash, composting, and recycling have contributed to the city's high diversion level. Through a local ordinance, Crockett requires all residents to recycle 20 categories of materials and collect four others for composting. All residents have weekly, year-round collection service for recyclables and yard debris. The use of clear bags allows city staff to readily identify materials improperly prepared for recovery or trash containing recyclables. City staff will not collect improperly set out materials.

The net cost of solid waste services has decreased from $72 per household in 1991 to $69 in 1996. Program cost-effectiveness is enhanced by high diversion levels, which reduce the need for hauling trash to the landfill 55 miles away, the dual-collection of recyclables and yard debris, and the city processing and marketing its own materials. Crockett staff collect recyclables and yard debris on a single truck, which is more efficient than if two trucks and two crews were used to collect each material separately. Crockett processes all recyclables and yard debris in its own facility. The Solid Waste Director markets recyclables directly to end users. This arrangement reduces costs as most of Crockett's markets pay to transport the processed material. The city retains all revenue from the sale of material it collects and has created stable employment for residents in its processing facility.

PROGRAM SUMMARY

	1991	1996
Tons Per Year	3,450	2,711
Disposal	3,450	1,300
Diversion	0	1,411
Percent Diverted	0%	52%
Recycled	0%	20%
Composted	0%	32%
Average lbs./HH/day	6.10	4.51
Disposal	6.10	2.16
Diversion	0.00	2.35
Annual Disposal Fees		
Disposal	$32,912	$16,641
Net Program Costs/HH	$71.94	$68.71
Disposal Services	$71.94	$24.64
Diversion Services	$0	$44.07

Notes: 3,100 households served in 1991; 3,293 in 1996. 1991 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 8,300 (1996)
HOUSEHOLDS: 3,293 (1996); 2,834 in SFDs and duplexes, 459 in MFDs
BUSINESSES: 564 (1996)
LAND AREA: 6.29 sq. miles
HOUSEHOLD DENSITY: 523 households/sq. mile
AVERAGE PER CAPITA INCOME: $9,801 (1989)
MEDIAN HOUSEHOLD INCOME: $15,720 (1989)
COMMUNITY CHARACTER: Rural city in the Piney Woods of East Texas bordering National Forest to the east. One major employer with manufacturing and corporate offices in Crockett is Northcut Woodworks
COUNTY: Houston

WASTE REDUCTION

	Tons (1996)
Recycled[1]	532
Scrap Metal and White Goods	160
Mixed Paper	141
Glass[2]	91
Steel Cans[3]	66
Plastics[4]	48
Corrugated Cardboard[5]	41
Aluminum	6
Out-of-Town Drop-off[6]	-21
Composted/Chipped	879
Yard Debris[7]	879
Total Waste Reduction	1,411
MSW Disposed	1,300
Landfilled[8]	1,300
Total Generation	2,711
Percent Reduced	52.1%
Lbs. Waste/HH Served/Day	4.51

Notes:
[1]Represents tons marketed. Reject rate of 3% by weight subtracted.
[2]Crockett reported 93 tons of glass recycled with 2% originating in the commercial sector.
[3]Crockett reported 73 tons of steel cans recycled with 10% originating in the commercial sector.
[4]Crockett reported 50 tons of plastics recycled with 3% originating in the commercial sector.
[5]Crockett reported 273 tons of corrugated recycled with 85% originating in the commercial sector.
[6]Crockett reported 416 tons of material delivered to its drop-off facility, 5% of which was delivered by residents and businesses from outside Crockett city limits.
[7]Crockett estimated tons from 8,790 cubic yards at 10 cubic yards/ton.
[8]ILSR calculated disposal tonnage based on information provided by city. In 1996, two 25-cubic-yard trash trucks were filled each week with residential trash. Disposal was charged by cubic yard and was converted to tons using the conversion of one cubic yard of compacted MSW = 1,000 pounds (from the EPA document *Measuring Recycling: A Guide for State and Local Governments*). Crockett estimated each 25-cubic-yard truck truck to weigh eight tons rather than the 12.5 tons used by ILSR. Using Crockett's tonnage estimates, waste disposal drops to 832 tons in 1996, the waste reduction level jumps to 62.9% and per household generation drops to 3.73 pounds per day.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

In 1991, Texas set a state goal to recycle 40% of municipal solid waste (MSW) by January 1, 1994. The Legislature revised the goal in 1993 to a 40% reduction in MSW disposal using 1992 as the baseline year and adjusting for population growth. This new goal has no specific target date.

Crockett's local ordinance, effective February 1993, requires residents to use clear bags for trash, most recyclables, and yard trimmings. The ordinance requires residents to separate paper, glass, plastics, tin, aluminum, cardboard, leaves, brush, grass trimmings, and other yard debris from trash. The city can levy fines up to $2,000 for each violation.

Source Reduction

While Crockett has instituted no specific source reduction initiatives, residential waste generation per household is below other record-setting communities. This low generation may be due to Crockett's smaller than average household size and local conditions. Average household size in the U.S. is 2.69 persons; Crockett's average household size is only 2.52 persons. Per capita disposal of MSW in the Deep East Region of Texas is only 3.5 pounds per person per day, 54% of the average for the entire state.1 Crockett's per capita total municipal solid waste generation of 4.51 pounds per person per day is above the regional average. Furthermore, food discards account for 10.2% of the MSW stream in Texas, and Crockett residents discard very little food in their municipal waste.2 Many residents in this rural community keep animals and feed them their unwanted food. Crockett's Solid Waste Director reports trash collected in Crockett is very dry and contains very few food scraps.

Recycling Program

In 1996, Crockett recycled 20% of its residential waste. The Department of Sanitation collects 20 items at curbside for recycling (one additional category, oil filters, is collected at the drop-off only). Residents are required to place newspapers and other paper in a paper or clear plastic bag, to flatten and bundle corrugated cardboard, and to commingle other recyclables in clear bags. The clear bags allow collection crews to easily see contaminants mixed with recyclables. Collection crews tag improperly prepared materials to explain why they were not collected and leave them at the curb.

Two-person collection crews gather residential recyclables and yard debris weekly, year-round, on the same truck. Collection crews place recyclables at the front of the truck and yard debris at the rear. Upon arrival at Crockett's recycling center, which is less than a quarter of a mile from the city center, crews unload yard debris at the compost site then deliver recyclables to the Center's processing area. Local residents can also deliver recyclables to the recycling center.

Crockett's Department of Sanitation provides trash and recycling services to the city's commercial sector too. Commercial establishments recycle glass, plastics, steel cans, and corrugated cardboard.

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider:	City of Crockett Department of Sanitation
Start-up Date:	August 1992
Mandatory:	Yes, local ordinance became effective February 1993
Households Served:	All 3,293: 2,834 in SFDs and duplexes, 459 in MFDs (with three or more units)
Materials Accepted:	All paper items including corrugated cardboard, paperboard, newspaper, magazines, mail, office paper, and phone books, steel and aluminum cans, aerosol cans, aluminum foil and plates, glass bottles and jars, scrap metal, all plastics, white goods not containing freon, used motor oil
Collection Frequency:	Weekly
Set-out Method:	Newspaper, paperboard, magazines, and mail in clear plastic or paper bags, cardboard flattened and bundled, mixed recyclables in clear plastic bags, white goods and scrap metal set at curb beside recyclables, used oil set out in plastic jugs
Collection Method:	Two-person city crews collect recyclables and yard debris on the same 11-cubic-yard dump truck. Collectors place bagged and bundled recyclables near the front of the truck and bagged and bundled yard debris at the rear of the truck. Jugs of oil are placed on racks fitted on the side of the trucks.
Participation Rate:	Estimated at 80-90%
Participation Incentives:	Mandatory with potential fines of up to $2,000 for non-compliance
Enforcement:	Improperly prepared materials not collected, ordinance allows for a fine of up to $2,000 per day to be issued for "the commission of any act prohibited [by the ordinance and] the failure to perform any act required [by the ordinance]." No fines have been issued.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date:	August 1992
Service Provider:	City of Crockett Department of Sanitation
Households Served:	All 3,293
Mandatory:	Yes
Materials Collected:	Brush, leaves, grass clippings, other yard debris
Collection Frequency:	Weekly
Set-out Method:	Brush bundled, other yard debris in clear plastic bags
Collection Method:	Collected with recyclables. See collection method for recyclables.
Participation Rate:	~100% in fall; about 20-25% in "off" months
Participation Incentives:	Free finished compost for Crockett residents
Enforcement:	Same as recyclables

DROP-OFF COLLECTION

Number of Sites:	One
Staffing:	Staff always present when facility open (7:30 AM to 4 PM, Monday through Friday)
Service Provider:	City of Crockett Department of Sanitation
Materials Accepted:	All materials collected in the curbside program, plus used oil filters
Participation Incentives:	Mandatory recycling with possibility of fines
Sectors Served:	Anyone is welcome to use the recycling center. Crockett estimates 5% of the eight tons delivered weekly to the drop-off center are delivered by out-of-town residents

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
Ford Dump Truck[1]	$20,737	Trash/Recycling/Composting	1997
2 Conveyor Systems[2]	$31,614	Recycling	1995
Filter Crusher[2]	$2,050	Recycling	1995
Fork Lift[2]	$18,300	Recycling	1995
Front-end Loader[2]	$39,500	Composting	1995
Hobbs-end Dump Trailer[2]	$10,550	Recycling	1995
Self-Dumping Hoppers[2]	$4,450	Recycling	1995
Maxigrinder[3]	$194,982	Composting	1994
Baler[1]	$7,900	Recycling	1992
2 25-Cubic-Yard Compactor Trucks[1]	$176,200	Trash	1992
2 Ford Dump Trucks[1]	$45,772	Trash/Recycling/Composting	1992
Glass Crusher[4]	$0	Recycling	1992
Plastics Granulator[4]	$0	Recycling	1992
Mack Truck[2]	$40,200	Recycling	1990

Notes:
[1]Purchased out of the city's General Fund
[2]Purchased from grant funds
[3]Purchased using combination of grant and city funding
[4]Gifts from local businesses

Source: Institute for Local Self-Reliance, 1999.

The city owns and operates its own recycling processing facility, converted from a lumber enterprise. The next nearest recycling center is fifty miles from Crockett. Crockett's decision to implement recycling was taken in order to reduce the waste being hauled to the landfill, 55 miles distant. The establishment of its own recycling center allowed the city to institute recycling and decrease hauling distance. Paper is kept separate from the other recyclables and is baled on-site. A mechanical sorter removes steel cans, the remaining materials are manually sorted. Plastics, steel cans, and aluminum cans are baled. The MRF also has a granulator to process plastics. Glass is crushed. The reject rate for materials processed at this facility is approximately 3% by weight. Crockett's Solid Waste Director markets the materials directly to end users.

Yard trimmings composting in piles at Recycling Center

Composting Program

In 1996, Crockett composted 32% of its residential waste such as yard debris and brush, which are collected the same day as recyclables on the same truck.

City staff compost leaves, grass clippings, and other yard debris in piles, and grind brush into mulch. A front-end loader turns compost piles. Mulch and compost are given away to residents.

Education, Publicity, and Outreach

Crockett uses radio, newspapers, and written materials to publicize its waste reduction programs and to educate residents on how to properly participate. When the city's recycling program was first initiated, the city Solid Waste Director appeared on a local call-in radio program to explain the new system and answer residents' questions. Crockett periodically encloses pamphlets on waste reduction programs in residents' water bills. The tags left with uncollected materials also serve as an educational tool. The tag explains why material was left at the curb and how the resident should have prepared the material for collection.

Staff at City Hall answer inquiries about proper waste preparation over the telephone. At the beginning of the recycling program, the staff fielded around 80 calls per day. By 1997, only one or two calls a day were received.

Costs

Prior to implementing recycling and composting programs in 1992, Crockett paid a

private company to collect and dispose of its trash. In 1991, the cost (in 1996 dollars) to the city was $223,000 or $72 per household for residential service. In 1996, total solid waste costs were $250,254 but were offset by $24,000 in revenues from the sale of recyclables. Net solid waste management costs were $69 per household.

In 1996, net waste reduction costs were $103 per ton, trash collection and disposal were $62. Personnel costs and related overhead costs such as benefits are Crockett's largest expenditures. Therefore, the labor intensive processing center adds significantly to the gross per ton recycling cost. In 1996, material revenues partially offset this cost. Net recycling costs were $144 per ton. Composting costs were $78 per ton and trash costs, $62 per ton. In 1991, prior to the start of recycling and composting, trash collection and disposal cost $65 per ton.

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$100,554	532	$188.91	$30.54
Collection	$7,256	532	$13.63	
Recycling Processing[1]	$53,325	532	$100.18	
Administration/Overhead/Depreciation[2]	$39,9973	532	$75.10	
Composting Gross Costs	$68,575	879	$78.02	$20.82
Collection	$11,981	879	$13.63	
Processing[3]	$18,665	879	$21.23	
Administration/Overhead/Depreciation[2]	$37,929	879	$43.15	
Waste Reduction Gross Costs	$169,129	1,411	$119.84	$51.36
Materials Revenues[4]	($24,000)	1,411	($17.01)	($7.29)
Net Waste Reduction Costs	$145,129	1,411	$102.84	$44.07

Note: Figures may not total due to rounding. ILSR pro-rated personnel, administrative, and overhead costs, by using the following distribution of personnel as reported by Crockett's Solid Waste Director: The city has 14 total FTE staff who receive average yearly compensation of $13,839; eight employees spend 80% of their time on trash services, 5.8 FTE staff work collecting and processing recyclables, and 1.8 FTE staff work collecting and composting yard trimmings. The staff time was split among commercial and residential sectors based on the percent of total tonnage handled in each sector. ILSR pro-rated vehicle and equipment costs based on the percent of usage time spent in each waste management function.

[1]Represents labor costs, equipment and vehicle costs, and half of the rent of the recycling center site costs are pro-rated based on percent of total material processed that originated in the residential sector.

[2]Overhead includes fringe benefits, insurance, utility costs, travel, training, and uniform expenses.

[3]Represents yard trimmings collection and processing labor costs, equipment and vehicle costs, and half of the rent of the recycling center site.

[4]Crockett's Solid Waste Director estimated material revenue for residential recycling. Total Crockett revenues for 1996 were $30,868.

TOTAL SOLID WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$81,125	1,300	$62.40	$24.64
Trash Collection[1]	$24,878	1,300	$19.14	
Hauling[2]	$20,866	1,300	$16.05	
Landfill Tip Fees[3]	$16,641	1,300	$12.80	
Administration/Overhead[4]	$18,742	1,300	$14.42	
Waste Reduction Gross Costs	$169,129	1,411	$119.84	$51.36
SWM Gross Costs	$250,254	2,711	$92.30	$76.00
Materials Revenues[5]	($24,000)	1,411	($17.01)	($7.29)
Total SWM Net Costs	$226,254	2,711	$83.45	$68.71

Note: Numbers may not total due to rounding. ILSR pro-rated personnel, administrative, and overhead costs, by using the following distribution of personnel as reported by Crockett's Solid Waste Director: the city has 14 total FTE staff who receive average yearly compensation of $13,839; eight employees spend 80% of their time on trash services, 5.8 FTE staff work collecting and processing recyclables, and 1.8 FTE staff work collecting and composting yard trimmings. The staff time was split among commercial and residential sectors based on the percent of total tonnage handled in each sector. ILSR pro-rated vehicle and equipment costs based on the percent of usage time spent in each waste management function.

[1]Crockett residents receive twice weekly trash collection.

[2]Trash hauled to Angelina County landfill, 55 miles from Crockett.

[3]Tip fees at Angelina County landfill are $6.40 per cubic yard. Crockett tipped 2,600 cubic yards of residential trash in 1996.

[4]Overhead includes fringe benefits, insurance, utility costs, travel, training, and uniform expenses.

[5]Crockett reported revenues of $87,000 from the sale of its recyclables in 1996. The figure above represents 68.7% (the proportion of material recycled generated in the residential sector) of $87,000.

Source: Institute for Local Self-Reliance, 1999.

Source: Institute for Local Self-Reliance, 1999.

Crockett currently employs 14 staff members in its solid waste management program. The average wage of these employees is $14,000 per year.

Funding & Accounting Systems

A $13 monthly waste management fee charged to each household's utility bill and state grant money fund the Department of Sanitation residential waste management programs. This revenue is deposited in the city's general fund. The Department of Sanitation is fully funded at the start of each year from the general fund. Revenues from the sale of recyclables are held in a special fund intended for capital equipment purchases. Crockett tracks expenditures using cash flow accounting.

The Texas Natural Resources Conservation Commission (TNRCC) provides grants to support local and regional solid waste projects consistent with regional plans and to update and maintain plans. In fiscal year 1996, $10.2 million in TNRCC funds were allocated to regional governments who pass grants along to local programs.

The state's Solid Waste Assistance Partnerships (SWAP) program provides consultation and technical assistance to Clean Cities 2000 partners on solid waste management needs. Clean Cities 2000 includes 57 municipalities which have implemented comprehensive environmental programs, report significant reductions in landfill disposal and related cost savings, and get revenue from the sale of recyclables. Crockett is a Clean Cities 2000 partner. This membership has resulted in Crockett receiving bonus grant funds from the regional government.

Future Plans and Obstacles to Increasing Diversion

Identifying markets for materials has proven to be a barrier to expansion of the city's programs. In mid 1997, Crockett had stockpiled over 30 bales (~10 tons) of #3-7 plastics for which the Solid Waste Director had been unable to find a market. A market was located in late 1997. The Director has also considered adding polystyrene to the recycling collection program but is first trying to locate a market for the material.

Crockett has considered decreasing trash collection frequency from twice a week to once a week but the Solid Waste Director describes this as part of a "very long-term" plan. He believes residents would resist the change and, if it occurred, it would need to be implemented slowly.

Tips for Replication

Secure the best possible markets for recyclables. Crockett staff engage in a constant process of re-evaluating markets in an effort to balance high revenues with long-term stability.

Use clear bags to make evident to crews contamination of recyclables and failure to separate recyclables from trash.

Be creative. Crockett has developed a successful program on limited resources.

Allow residents to set out commingled materials. They like convenience.

Build positive relationships with the public. Crockett's Solid Waste Director is accessible to residents, who respond through consistent quality participation in the solid waste programs.

Notes:

[1]"Municipal Solid Waste Management in Texas: Status Report," Texas Natural Resource Conservation Commission, April 1997, p. 41. Very little recycling and waste recovery occurs in this region of Texas so waste disposal figures can be assumed to approximate waste generation.

[2]R.W. Beck and Associates, "1991 Recycling Rate and Market Research," Texas Water Commission, January 1993.

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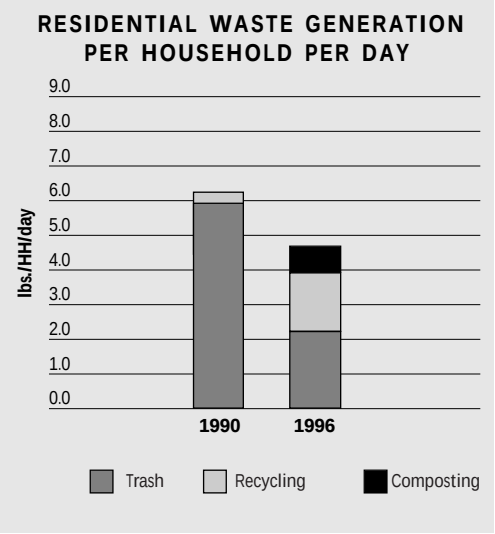
DOVER, NEW HAMPSHIRE

Residential Waste Reduction **52%**

In response to escalating costs of trash disposal and citizen pressure, the City of Dover opened a drop-off recycling center in 1990.[1] In September 1991 it began weekly curbside recycling service followed by a pay-as-you-throw (PAYT) system for trash the next month. Dover contracts with Waste Management of New Hampshire, Inc. (WMI) to provide trash, recycling, and fall leaf collection and to service the city's drop-off center. WMI also processes and markets the recyclables and yard debris. The curbside programs collect 20 categories of materials (including mixed paper, juice and milk cartons, and scrap metal); the drop-off site accepts 25 categories. In 1996 Dover diverted 52% of its residential waste; 35% through recycling and 17% through composting.



Source: Institute for Local Self-Reliance, 1999.

Convenient curbside residential recycling service on the same day as trash collection is critical to Dover's program success. The curbside program accounts for about 80% of the recyclable materials diverted. PAYT trash fees further encourage residents to divert as much waste as possible from disposal. The drop-off site accepts materials not collected at the curb and provides a free, regular outlet for residents' brush and other yard debris. Most yard debris is collected via the drop-off site; seasonal leaf collection represents about a quarter of the yard debris collected. The state yard debris landfill ban helped spur Dover to compost.

Dover's waste management system is more cost-effective than it was before curbside recycling and PAYT trash were implemented. The savings are due to the low cost of both recycling and composting compared to disposal and a reduction in total waste generation. In 1996, per ton costs for recycling were $75. Per ton composting costs were $27. In contrast, trash collection and disposal costs averaged $115. In addition, as a result of the PAYT system, Dover produced less total waste in 1996 than in 1990, even though the number of households served increased by more than 10%. On a per household basis, waste generation decreased by 24% and costs decreased by 40% (from $122 per household in 1990 to $73 per household in 1996). The combination of using cheaper waste management alternatives than disposal and producing less waste, reduced Dover's net residential waste management budget from over $1.1 million in 1990 to $798,000 in 1996.

PROGRAM SUMMARY

	1990	1996
Tons Per Year	10,838	9,462
Disposal	10,496	4,541
Diversion	342	4,921
Percent Diverted	3%	52%
Recycled	3%	35%
Composted	0%	17%
Average lbs./HH/day	6.18	4.71
Disposal	5.98	2.26
Diversion	0.19	2.45
Annual Disposal Fees		
Disposal	$789,489	$193,561
Net Program Costs/HH	$121.55	$72.53
Disposal Services	$121.28	$43.78
Diversion Services	$0.28	$28.75

Notes: 9,611 households served in 1990; 11,000 in 1996. Dover also serves 210 small businesses in its residential waste programs. 1990 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 25,042 (1990); 26,094 (1996); 27,000 (1997)
HOUSEHOLDS: 11,315 (1996); 5,641 SFDs (dwellings with four units or less), 5,674 MFDs
BUSINESSES: 275 (est.)
LAND AREA: 28.3 square miles
HOUSEHOLD DENSITY: 400/sq. mile
AVERAGE PER CAPITA INCOME: $15,413 (1989)
MEDIAN HOUSEHOLD INCOME: $32,123 (1989)
COMMUNITY CHARACTER: Small rural city, manufacturing economy. Principal businesses include Textron, Liberty Mutual, and Heidelberg Web Press
COUNTY: Strafford

RESIDENTIAL WASTE REDUCTION

	Tons (1996)
Recycled/Reused	3,308
Mixed Paper	1,891
Commingled Containers	1,193
Corrugated Cardboard	227
Light Iron/White Goods	218
Batteries	57
Office Paper	30
Beverage Glass	18
Aluminum/Steel Cans	7
HDPE/PET	6
Textiles[1]	NA
MRF Rejects[2]	-338
Composted/Chipped	1,612
Leaves and Other Yard Debris (Drop-off)	1,155
Leaves and Other Yard Debris (Curbside)	450
Clean Wood	7
Total Waste Reduction	4,921
MSW Disposed	4,541
Landfilled	4,203
MRF Rejects	338
Total Generation	9,462
Percent Reduced	52.0%
Lbs. Waste/HH Served/Day	4.71

Note: Figures above represent generation and recovery by 11,000 households and 210 small businesses in downtown area of city. Generation rate calculated using 11,000 as household figure. All businesses can use drop-off center but the non-residential materials are considered a negligible portion of total recovery. Numbers may not add to total due to rounding.

[1]Goodwill bin for collection of textiles at drop-off center. Tons collected not reported to town.

[2]Based on 10% reject rate on 3,371 tons of material (light iron and batteries excluded) as reported by WMI.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

Effective 1993, yard debris and wet-cell batteries were banned from disposal in New Hampshire landfills and incinerators.

New Hampshire has a goal to reduce per capita solid waste disposed 40% by weight by the year 2000 as compared to 1990. The goal is to be achieved through "source reduction, recycling, reuse, and composting, or any combination of such methods."[2]

The centerpiece of Dover's waste management policy is its PAYT system for trash. The city's "Integrated Waste Management Plan" states waste collection and disposal costs should be the responsibility of the generator, while the costs of recycling services are borne by the city. Local ordinance codified this policy through establishment of the city's per-bag fees for trash disposal.

All municipal trash customers must place trash in orange city bags or tag oversize items. Trash set out in other containers or untagged is not collected. Local stores carry the bags and receive 2¢ per bag or tag sold. The 15-gallon bags sell for $0.75 and the 30-gallon bags for $1.10; tags cost $2.75. WMI collects bagged or tagged trash under contract with the city.

Source Reduction Initiatives

Dover's "Integrated Solid Waste Management Plan" encourages residents to backyard compost but no specific program supports this. The Community Services Department provides home composting brochures.

Dover does not specifically address source reduction. According to the recycling coordinator, "Bag-and-tag does all that for us." Dover's per household waste generation figure is under five pounds per household per day, well below the national average of seven pounds per household per day.[3] Since PAYT trash fees were implemented, waste generation per household has decreased 24% by weight.

Recycling Program

Before 1990, Dover offered its residents no recycling program. A drop-off site was established in May of that year and voluntary curbside recycling service began in 1991. A month after curbside recycling began, the city instituted the PAYT system for trash. When curbside recycling began, Dover gave each single-family household a free 18-gallon bin for commingled recyclables. WMI provided multi-family dwellings with 65- or 95-gallon toters for recyclables. Residents can receive free collection of white goods and scrap metal on the first Wednesday of each month. They must first call to get on the city's collection list. In 1996, 35% of residential waste was recycled.

The Environmental Programs Division of the Dover Community Services Department[4] contracts with WMI to collect, process, and market recyclables. Recycling collection crews do not collect recycling bins containing visible contamination; stickers are attached to the bins explaining why the crew did not empty them. WMI's MRF is located at its Turnkey Landfill in Rochester, New Hampshire (six miles from Dover). Material is processed using magnets to separate steel, a blower to separate aluminum, and

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: Waste Management of New Hampshire (WMI)

Start-up Date: September 1991

Mandatory: No

Households Served: All residential structures eligible for service; 11,000 households are in program, 5,641 units in buildings with four or fewer units, 5,359 units in buildings with five or more units. Approximately 210 businesses in the downtown area are also served.

Materials Accepted: Newspaper, corrugated cardboard, paperboard, magazines and catalogs, mail, office paper, phone books, glass (brown, clear, green, and blue) food and beverage containers, metal food cans, #1 and #2 plastic bottles, juice boxes, milk cartons, aluminum foil and beverage cans. Large appliances and scrap metal collected separately by appointment.

Collection Frequency: Weekly, same day as trash

Set-out Method: Buildings with one to eight dwelling units: Paper in a reusable bin or in brown paper bags; corrugated, tied in bundles; other materials commingled in any bin that is clearly distinguishable from trash containers.

MFDs (nine or more dwelling units): 65- or 95-gallon toters, one for paper, one for containers

Collection Method: Recyclables collection: Side-loading 40-cubic-yard split packer trucks with single-person crew. Same truck used for SFDs and MFDs. Appliances and scrap metal collection: local contractor with pick-up truck

Participation Rate: A 1994 count by collection crews found 74% of residents were recycling at curbside

Participation Incentives: Reduced trash disposal costs through increased recycling

Enforcement: Stickers attached to any unacceptable materials, which are not collected. WMI estimates four or five bins stickered in Dover each day. If two violations are reported in 30 days, the recycling contractor has the right to discontinue recycling services to the offender. WMI has discontinued service to about 100 units, all in MFDs.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: 1992

Service Provider: Waste Management of New Hampshire (WMI)

Households Served: All Dover households eligible, all material set out at curbside in kraft and/or biodegradable plastic bags are collected

Mandatory: No

Materials Collected: Leaves and other soft yard debris (including grass clippings, garden plants, pine needles but excluding brush and woody debris), holiday trees

Collection Frequency: 1996: two weeks in spring and two weeks in fall, each household has collection once each week. Starting in 1997, leaf collection is offered fall only and holiday tree collection was discontinued.[5]

Set-out Method: Leaves and other soft yard debris bagged in bags provided free by city, holiday trees set at curb

Collection Method: Collected by single-person crew in 40-cubic-yard front-end load packer truck

Participation Rate: NA

Participation Incentives: Free biodegradable bags provided to residents, reduced trash fees through increased diversion

Enforcement: None

DROP-OFF COLLECTION

Number of sites: One, at DPW yard. Opened May 1990.

Staffing: Recycling coordinator staffs site when open (Tuesdays 2-5 PM, Wednesdays 8 AM-12 PM, and Saturdays 8 AM-2 PM)

Service Provider: Site operated by Dover Department of Community Services, serviced by Waste Management of NH

Materials Accepted: All materials collected at curbside except milk and juice boxes plus holiday trees, brush, tires, household and automotive batteries, construction and demolition materials, wood, empty aerosol cans, textiles, and oil filters

Participation Incentives: Reduced trash fees through increased recycling and composting

Sectors Served: Residential and small commercial enterprises, users must have vehicle permit stickers obtained free upon proof of Dover residency or business

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
2 Roll-off Containers[1]	$7,500	Composting	1997
5,500 Recycling Bins[2]	$8,400	Recycling	1991

[1]40 cubic yards each. Roll-off containers also used to haul sand and salt during winter months.
[2]Purchased using state grant funds.

Source: Institute for Local Self-Reliance, 1999.

hand sorting for the remaining materials. The current contract extends from March 1, 1995, to June 30, 2000, and is a flat fee contract under which Dover receives no revenue from the sale of recyclables. The MRF reports a 10% by weight reject rate for recyclables.

Composting Program

Dover diverts 17% of its residential waste from disposal through its voluntary composting programs. Residents can deliver leaves, brush, and other yard trimmings to the city's drop-off site. In addition, the city contracts with WMI for seasonal curbside collection of bagged yard debris.

Trash and recyclables set out at curbside

Dover distributes free bags through local stores for the curbside collection program. In 1996, the collection programs operated for two weeks in the spring and fall with each residence receiving four annual collections. As a cost-cutting measure, starting in 1997, collection is only offered the last week in October and the second full week in November on the same day as residents' trash collection.

Under a separate city contract, WMI processes the materials collected in both Dover's curbside and drop-off collection programs. WMI uses an in-vessel compost system adjacent to its Turnkey Landfill to process the material along with biosolids. (The compost site is about six miles from the drop-off site.) Finished compost is sold commercially in the Northeast under the trade name "All Grow."

Education, Publicity, and Outreach

The Dover Community Services Department produces fliers and newsletters about recycling and waste reduction. A city newsletter also covers program information, and city staff provide information at special community events.

Costs

In 1996, Dover's $798,000 solid waste management costs consisted primarily of contractor costs for trash collection and disposal (49%); recycling collection, processing, and marketing (31%); leaf collection (2%); and composting (1.5%). The city-purchased trash and leaf bags account for nearly 10% of the total solid waste budget; personnel, administration, and education costs make up the rest. The city employs two people full-time to track and administer the waste management system including contractor oversight.

Per ton trash costs have remained relatively constant since instituting the recycling and composting programs and switching to a PAYT trash system. Per ton costs for trash were $111 in 1990 and $115 in 1996. Overall budget savings have resulted from significantly lower per ton costs for waste reduction ($60 per ton in 1996) and reduced generation both for the city as a whole and per household. Dover's net residential solid waste management costs dropped from $1.1 million in 1990 to $798,000 while adding more than 1,000 customers. Per household costs were reduced from $122 in 1990 to $73 in 1996. These costs take into account the cost of inflation.

Funding & Accounting Systems

Dover's trash budget is operated as an enterprise fund, separate from other waste management services. Revenues are raised for the enterprise fund through the sale of trash bags and tags.

Dover's recycling and composting programs are financed through the tax base.

Dover tracks the costs of all its solid waste programs using cash flow accounting.

In 1989, New Hampshire instituted the Governor's Recycling Program (GRP), which initially made $1.5 million in grants available to municipalities for capitalizing recycling programs. Grants are no longer awarded but the program still provides waste reduction technical assistance, tracks data, promotes markets for materials, and supports innovation in waste reduction systems and technologies. In 1991, Dover received funds from the GRP, which it used to purchase recycling bins.

Future Plans and Obstacles to Increasing Diversion

A small increase in illegal dumping occurred when the bag-and-tag system was instituted. Prosecution of offenders is difficult because it requires eye-witness testimony.

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$272,340	3,646	$74.69	$24.76
Curbside Collection and Processing[1]	$230,000	2,985	$77.05	
Drop-off Collection[2]	$16,000	661	$24.20	
Administration/Overhead/Depreciation[3]	$23,840	3,646	$6.54	
Education/Publicity	$2,500	3,646	$0.69	
Composting Gross Costs	$43,900	1,612	$27.23	$3.99
Curbside Collection[4]	$13,500	450	$30.00	
Leaf Bags	$16,900	450	$37.56	
Drop-off Collection[5]	$0.00	1,162	$0.00	
Processing/Hauling[6]	$12,000	1,605	$7.48	
Administration/Overhead/Depreciation[7]	$1,000	1,612	$0.62	
Education/Publicity	$500	1,612	$0.31	
Waste Reduction Gross Costs	$316,240	5,259	$60.14	$28.75
Materials Revenues[8]	($0.00)	5,259	($0.00)	($0.00)
Net Waste Reduction Costs	$316,240	5,259	$60.14	$28.75

Note: Tonnage does not agree with table on page 84 as figures above include material rejected at MRF. Numbers may not add to total due to rounding.
[1]Contract cost with WMI of NH for weekly collection, processing, and marketing of recyclables from 11,000 households and 210 small businesses.
[2]Contract cost with WMI of NH for weekly collection, processing, and marketing of recyclables from drop-off center.
[3]Includes cost for 57% of salary for two full-time employees. Overhead costs for these employees borne by the Community Services Department.
[4]Contract cost with WMI of NH for collection of leaves in spring and fall.
[5]Drop-off for yard debris is unattended.
[6]Payments to WMI for collection of yard debris from drop-off and processing of all materials at its compost site.
[7]Includes cost for 2.5% of salary for two full-time employees. Overhead costs for these employees borne by the Community Services Department.
[8]Dover receives no revenue from materials marketed as per its contract with WMI.

TOTAL SOLID WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$481,606	4,203	$114.58	$43.78
Trash Collection[1]	$201,000	4,203	$47.82	
Bag/Tag Purchase	$60,370	4,203	$14.35	
Landfill Tip Fees[2]	$193,561	4,203	$46.05	
Administration/Overhead[3]	$16,075	4,203	$3.82	
Education/Publicity	$10,600	4,203	$252	
Waste Reduction Gross Costs	$316,240	5,259	$60.14	$28.75
SWM Gross Costs	$797,846	9,462	$84.32	$72.53
Materials Revenues	($0.00)	5,259	($0.00)	($0.00)
Total SWM Net Costs	$797,846	9,462	$84.32	$72.53

Note: Numbers may not add to total due to rounding.
[1]Contract cost with WMI of NH for weekly collection of trash.
[2]Dover pays tip fees to WMI based on actual tons disposed.
[3]Includes cost for 40% of salary for two full-time employees. Overhead costs for these employees borne by the Community Services Department.

Source: Institute for Local Self-Reliance, 1999.

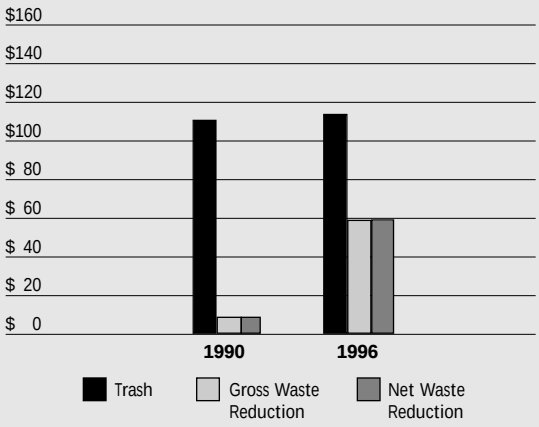
WMI collector loading recyclables into side-loading 40-cubic-yard split packer truck

White goods collected via on-call curbside collection service and stored on city property

The recycling coordinator would like to add food discards collection in order to increase diversion. The in-vessel composting system used at the Waste Management facility makes this feasible but a collection strategy needs to be developed.

Dover plans to continue an aggressive waste diversion program not just to save the city money in the short term but also to cushion itself against future costs. Dover's municipally-owned former landfill is on the Superfund National Priority List and the city has been assessed 70% liability for its clean-up. Dover city planners believe aggressive waste diversion decreases the potential for future public liability for the current disposal site.

PER TON OPERATING COSTS FOR RESIDENTIAL WASTE MANAGEMENT[6]



Source: Institute for Local Self-Reliance, 1999.

Tips for Replication

Institute a user-fee based program.

Research the bags to be used in a bag-and-tag system. It is important to have bags of the correct strength and size. Color is also important but could add unnecessary costs. (Dover's orange bags are distinctive but cost a few cents more per bag compared to blue or yellow. In retrospective, Dover would have chosen an alternative distinctive color that did not add unnecessary costs.)

Talk about waste reduction plans to all groups who will listen, including civic groups, the League of Women Voters, and Chambers of Commerce.

Include low-income residents in the program. Dover's low-income residents receive an allowance included in welfare checks to accommodate the cost of purchasing trash bags.

Establish a newsletter to regularly remind residents about the program and update them on any changes.

Track data.

Notes:

[1]Dover paid landfill tip fees of $16/ton in 1985; the fees rose to $65/ton in 1990.

[2]The state waste reduction goal is complemented by a requirement that waste disposed at state landfills be reduced at least 20% by weight through "removal of recyclable materials, composting, resource recovery, or any other method approved by the division of waste management, or any combination of such methods."

[3]Based on 4.4 lbs of MSW per person per day, 2.69 persons per household, and 60% of MSW generated in residential stream. See U.S. EPA, *Characterization of Municipal Solid Waste in the U.S.: 1996 Update*, May 1997.

[4]The Community Services Department provides public works services (i.e., water, sewer, snow removal, solid waste management, street and drain maintenance) and maintains community facilities (i.e., playgrounds, ice rink, swimming pools, ball fields).

[5]After fiscal year 1996, spring leaf collection was discontinued as a cost-cutting measure.

[6]Dover's 1990 recycling costs were under $10 per ton largely because the program was drop-off only and staffed by volunteers. WMI provided roll-offs and collected materials free of charge and retained the revenue from material sales.

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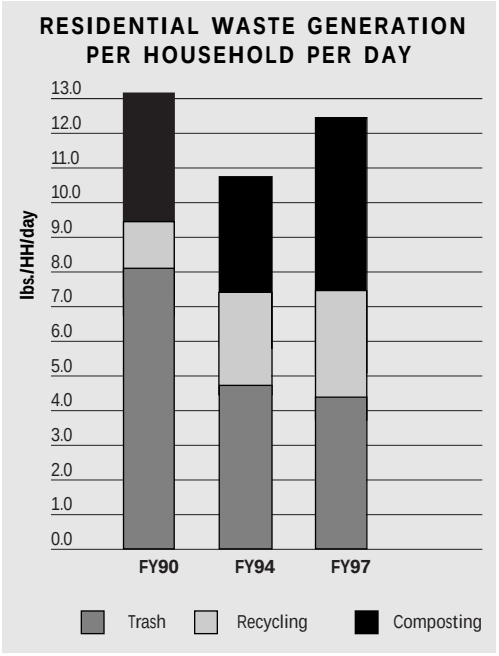
FALLS CHURCH, VIRGINIA

Residential Waste Reduction **65%**

Falls Church made a commitment to recycling in 1989 when it hired its first Recycling Coordinator. The position was originally intended to be temporary but eight years later, the same person holds the position and the program has grown under her leadership. Effective 1991, city code required the city to provide curbside recycling and yard debris services to all residents receiving city trash service. As a result, the city provides weekly trash and curbside recycling services, and brush, fall leaves, and bagged yard debris collection services to its residents. Falls Church's waste reduction rate increased from 39% in FY90 to 65% in FY97 (25% through recycling and 40% through composting). The biggest gain was in recycling, which rose from 10% to 25%. During the same period, per household trash disposal was cut nearly in half.



Source: Institute for Local Self-Reliance, 1999.

Drivers for Falls Church's waste diversion program are curbside collection of a wide variety of materials, year-round yard debris collection (especially the fall leaf program which accounts for 45% of the city's total waste diversion), and community involvement in education programs. The city provides curbside collection of 14 types of recyclables and four types of yard debris.[1] Falls Church is an old community with mature lawns and trees and yard debris is a significant component of its waste stream. The cornerstones of the city's education program are the Recycling and Litter Prevention Council (RLPC) and the "Recycling Block Captains" program in which over 100 citizen volunteers participate.

The city's waste reduction program is cost-effective due to a reduction in trash routes made possible by decreased trash generation, and a fee structure whereby increased recycling does not increase costs because the recycling contractor is paid per household served. Falls Church reduced trash collection from twice to once weekly in 1991, less than one year after the city started multi-material curbside recycling. As a result, the city cut the number of trash crew members from ten to seven.[2] Unlike recycling, trash and yard debris costs grow as these streams increase because of tonnage-based tip fees the city pays for their management. In the 1990s, the greatest increase in the city's diversion rate resulted from recovery of trash for recycling. As a result of these factors, Falls Church experienced a decrease in its solid waste management budget from $1.05 million in FY90 to $630,000 in FY97.

PROGRAM SUMMARY

	FY90	FY97
Tons Per Year	6,956	6,655
Disposal	4,259	2,316
Diversion	2,597	4,339
Percent Diverted	39%	65%
Recycled	10%	25%
Composted	29%	40%
Average lbs./HH/day	13.23	12.45
Disposal	8.10	4.34
Diversion	5.13	8.12
Annual Disposal Fees		
Disposal	$124,576	$110,654
Net Program Costs/HH	$372.21	$215.21
Disposal Services	$194.43	$104.30
Diversion Services	$177.78	$110.91

Notes: 2,880 households served in FY90; 2,928 in FY97. FY90 dollars adjusted to FY97 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 9,578 (1989), 10,000 (1996, estimate)
HOUSEHOLDS: 4,637 (1996); 2,194 detached single-family homes, 1,441 multi-family units, 431 townhomes, 571 condominiums
BUSINESSES: 1,200, 300 of which are home-based
LAND AREA: 2.2 sq. miles
HOUSEHOLD DENSITY: 2,108 households/sq. mi.
AVERAGE PER CAPITA INCOME: $26,709 (1989)
MEDIAN HOUSEHOLD INCOME: $51,011 (1989)
COMMUNITY CHARACTER: Small suburban city in metropolitan area of Washington, DC
COUNTY: Independent city, not in a county. The city is bordered by Fairfax County and Arlington County.

RESIDENTIAL WASTE REDUCTION

	Tons (FY97)
Recycled	1,684
Newspaper	894
Corrugated Cardboard/Paperboard	286
Glass	252
Mixed Paper/Phone Books	216
Cans	74
Ferrous Scrap/White Goods	58
Plastics	23
MRF Rejects[1]	-119
Composted/Chipped	2,655
Leaves[2]	2,035
Brush	411
Yard Trimmings	209
Total Waste Reduction	4,339
MSW Disposed	2,316
Incinerated	2,198
MRF Rejects	119
Total Generation	6,655
Percent Reduced	65.2%
Lbs. Waste/HH Served/Day	12.5

Note: Figures include trash and recycling from municipal buildings and 2,928 households (single-family detached housing, townhouses, and townhouse-style condominiums). An 80-unit condominium complex receives curbside paper service and a 50-unit condominium complex received recycling service in FY97. Recycling tonnages above do not include materials from these complexes. ILSR reduced drop-off tons as reported by Falls Church by 23% to exclude material delivered by non-residents, commercial and institutional establishments and residents not in the city's residential program. The 23% reflects the result of a 1992 survey in which recycling center users were polled as to their sector of origin.

[1]Based on 9% by weight of material processed at MRF rejected as nonrecyclable as reported by BFI.

[2]Falls Church calculated weight based on scale weight of an average truck load (3.25 tons/load) multiplied by 626 loads.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

The state has a limited role in community waste management. The Virginia General Assembly passed state recycling goals of 10% by 1991, 15% by 1993, and 25% by 1995.

Fairfax County enacted disposal bans at its facilities on white goods and brush (effective January 1991) and all other yard debris (effective 1992). (Falls Church disposes of its trash at Fairfax County's I-66 Transfer Station.)

Chapter 13 of the Falls Church City Code was re-written in 1991. The chapter title was changed from "Garbage and Trash" to "Solid Waste" and specifies that residents receiving trash service must also receive curbside recycling and yard debris services. Participation in the programs is voluntary.

The Falls Church code requires businesses with more than 200 employees or that produce more than 100 tons per year of waste to recycle and all businesses to file an annual report reporting tons recycled. The code requires apartment and condominium complexes to provide on-site recycling of newspaper, glass, and cans at least once every two weeks.

Source Reduction and Reuse Initiatives

In 1991, Falls Church began offering its residents backyard composting classes. As of November 1997, the recycling coordinator conducts classes when citizen requests indicate enough demand to fill a class. For the last few years the city has offered a leaf-cycling and composting demonstration once a year.

The city and the RLPC co-sponsored a textiles and clothing reuse/recycling pilot program in fall 1997, which collected six tons of materials. If a second collection event is successful, the city may establish an ongoing, semi-annual program. Falls Church supports other source reduction and reuse strategies in its publications and through referrals to private groups offering reuse programs.

Recycling Program

In FY97, Falls Church recycled 25% of its residential waste stream. The city provided each household in the residential program with a green bin for recyclables.[3] Under contract, Browning-Ferris Industries provides weekly curbside collection of binned and bagged recyclables. BFI processes collected materials at its MRF located in Newington, Virginia, 15 miles from Falls Church. Commingled materials are sorted with magnets to remove steel, an air classifier to remove aluminum and plastics, and a trommel to remove contaminants. Aluminum, plastics, and glass are further hand-sorted. Bags of paper from Falls Church arrive at the MRF in one truck compartment. Sorters remove bags of non-newspaper from the tipping floor and send it to a manual sorting line. The newspaper is baled. About 8-9% of material processed at the MRF is rejected.

City DPW crews collect white goods by appointment as part of the bulky waste collection program. Collected appliances are delivered to USA Waste of Northern Virginia (formerly Metro Recyclers) for recycling.

The city maintains a drop-off center for recyclables. Metro Recyclers serviced this facility until June 1997; the contract was then granted to Capitol Fiber.

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: Browning Ferris Industries for weekly recycling collection; Falls Church DPW for white goods collection

Start-up Date: Newspaper recycling began in 1970s. Program expanded to include glass, aluminum, and plastics in December 1990. Magazines, catalogs, and corrugated added in December 1993. In July 1995, the city added mixed paper, paperboard, and phone books.

Mandatory: No

Households Served: All those receiving city trash service (2,928 households including all single-family dwellings, townhouses, and townhouse-style condominiums) and a 50-unit condominium complex. The city provides paper collection to an 80-unit condominium complex.

Materials Accepted: ONP, magazines, catalogs, mixed paper (mail, copier and computer paper, colored and glossy paper, envelopes, folders, and note cards), OCC, paperboard, phone books, glass bottles and jars, metal cans, #1 and #2 plastic bottles, white goods

Collection Frequency: Wednesdays for commingled materials (residential trash collection is performed Monday through Thursday so approximately one-fourth of residents get same day recycling and trash services), white goods by appointment

Set-out Method: Each in own bundle or paper bag: (1) newspaper, magazines, catalogs, (2) mixed paper, (3) OCC and paperboard. Bundles set next to or in green 18-gallon bin, provided by the city. Phone books next to or in bin. Commingled in bin: glass bottles and jars, metal cans, #1 and #2 plastic bottles and jugs. White goods by appointment

Collection Method: Single-person crews collect recyclables in a 34-cubic-yard split side-loader (McNeilus body on a Peterbilt or International truck). The truck is split into two compartments, each taking up 50% of the truck volume. Two-person crews collect white goods and bulk trash in either a four-cubic-yard dump truck or a 24-cubic-yard clam truck

Participation Rate: 90% (conservative coordinator estimate)

Participation Incentives: Convenience

Enforcement: Contract requires collection crews to leave unacceptable items in bins with a written notice indicating the nature of the problem.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: Leaf and brush collection began in the 1970s. Other materials added 1993.

Service Provider: City of Falls Church Department of Public Works

Households Served: Those receiving city trash services only

Mandatory: No

Materials Collected: Grass clippings, brush, leaves, and other yard and garden debris

Collection Frequency: Bagged yard debris: Mondays from January through October, leaves collected Oct. 15 to Dec. 15. Brush is collected year-round except during leaf season. Brush and leaves collection crews follow routes getting as much done as possible and continuing from the ending spot the next day. (The amount of a route the collection crews can cover in a day varies immensely depending on number and volume of set-outs). Usually the brush collection crews cover the city every two and a half weeks.

Set-out Method: Grass clippings, twigs, leaves, and other yard and garden debris must be placed in 30-gallon paper bags and have collection sticker affixed. Sticker available at City Hall and Community Center for $0.50. Fall leaf collection: leaves raked to curb. Brush stacked or bundled and set at curb.

Collection Method: Bagged yard debris collected by two-person crews in 25-cubic-yard Loadmaster packer trucks. Leaf collection by four- to five-person crews using vacuum collectors attached to dump trucks. Brush collected by two-person crews in either 25-cubic yard packer truck or a 24-cubic-yard clam truck

Participation Rate: NA

Participation Incentives: Free leaf mulch, convenience of weekly collection for most of the year

Enforcement: Crews leave unacceptable items with a yellow tag indicating the nature of the problem.

DROP-OFF COLLECTION

Number of sites: One, the site is accessible 24 hours a day.

Staffing: None

Service Provider: Capitol Fiber

Materials Accepted: ONP, mixed paper (magazines, catalogs, mail), OCC, paperboard, glass bottles and jars, metal cans, aluminum foil and pie pans, #1 and #2 plastic bottles, phone books, scrap metal, some household batteries

Participation Incentives: Large amounts of materials (especially cardboard) are more easily prepared for drop-off than curbside collection

Sectors Served: All

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
ODB Vacuum Leaf Collector	$13,700	Composting	1997
Peterbilt Truck w/ 25-cubic-yard Loadmaster Packer	$104,000	Trash Collection	1997
200 18-Gallon Recycling Bins	$1,840	Recycling	1996
Volvo Truck w/ 25-cubic-yard Loadmaster Packer	$106,000	Trash Collection	1996
Ford Dump Truck (4 cubic yards)[1]	$47,406	Brush and Special Collections	1995
2 ODB Vacuum Leaf Collectors	$27,400	Composting	1994
Ford Dump Truck (4 cubic yards)[1]	$38,800	Brush and Special Collections	1990
GMC Truck w/ 25-cubic-yard Loadmaster Packer	$109,243	Trash Collection	1990
3,100 18-Gallon Recycling Bins	$13,622	Recycling	1990
GMC Truck w/ 25-cubic-yard Loadmaster Packer	$107,500	Trash Collection	1989
GiantVac Leaf Collector	$10,420	Composting	1988
Ford Clam Truck (24 cubic yards)	$45,127	Brush and Special Collections	1988

Note: Equipment was paid in full at the time of purchase out of city's general fund. DPW pays for use on a per mile basis, the cost of which includes purchase, fuel, insurance, and depreciation.
[1]Vehicles also used for non-MSW tasks.

Source: Institute for Local Self-Reliance, 1999.

Composting Program

In FY97, Falls Church composted 40% of its residential waste. The city encompasses many single-family homes with mature lawns and trees. Yard debris generation is more than five pounds per household per day. Residents must bag yard debris, such as grass clippings and plant materials, in kraft bags and affix a sticker, which cost 50¢ each. The city provides brush and fall leaf collections for no extra charge to residents. City crews collect yard debris, January through October; loose leaves, mid-October through mid-December; and brush year-round except during leaf season. The city delivers yard debris and brush to Fairfax County's I-66 Transfer Station (10 miles from Falls Church) for processing. The county tub-grinds brush on-site and allows free pick-up of mulch by county residents. The county transfers yard trimmings to a county-owned Manassas site operated by O. M. Scott under cooperative agreement. O. M. Scott windrow composts yard debris at the site and sells the finished product as commercial compost.

Falls Church crew performs fall leaf collection.

Falls Church hires a tub-grinding service to process leaves at the city's leaf storage area. The city gives the leaf mulch to residents on a self-haul or delivery basis. The city's free delivery service is especially popular among residents. The city gives extra leaves to Potomac Vegetable Farm, a local organic farm.

Education, Publicity, and Outreach

Falls Church's multi-faceted education and outreach program focuses on outreach through personal contact, written materials, and programs in schools and community groups.

Falls Church encourages volunteer participation through its Recycling and Litter Prevention Council (RLPC) and "Recycling Block Captain" programs. The RLPC is made up of a nine member executive committee and several task groups including youth education, business recycling, and textiles collection. Recycling block captains are citizens who distribute recycling information in their neighborhoods and serve as a liaison between them and the city.

"Operation Earthwatch," a program sponsored by the RLPC's Education Task Group and supported by other local groups encourages elementary students to reduce waste and perform other environmental activities. The RLPC has organized school field trips to the I-66 Waste Disposal Facility (the county trash transfer station, recycling drop-off site, and yard debris processing site) for elementary students as part of a comprehensive education program on waste.

Among brochures available to residents are "The 3 R's Directory," "The Recycler" newsletter, the

"What's the Law?" brochure, and the "City of Falls Church Recycling and Waste Reduction Guide." Most brochures are available at City Hall, the Community Center, the Library, and some local businesses. Videotapes on recycling-related issues are also available to schools and community groups.

WASTE REDUCTION COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$111,458	1,803	$61.83	$38.07
Curbside Collection and Processing[1]	$63,012	1,321	$47.70	
Drop-off Collection[2]	$1,961	424	$4.62	
Special Collections[3]	$8,298	58	$143.96	
Administration/Depreciation	$17,530	1,803	$9.72	
Education/Publicity	$20,657	1,803	$11.46	
Composting Gross Costs	$213,289	2,655	$80.33	$72.84
Brush Collection[4]	$66,385	411	$161.36	
Leaf Collection/Delivery[5]	$90,065	2,035	$44.27	
Yard Trimmings Collection[4]	$24,894	209	$119.05	
Leaf Processing[6]	$9,000	2,035	$4.42	
Tip Fees[7]	$16,698	620	$26.93	
Administration	$2,539	2,655	$0.96	
Education/Publicity	$3,707	2,655	$1.40	
Waste Reduction Gross Costs	$324,746	4,458	$72.85	$110.91
Materials Revenues	($0.00)	4,476	($0.00)	($0.00)
Net Waste Reduction Costs	$324,746	4,458	$72.85	$110.91

Note: Figures may not total due to rounding. FY97 started July 1, 1996, and ended on June 30, 1997. Recycling tonnage figure differs from figure in table on page 90 as figure above includes MRF rejects. Cost figures above include equipment depreciation and overhead and administration costs for the Recycling and Litter Prevention program. Overhead/administrative costs above this level are not included.

[1]Represents actual contract payment to BFI based on $1.78 per household per month for 2,950 households served. The actual count of households served differs slightly with 2,928 single-family homes, townhouses, and townhouse-style condominiums receiving city trash and recycling services. An additional 50-unit condominium complex receives full curbside recycling service and an 80-unit condominium complex receives recycling of paper only. Recycling tonnage represents material from 2,928 households served by both city recycling and trash programs only. The city's recycling contract extended from July 1,1995 to June 30, 1997, with three one-year extension options. The city has exercised its first option.

[2]Represents payments to Metro Recyclers. The contractor was paid $50 per pull at the site. ILSR pro-rated costs to reflect Falls Church tonnage only.

[3]Represents 50% of salaries and benefits for city staff performing bulky waste and white goods collections, and vehicle charges. Exact split of costs for trash versus white goods was not available but city estimates about half of material is white goods.

[4]City trash crews collect brush and other yard trimmings. ILSR calculated costs by pro-rating trash crew costs according to amount of time spent on yard trimming collection functions.

[5]Falls Church provides free home delivery of truckloads of leaf mulch as an extra service for city residents.

[6]Represents flat fee payment to private company for mulching leaves at city mulch site.

[7]Tip fees paid to Fairfax County for tipping of brush and other yard trimmings. FY97 fees were $25 per ton for brush and $30 for other yard trimmings. Tip fees cover transport and processing costs.

TOTAL SOLID WASTE MANAGEMENT COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$305,400	2,198	$138.97	$104.30
Trash Collection[1]	$190,857	2,198	$86.85	
Trash Hauling[2]	$11,762	2,198	$5.35	
Tip Fees[3]	$98,892	2,198	$45.00	
Administration/Education/Publicity	$3,889	2,198	$1.77	
Waste Reduction Gross Costs	$324,746	4,458	$72.85	$110.91
SWM Gross Costs	$630,146	6,655	$94.68	$215.21
Materials Revenues	($0.00)	4,476	($0.00)	($0.00)
Total SWM Net Costs	$630,146	6,655	$94.68	$215.21

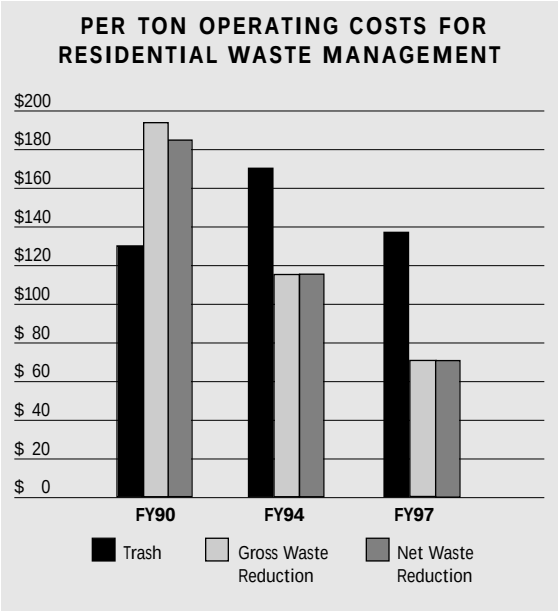
Note: Figures may not total due to rounding. FY97 started July 1, 1996, and ended on June 30, 1997. Figures above include debt service on equipment and overhead and administration costs for the trash collection and disposal program. Overhead/administrative costs above this level are not included.

[1]Two two-person city crews collect trash weekly.

[2]Represents fees city paid to private hauler.

[3]Trash disposed at the county-owned I-66 Transfer Station. FY97 tip fee $45 per ton. This facility is 10 miles from Falls Church, in Fair Oaks, Virginia.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

Costs

In 1996, the city spent about $630,000 for solid waste management — about $215 per household served. Of this, 48% was spent on trash collection and disposal, 18% on recycling, and 34% on yard debris collection and recovery. Falls Church receives no revenue from the sale of its materials. The city's recycling coordinator believes this arrangement is advantageous to the city because it was able to negotiate a low-cost collection contract (based on number of households served) and is cushioned from market fluctuations. On a per-ton basis, trash cost $139 and waste reduction cost $73 (recycling cost $62 per ton, and yard debris recovery, $80).

Components of the 1996 budget were personnel costs (54%), tip fees (20%), fees paid to contractors for services (13%), and equipment costs (9%). The city employs seven full-time employees to collect trash and yard debris. Hourly wages average $13.68 for crew members.

Funding & Accounting Systems

The Falls Church DPW receives its funds each year directly from the city's general fund. Revenue generated by the sale of yard debris stickers ($7,222 in FY97) and a yearly state litter control grant are deposited into the general fund.[4] The city owns the equipment used by the DPW; the Department is charged for its use. Falls Church uses accrual accounting techniques to track its expenditures.

Future Plans and Obstacles to Increasing Diversion

The city is continually exploring new opportunities for further waste reduction, such as the textiles and clothing reuse/recycling pilot program. Another program being planned is an educational campaign to encourage vermicomposting of food discards.

The RLPC's Business Recycling Task Group has initiated a new program aimed at the commercial sector, the Business Recycling Mentor Program, in which businesses recycling for a long time offer guidance to businesses just starting programs.

Central to the city's future plans is a commitment to sustain its strong education and outreach programs, at least at their current levels. The recycling coordinator believes the city's current waste diversion success is a result of the education program, and believes an on-going program is necessary to reach new residents and to keep long-term residents involved.

Tips for Replication

Community involvement and encouraging volunteers are critical to keeping residents motivated and participating.

Educate, especially target children. Children can have a big effect on a household's behavior.

Recover yard debris. In older, developed communities, such as Falls Church, yard debris comprises a high proportion of waste generated.

Make program participation convenient.

Notes:
[1]Three additional material categories are accepted only at the city's drop-off recycling center.
[2]Trash crews also perform brush, yard debris, and leaf collection. The reduction in trash services to once weekly resulted in the city using two two-person crews four days a week for trash collection as opposed to two three-person crews.
[3]Residents are provided with a free replacement bin in the event theirs is lost, damaged, or stolen.
[4]The state liter control grant has averaged $3,050 over the last nine years. The FY97 grant was $3,692.

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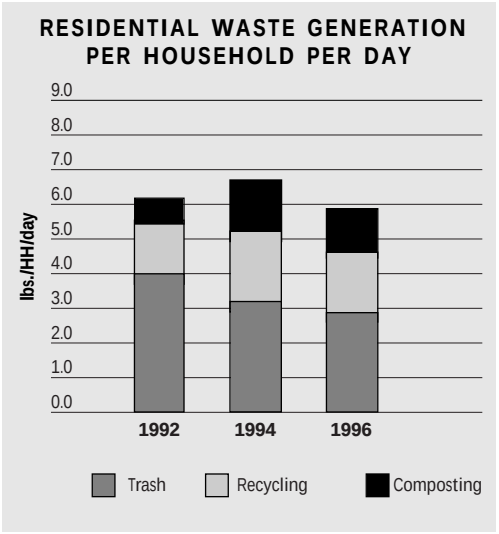
FITCHBURG, WISCONSIN

Residential Waste Reduction **50%**

Fitchburg has a long history of innovation in waste reduction programs. The city instituted the first mandatory recycling ordinance and the first multi-family recycling ordinance in Wisconsin and was the first city in the U.S. to implement curbside polystyrene collection.

Fitchburg contracts with Browning Ferris Industries to provide trash collection and disposal, recycling collection, processing and marketing, and curbside collection of non-woody yard debris. The city provides periodic brush collection. In 1996, Fitchburg diverted 50% of its waste from disposal (29% through recycling and 21% through composting).



Source: Institute for Local Self-Reliance, 1999.

Fitchburg achieved high waste reduction through recycling of many items, composting, and pay-as-you-throw (PAYT) trash fees. Residents can recycle 21 types of materials; 17 through their weekly curbside collection program; two through monthly collection of reusable goods (household durable items and textiles); one material collected (scrap metal) at drop-off only; and one material (white goods) collected by special appointment. Yard debris collection and drop-off programs accept leaves, grass clippings, and other yard and garden debris. A separate program collects and processes brush. PAYT trash rates serve as an incentive for decreased disposal. Solid waste disposal per household has dropped from four pounds per household in 1992 (before PAYT rates were initiated) to about three pounds per household in 1996.

Drivers for cost-effectiveness of the city's waste reduction programs include low costs associated with composting, inexpensive collection at drop-off sites, and a decrease in waste generation by residents. In 1996, per ton waste reduction costs were $101. Composting costs were only $78, well below the $100 per ton cost of trash collection and disposal. Drop-off recycling collection cost $7 per ton compared to $96 per ton for curbside collection; drop-off composting collection (and processing) cost $15 per ton, curbside collection (and processing), $117. Per household waste generation dropped 4% from 1992 to 1996, with trash disposal decreasing by a pound per household per day. As a result, Fitchburg disposed of less waste in 1996 than in 1992 despite a nearly 20% growth in households. Fitchburg's net solid waste management budget increased from $398,000 in 1992 to $417,000 in 1996 but per household costs decreased from $126 to $108 during the same period.

PROGRAM SUMMARY

	1992	1996
Tons Per Year	3,644	4,147
Disposal	2,379	2,079
Diversion	1,265	2,068
Percent Diverted	35%	50%
Recycled	24%	29%
Composted	11%	21%
Average lbs./HH/day	6.16	5.89
Disposal	4.02	2.95
Diversion	2.14	2.94
Annual Disposal Fees		
Disposal	$71,746	$72,666
Net Program Costs/HH	$126.48	$108.12
Disposal Services	$72.08	$52.51
Diversion Services	$54.40	$55.61

Notes: 3,243 households served in 1992; 3,860 in 1996. 1992 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 16,254 (1992), 17,266 (1996)

HOUSEHOLDS: 6,685 (1990); 3,057 single-family households and duplexes, 3,628 multi-family units. 7,500 (1996); 3,860 units in buildings with 1-4 units

BUSINESSES: 330

LAND AREA: 34.67 sq. miles

HOUSEHOLD DENSITY: 216 households/sq. mi.

AVERAGE PER CAPITA INCOME: $17,668 (1989)

MEDIAN HOUSEHOLD INCOME: $35,550 (1989)

COMMUNITY CHARACTER: Small city in the Madison metropolitan area with diverse character. The sections of the city nearest Madison are urbanized, other sections within the city limits are rural farmland. The city maintains an extensive park system, giving the community a rural flavor. Principal employers include Certco, Nicolet Instrument Corp., Promega Corp., Nicolet Biomedical, Inc., Placon Corp., and General Beverage Sales.

COUNTY: Dane

RESIDENTIAL WASTE REDUCTION

	Tons (1996)
Recycled	1,185
Newspaper	434
Glass	211
Magazines	186
Mixed Paper	179
Corrugated Cardboard	74
Scrap Metal[1]	38
Steel/Tin	37
HDPE	36
Aluminum	25
PET	15
Polystyrene	6
Other Plastics	4
Reusable Items[2]	NA
White Goods[3]	NA
MRF Rejects[4]	-60
Composted/Chipped	883
Yard Trimmings (Drop-off)[5]	534
Brush[6]	186
Yard Trimmings (Curbside Collection)[7]	163
Total Waste Reduction	2,068
MSW Disposed	2,079
Landfilled	2,019
MRF Rejects	60
Total Generation	4,147
Percent Reduced	49.9%
Lbs. Waste/HH Served/Day	5.89

Note: Figures include only waste handled by Fitchburg's city-sponsored single-family residential waste programs. Waste generated in residences with more than four units and yard debris handled at county sites are not included.

[1]Total scrap metal collected was 50 tons. The Project Manager reported some non-residential scrap was collected but conservatively estimated residential scrap as 75% of total.

[2]Tons not tracked. Fitchburg estimates collection was under two tons.

[3]Tons not tracked by city or hauler.

[4]Based on average 5% by weight reject rate at MRF.

[5]Estimated tons using 96 10-cubic-yard loads of grass trimmings with an estimated density of 600 pounds per cubic yard and 164 10-cubic-yard truckloads of leaves with an estimated density of 300 pounds per cubic yard.

[6]Fitchburg estimated weight using 99 6-cubic-yard loads of chips produced from material collected, at a density of 625 pounds per cubic yard.

[7]Actual scale weights as reported by BFI.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

In 1989, Dane County banned newsprint from its landfill.[1] In 1993, the state modeled its laws on the Dane County ordinance when it banned yard debris from Wisconsin landfills. Effective 1995, all plastic, steel, glass, and aluminum containers; paperboard; polystyrene packaging; corrugated cardboard; newspaper and other paper; and tires were banned from Wisconsin landfills. The state subsequently allowed a temporary exemption for #3 through #7 type plastics. Communities determined by the Wisconsin Department of Natural Resources to have an "effective recycling program" are exempted from the bans. The state has no recycling goal.

Fitchburg's Solid Waste and Recycling Ordinance requires all occupants of residential and commercial property in the city to separate recyclables from trash. The ordinance specifies 16 categories of material as recyclable, details proper preparation methods for the materials, requires owners of multi-family dwellings with five or more units to implement a recycling program, and prohibits delivery of recyclables to any disposal facility. The Public Works Director or a designated representative may inspect recyclable materials, trash, collection areas of multi-family residences and businesses, and waste management facilities. The city can levy fines against anyone who delivers materials collected for recycling to a solid waste disposal facility. It can also fine other violators of the ordinance from $10 to $1,000. To date, fewer than 10 individuals and no businesses have been fined.

All residents pay an annual base rate for trash, recycling, and yard debris services. The FY97 fee is $82 per household and covers collection and disposal of up to one 32-gallon trash can per week. Weekly collection of one 64-gallon container costs an extra $34.68 per year; a 95-gallon container costs $60.96 extra. Approximately 13% of residents subscribe to service above the base level. Residents with occasional extra trash can use trash tags.[2] The city annually provides households with ten free trash tags, which can be attached to an extra container of trash. Additional tags ($1.50 each) are available at local retail stores, the utility district office, or City Hall.

Source Reduction and Reuse Initiatives

After PAYT trash rates began in 1994, per household MSW generation decreased 4% by weight (from 6.16 pounds per household per day in 1994 to 5.89 pounds in 1996.)

Fitchburg encourages residents to compost at home. The city sold approximately 400 composting bins at a reduced price in 1996 and another 50 in 1997. The city also encourages residents to use mulching mowers through publication of articles about mulching mowers and their benefits in its recycling newsletter.

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: BFI

Start-up Date: Voluntary recycling began 1987, mandatory program with weekly collection began 1988

Mandatory: Yes, effective 1988. Requirement includes all materials collected at curbside except household durable goods.

Households Served: 3,860, all units in buildings with four or fewer residences

Materials Accepted: Glass bottles and jars, steel and aluminum cans, all plastic containers, #4 plastic container lids, rigid and foam polystyrene, newspapers, white paper, mail, magazines, paperboard, phone books, brown paper bags, corrugated cardboard, reusable household items (e.g., clothing, books, small appliances, housewares, and toys), and white goods. Reusable items must fit into a 32-gallon clear plastic bag and be in reusable condition.

Collection Frequency: Weekly, same day as trash. White goods collected by appointment on Thursdays for a $35 fee. Reusable items once monthly on special collection days.

Set-out Method: Yellow and green stackable 12-gallon bins . Commingled containers and bagged polystyrene foam in the yellow bin, newspaper in the dark green bin, mixed paper in a kraft bag beside bins, and flattened corrugated cardboard placed under the bins. Even if they only have cardboard for recycling on a particular week, residents are asked to place the material in or under a bin so the material will be noticed by collection crews. Reusable items in clear plastic bags. Additional recycling bins can be used for extra commingled containers or newspapers.

Collection Method: Single-person crew collects material into a two-compartment 38-cubic-yard side-loading LaBrie truck with an adjustable divider. Durable goods are collected separately by a single-person crew using a pick-up truck. Single-person crew using a flat-bed truck with boom collects appliances.

Participation Rate: 98% from consultant study reflecting data collected in 1996

Participation Incentives: Reduced trash fees through decreased disposal, potential fines for non-compliance with mandatory participation requirements

Enforcement: Mandatory program with potential fines up to $1,000 for non-compliance. Fewer than 10 individuals have received fines for failure to recycle. Collection crews leave unacceptable materials and contaminated recyclables in the recycling bin with a card explaining why they did not collect materials.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: 1989

Service Provider: Public Works collects brush, BFI collects other yard debris

Households Served: 3,994 for yard debris collection, 7,500 for brush collection

Mandatory: Yes

Materials Collected: Leaves, grass clippings, brush, and other yard debris, and holiday trees

Collection Frequency: Four times yearly for yard debris (once in each of April, May, October, and November) and eight times yearly for brush and holiday tree collection (once in each of January, April, May, June, August, September, October, and November)

Set-out Method: Yard debris in bags or cans, brush bundled, bare holiday trees (not bundled or cut)

Collection Method: Single-person crew collects yard debris into a 25-cubic-yard manual rear-load packer truck. Two-person crews collect and chip brush using a Ford F350 truck with service body pulling a Vermeer chipper.

Participation Rate: NA

Participation Incentives: Reduced trash fees through decreased disposal, potential fines for non-compliance with mandatory participation requirements, yard debris not collected if mixed with trash or set out for trash collection

Enforcement: Potential fines for failure to comply with ordinance, fines have been issued for piles of unbundled brush in public view

DROP-OFF COLLECTION

Number of sites: Fitchburg operates a drop-off site at City Hall. Two county sites are also conveniently located for Fitchburg residents.

Staffing: None

Service Provider: Department of Public Works

Materials Accepted: Leaves, grass clippings, fruits, flowers, vegetables and other yard and garden debris; mixed paper including mail, corrugated cardboard, newspaper, paperboard, kraft paper bags, office paper, and magazines; and scrap metal

Participation Incentives: Reduced trash fees through decreased disposal

Sectors Served: All sectors (note: commercial/institutional materials are excluded from Fitchburg's 50% diversion level)

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
New Holland 675 Spreader[1,2]	$900	Composting	1997
Case 1840 Skid Steer Loader	$17,884	Composting	1996
400 Composting Bins[3]	$13,069	Home Composting	1996
Ford Explorer	$20,051	Recycling/Composting	1996
Case 821B Loader	$127,700	Composting	1995
Ford F150 Truck[4]	$13,541	Recycling/Composting	1993
Ford F350 Truck with Service Body	$28,517	Composting	1991
International Dump Truck[5]	$64,382	Recycling	1991
Vermeer Chipper	$14,708	Composting	1990
9,000 Recycling Bins[6]	$45,405	Recycling	1987
John Deere Skid Steer Loader[1,4]	$6,500	Composting	1985
Case 440 Tractor[7]	$4,000	Composting	1965

Notes: Unless otherwise noted, equipment purchased out of capital funds.
[1]Purchased used.
[2]Purchased out of operating budget.
[3]Purchased out of operating budget. The city sold the bins at a 20% subsidy, recovering 80% of this expenditure.
[4]Retired 1996.
[5]Used for composting until 1997, currently used only occasionally in recycling program.
[6]Purchased from state loan funds.
[7]City contact estimated purchase price and date. Before compost program was started, tractor was in storage.

Source: Institute for Local Self-Reliance, 1999.

BFI collects reusable household items at curbside. Once a month, the hauler collects clothing, toys, books, tools, linens, small appliances, housewares, and any other reusable household item residents place at the curb in clear plastic bags on their regular recycling day. BFI donates all collected items to the St. Vincent DePaul Society charity. Fitchburg supports reuse of items not collected at curbside, such as appliances, furniture, or anything else that will not fit into a 30-gallon bag, by providing residents information on charities that do accept the items.

Recycling Program

In 1996, Fitchburg recycled 29% of its residential waste. The city provides two color-coded stackable recycling bins to all new homes. Residents can purchase additional or replacement bins for $7.50 each.

BFI uses a 38-cubic-yard split side-loading truck to collect recyclables.

Fitchburg contracts with BFI to provide residential curbside recycling. BFI delivers collected materials to Green Valley in Waunakee, Wisconsin, (25 miles from Fitchburg) for processing and marketing. At Green Valley, staff sort paper manually. Magnets and eddy currents remove steel and aluminum from commingled recyclables. Remaining materials are sorted manually. The reject rate at the MRF is 5% by weight. Under its BFI contract, the city would receive 80% of revenues.[3]

Fitchburg does not provide solid waste services for apartment buildings with five or more units. Building owners must contract privately for trash and recycling services. Local ordinance requires residents of apartments to recycle the same materials as residents of single-family homes.

Composting Program

In 1996, Fitchburg composted 21% of its residential waste stream. The city contracts with BFI to provide curbside leaf, grass clipping, and other non-woody yard debris collection four times a year. BFI delivers yard debris to the Columbia County mixed waste composting facility (50 miles from Fitchburg). Composting facility staff compost yard debris with mixed trash in an in-vessel composter. Finished material is land spread on area farms.

Residents can deliver non-woody yard debris to a drop-off center located at Fitchburg City Hall. City staff remove contaminants and land spread it.[4]

The city provides curbside brush collection seven or eight times a year to all Fitchburg residents (including those in multi-family dwellings). Two- or three-person crews using pick-up trucks and tow-behind chippers collect and chip the material. The chips are given away to residents.

Education, Publicity, and Outreach

The centerpiece of Fitchburg's outreach is the "Fitchburg Recycling Update," a newsletter published three or four times a year. The newsletter contains information about collection programs, changes in program hours, collection methods, and materials accepted. Every household served by the city's solid waste programs receives the newsletter.

When PAYT trash rates began, Fitchburg produced and direct-mailed a "Homeowner's Guide to Solid Waste Disposal."

The DPW Project Manager performs waste assessments for businesses and institutions and gives

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$146,096	1,246	$117.28	$37.85
Curbside Collection and Processing[1]	$98,978	1,030	$96.13	
Drop-off Collection[2]	$1,449	216	$6.70	
Drop-off Processing and Hauling[3]	$355	1,246	$0.29	
Administration/Enforcement/Depreciation[4]	$33,581	1,246	$26.96	
Education/Publicity[5]	$11,733	1,246	$9.42	
Composting Gross Costs	$68,564	883	$77.69	$17.76
Curbside Collection and Processing[6]	$40,900	349	$117.36	
Drop-off Collection and Processing[7]	$8,216	534	$15.38	
Administration/Enforcement/Depreciation[4]	$16,637	883	$18.85	
Education/Publicity[5]	$2,811	883	$3.19	
Waste Reduction Gross Costs	$214,660	2,128	$100.86	$55.61
Materials Revenues	($0)	2,128	($0)	($0)
Net Waste Reduction Costs	$214,660	2,128	$100.86	$55.61

Note: Tonnages do not correspond with those on the table on page 96, as they represent materials collected and include MRF rejects. Figures may not total due to rounding. Figures above include depreciation on equipment and limited overhead and administrative costs within the Department of Public Works. Overhead/administrative costs above the Department level are not included. Source reduction education and publicity costs are not separable from recycling and composting costs and are included in those line items. Numbers may not add to total due to rounding.

[1]Represents contract costs with BFI for weekly curbside collection and processing, and staff costs for Fitchburg Project Manager.
[2]Represents salaries and benefits for Fitchburg staff at drop-off site.
[3]Represents salaries and benefits for Fitchburg staff.
[4]Includes salaries, benefits, office supplies, consulting services, equipment depreciation, and staff travel and training costs.
[5]Includes salaries, benefits, printing costs, and office supplies.
[6]Represents contract costs for collection services performed by BFI, staff salaries and benefits, and equipment costs for city collection and processing.
[7]Represents staff salaries and benefits, and equipment costs for drop-off collection and processing of collected material.

TOTAL SOLID WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs[1]	$202,701	2,019	$100.42	$52.51
Trash Collection	$130,035	2,019	$64.42	
Landfill Tip Fees[2]	$72,666	2,019	$36.00	
Administration/Enforcement[3]	NA	2,019	NA	
Education/Publicity[4]	NA	2,019	NA	
Waste Reduction Gross Costs	$214,660	2,128	$100.86	$55.61
SWM Gross Costs	$417,361	4,147	$100.65	$108.12
Materials Revenues	($0)	2,128	($0)	($0)
Total SWM Net Costs	$417,361	4,147	$100.65	$108.12

Note: Disposal tonnages do not correspond with those on the table on page 96, as they represent materials collected and exclude MRF rejects. Numbers may not total due to rounding. Figures above include equipment depreciation. Overhead/administrative costs above the DPW level are not included.

[1]Contract payment to BFI totaled $202,701 and includes collection and tip fees for disposal.
[2]Costs reflect tip fee at Dane County Landfill, which is 12 miles away.
[3]Very little Fitchburg staff time is spent overseeing trash program. All staff time spent on waste programs is included in waste reduction costs above.
[4]Trash education and publicity not separable from waste reduction education activities and are included in those figures.

Source: Institute for Local Self-Reliance, 1999.

Source: Institute for Local Self-Reliance, 1999.

presentations to schools and civic organizations about waste management.

Fitchburg also promotes its programs via videos shown on cable TV and press releases distributed to local radio, television, and print media.

Costs

In 1996, the city spent about $417,000 for trash, recycling, and yard debris services — about $108 per household served. Of this, about 49% was spent on trash collection and disposal, 35% on recycling, and 16% on yard debris collection and recovery.

On a per-ton basis, trash cost $100 and waste reduction cost $101 (recycling cost $117 per ton and yard debris recovery, $78). The largest components of the 1996 budget were contract costs (79%) and personnel costs (11%).

The DPW's budget rose during the last decade; so did the population and number of households served. When the cost of inflation is taken into account, average per household costs for waste management services have decreased from $126 in 1992 to $108 in 1996. During this same period, landfill tip fees increased 17% in real dollars.

Funding & Accounting Systems

Residents pay an annual fee of $82, assessed on property tax bills, to fund solid waste management services. Subscribers of trash service levels above the base service level of one 32-gallon trash can per week must pay additional fees. Recycling and yard debris services are also funded through state grants. The solid waste management fees and grants are maintained in an enterprise fund. Enterprise fund expenditures are tracked using accrual accounting.

Future Plans and Obstacles to Increasing Diversion

The Project Manager believes the city is collecting everything that can be cost-effectively collected, processed, and marketed. To increase its diversion rate among the homes served, the city must increase recovery of the materials it already collects.

As of late 1997, Fitchburg was engaged in a comprehensive waste planning process. If state funding expires, the city will need to replace these revenues with increased fees or decreased costs and is currently considering options to maintain a positive balance in its enterprise fund over the long term.

Tips for Replication

Listen to your line employees. Workers know the system and its strengths and weaknesses. For example, a Fitchburg staff member and farmer suggested using a manure spreader to land spread yard debris from the city's drop-off site. Doing so saves both time and money.

Get your hands dirty. Management can sometimes gain insight concerning problems and opportunities by working on collection routes and poking around in containers.

Don't reinvent the wheel. Talk with other recyclers when faced with problems. Most likely someone else has encountered a similar problem and can offer advice.

Optimize. Never stop striving to improve; there's always room for improvement.

Notes:

[1]Ferrous metal cans, aluminum cans, OCC, glass bottles and jars, HDPE plastic bottles and tubs, PET plastic bottles, large appliances, used oil, grass clippings, leaves, brush, tires, and lead-acid batteries were banned in 1991.

[2]By appointment, Fitchburg's trash hauler, BFI, will also collect large amounts of trash at the rate of $10 per cubic yard, appliances for $35 each, and all pieces of furniture that weigh more than 20 pounds for $10 each.

[3]In 1995 and 1996, BFI received no revenue from Fitchburg recyclables. The Project Manager believes the company's deal with the processor grants them a reduced tip fee rather than a share of revenue from sales.

[4]Fitchburg owns 27 acres of land surrounding the City Hall. City staff land spread the yard debris on about five acres of this land.

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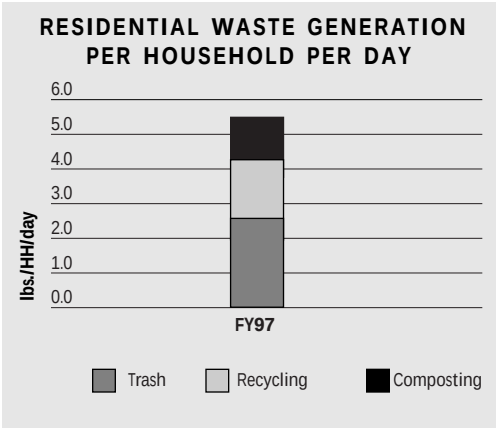
LEVERETT, MASSACHUSETTS

Residential Waste Reduction **53%**

In the late 1980s, Leverett faced the necessary closure of its landfill and the need to ship its waste to another disposal facility. In 1988, Leverett banned disposal of paper, cans, and glass in its landfill and began recycling these commodities. In 1990, Leverett began shipping its recyclables to a state-developed MRF in Springfield, Massachusetts. Recycling extended the life of the existing landfill by two years and reduced hauling and disposal costs to the new facility after the landfill closed in 1993. In FY97, Leverett residents diverted 53% of their residential waste from disposal — 31% through recycling and 23% through yard debris diversion.



Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 1,908 (1996)
HOUSEHOLDS: 650 (1996); all single-family homes and duplexes
BUSINESSES: 3
LAND AREA: 23 square. mi.
HOUSEHOLD DENSITY: 28.3 per sq. mile
AVERAGE PER CAPITA INCOME: $19,254 (1989)
MEDIAN HOUSEHOLD INCOME: $45,888 (1989)
COMMUNITY CHARACTER: Rural
COUNTY: Franklin

Leverett's recycling system, like its trash program, operates on a drop-off basis. The town's Recycle/Transfer Station is located on the site of its former landfill. Residents can deliver recyclables to this facility free of charge but must pay a per-bag fee for their trash.

A town yard debris ban, acceptance of 25 materials for recycling and reuse, and the pay-as-you-throw (PAYT) trash fees have contributed to Leverett's 53% waste reduction level. Yard debris is not managed by any town program, but it is barred from disposal at the town's Recycle/Transfer Station. Residents manage their own yard debris materials. The Recycle/Trash Station accepts all materials processed at the Springfield MRF and provides other programs for the recycling of batteries, textiles, household durables, paint, and appliances. Residents are encouraged to divert as much waste as possible through these programs; otherwise, they must pay per-bag fees for disposal.

Leverett's current waste management system is cost-effective compared to the costs of operating its own landfill and disposing of all the town's waste. Costs to operate the landfill in FY87, before the town's expanded waste reduction program began, were nearly $55,000 or $84 per household. Current costs average only $58 per household ($53 per household when revenues from recyclables are included). The town's PAYT trash fees, lack of tip fees for recycled materials, and reuse programs contribute to this cost-effectiveness. On a per-ton basis, trash costs $91 while net recycling costs are only $36 per ton. Part of the difference in trash and recycling costs results because Leverett pays an average of $58 per ton to the landfill for trash tip fees while the town pays no tip fees for recyclables at the MRF. The town's per-bag trash charges financially encourage residents to use the least-cost method for their waste management. Leverett's reuse programs not only divert materials from disposal, thereby avoiding tip fees; the programs also save residents the purchase price of any items reused through the programs.

PROGRAM SUMMARY

	FY87	FY97
Tons Per Year	NA	652
Disposal	NA	303
Diversion	0	349
Percent Diverted	0%	53%
Recycled	0%	31%
Composted	0%	23%
Average lbs./HH/day	NA	5.50
Disposal	NA	2.56
Diversion	NA	2.94
Annual Disposal Fees		
Disposal	$54,986	$17,372
Net Program Costs/HH	$84.46	$52.81
Disposal Services	$84.46	$41.37
Diversion Services	$0.00	$11.44

Notes: 651 households served in FY87; 650 in FY97. 1986 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

RESIDENTIAL WASTE REDUCTION

	Tons (FY97)
Recycled	200
Mixed Paper	127
Mixed Containers	51
Scrap Metal	9
Swap Shop[1]	7
Textiles/Clothing	1
Auto Batteries	1
Deposit Containers[2]	13
MRF Rejects[3]	-8
Composted/Chipped	149
Yard Trimmings[4]	149
Total Waste Reduction	349
MSW Disposed	303
Landfilled	293
Tires/Oil Burned	3
MRF Rejects	8
Total Generation	652
Percent Reduced	53%
Lbs. Waste/HH Served/Day	5.50

Note: Figures may appear not to add due to rounding.
[1]Tonnage estimated by Swap Shop attendant
[2]Reflects the weight of deposit containers collected in the town recycling program. Additional materials are redeemed by individual residents but not included in this figure.
[3]Based on 4% by weight of material processed at MRF rejected as nonrecyclable.
[4]Estimate of tonnage composted at home. Yard trimmings are banned from disposal in Leverett. Based on an estimate of 156 pounds per person per year used by the recycling coordinator. This figure is lower than the estimate derived from using the U.S. average per capita yard debris generation of 210 pounds per day (from the EPA report *Characterization of Municipal Solid Waste in the United States: 1997 Update*). Furthermore, Leverett is rural and homes have large yards. Actual generation is most likely higher than the national average.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

The Massachusetts Department of Environmental Protection has set statewide municipal solid waste recycling goals of 23% by 1992, 34% by 1996, and 46% by 2000. Massachusetts bans lead-acid batteries, leaves and other yard debris, white goods, all metal and glass containers, #1 and #2 single polymer plastics, and recyclable paper from disposal in all state landfills and incinerators. The bans were phased in from 1990 to 1994.

Waste disposal facilities must demonstrate that waste equivalent to 25% of their permitted capacity will be recycled either by themselves, the generators, or an intermediate handler.

Massachusetts' beverage container deposit law, effective January 17, 1983, requires consumers to pay a 5¢ deposit on containers for "soda water or similar carbonated soft drinks, mineral water, and beer and other malt beverages." Consumers can redeem containers at retailers that sell these products. A single corporation created by beverage distributors recycles about 75% of redeemed containers. Unclaimed deposits become state property; a portion of this money goes into the state's Clean Environment Fund. Massachusetts makes funds and equipment for source reduction, composting, recycling, and market development available to communities, schools, and businesses through this fund and other grant and loan programs.

Leverett enacted a mandatory recycling bylaw in 1988. According to this bylaw, residents were banned from putting recyclable paper, glass, and cans into the landfill. Violators can be fined $15 per offense. The bylaw was revised in 1993 to ban all materials accepted at the Springfield MRF.

Leverett charges PAYT fees for trash disposal. Residents must pay an annual $20 transfer and recycling station fee plus a per-bag fee for trash; recycling is free. In FY97, disposal fees were $1.50 per 30-gallon bag and 75¢ for 15-gallon bags.

Source Reduction and Reuse Initiatives

Leverett encourages reduction and reuse by providing alternatives to buying new items or throwing away old items. In fact, most of the structures at the town's Recycle/Transfer Station are devoted to reuse; the most active is the "Take it or Leave it." At this facility, residents have moved items such as hand and power tools, small and large appliances, exercise equipment, toys, used furniture, housewares, building materials, and even a snowblower into the reuse stream. Before leaving items, the town asks residents to consider whether the item is something the donor would take if they needed it. The town's only other criterion for leaving an item at the "Take it or Leave it" is that it has to work. Residents can leave "questionable" items if they agree to pay for disposal in the event the item does not get taken within three weeks. Items left at this facility are often used in interesting projects. One resident gathered bed-frames from the facility and used them as rebar in a dam he rebuilt.

The second most popular component of the town's reuse operations is its clothes bin where residents can deposit their own unwanted clothing or take items left by other residents. Residents can also donate unwanted clothing to the Salvation Army by

DROP-OFF COLLECTION

Number of sites:	One, on the site of the old town landfill. Recycling started at this location in 1988.
Staffing:	Yes
Service Provider:	Town of Leverett
Materials Accepted:	Newspaper, corrugated cardboard, magazines and catalogues, paperboard, mail, office paper, kraft paper bags, phone books, other books, juice and milk boxes, glass bottles and jars, metal food and beverage cans, all plastic bottles, tubs, trays, and jars, lead-acid batteries, household batteries, textiles, reusable goods, white goods, paint, and scrap metal
Participation Incentives:	Mandatory recycling with potential $15 fine for failure to recycle. No fines had been levied as of fall 1997.
Sectors Served:	Residential only. Residents must obtain and display special stickers in order to use the facility. These stickers cost $20 annually and allow holders to use the recycling facility for no extra charge and the trash transfer station for additional per-bag fees.

putting the items in the charity's donation box located at the Recycle/Transfer Station. Also located at the Recycle/Transfer Station is a Book Shed. A local couple manage the shed, a room-sized structure filled with used books in good condition. Some books have been taken and returned several times. Books that are not reused are either recycled or disposed. Paint is stored at the Recycle/Transfer Station in a shed the state provided for this purpose. The shed serves as a free paint exchange for town residents.

The Leverett Recycle/Transfer Station has instituted a "Looking to Buy, Looking to Sell" listing. This list provides an opportunity for residents to check out what's available before they buy something new and to try to sell items before they throw them away.

Leverett also collects paper egg cartons, packaging materials, and kraft paper bags at the Recycle/Transfer Station. These items are collected in response to residents' special requests. A local farmer uses the egg cartons for mulch. In 1998, Leverett started a packing material reuse project targeting "packing peanuts" and other small packaging materials for reuse by local businesses. A food grower uses the paper bags.

Leverett does not have an organized program for the management of yard debris but most residents have traditionally managed this material on their own. The town has banned these items from disposal, institutionalizing home composting and mulching. In recent years Leverett has sold reduced-price composters made possible through a partial state grant. As of the end of 1996, the community sold approximately 120 bins. The city provided residents purchasing bins with instruction booklets detailing the proper use of the bins. Many residents also compost food discards with their yard debris.

Recycling Program

In FY97, Leverett recovered 31% of its residential waste stream through recycling and reuse. Residents must bring their materials to the community's Recycle/Transfer Station. This facility is open every weekend (Saturdays and Sundays) from 10:00 A.M. until 12:55 P.M. Residents sort materials into roll-off bins located at the site. When the roll-offs are full, a contractor trucks them to a MRF in Springfield, about 50 miles from Leverett.

The state developed the Springfield MRF, which opened in 1990. The facility accepts and processes recyclables from more than 90 municipalities and a few commercial accounts. At the Springfield MRF, material is processed in two streams: commingled materials and paper. Staff remove corrugated cardboard from the paper stream and bale the cardboard and remaining mixed paper separately. The sorting of the commingled stream is more automated, using air classifiers, trommel screens, magnetic separators, and eddy currents. The facility averages a 4% reject rate of material accepted for processing (MRF staff do not accept obviously-contaminated loads for processing). In July 1996 the MRF, under private operation, started paying towns for their recyclables.

Leverett recycling staff have paid close attention to the quality of the materials going into the roll-off containers from the beginning of the program. Their effort has paid off; since the recycling program

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
3 30-yard Roll-off Containers[1]	$6,750	Recycling	1990, 1994, 1996
Trash Compactor	$12,000	Trash	1993
3 Sheds[2]	$1,000	Recycling	1990

Note: In addition to the equipment, Leverett's Recycle/Transfer Station includes four concrete pads upon which the roll-offs and trash compactor sit. These pads cost $1,500 each and were built in 1990, 1993, 1995, and 1996.
[1]Two of the containers were purchased with state grant funds.
[2]Two of the sheds were built by the town, the other was donated in 1992, is in poor condition, and ILSR considered it to have no value. The $1,000 cost represents estimated materials and labor costs for town staff to build two sheds.

Source: Institute for Local Self-Reliance, 1999.

started, only one roll-off container has been rejected from the MRF.

Availability of the Springfield MRF and state-provided equipment have enabled Leverett to expand its recycling program cost-effectively. From 1988 to 1990, when the MRF opened, Leverett collected only paper, glass, and cans for recycling. The town gave these materials to local parties who marketed them and received the revenues. The MRF accepts more materials than the town originally collected, charges no tip fee for recyclables at the facility, and started to pay the town revenue in 1997. State-provided equipment, especially roll-off boxes, allows Leverett to gather large shipments of recyclables before transferring them to the MRF, thereby lowering per ton transportation costs.

Refundable bottles collected at the drop-off facility are returned for their deposit and the funds are used to purchase a local piece of land for use as a preserve. Car batteries are accepted for free.

Leverett sponsors "Large Item Weekends " six weekends per year. During these events residents can deliver large items, such as appliances and furniture, to the transfer station. Other residents scavenge the metal pile during these events, recovering (mainly for repair and reuse) items such as lawn mowers and small farm equipment. Metal items collected during these events and not taken by other residents are recycled by a local salvager.

Leverett's Take It or Leave It located at the town's Recycle/Transfer Station

Education, Publicity, and Outreach

Leverett uses newsletters, local media, and personal contact to inform residents about its waste reduction programs. The town has used some promotional materials provided by the state. The town newsletter (published six times a year) includes an article about some aspect of recycling and/or waste management in at least every other issue and the columnist answers questions about proper residential waste handling. Recycling and reuse program announcements are also occasionally included in the local elementary school weekly newsletter. Special events are announced in the local newspapers. The town's recycling coordinator answers residents' questions about waste management over the telephone.

Leverett has active recycling and waste reduction programs in its schools. Elementary school students save table scraps from their lunchroom; local farmers use these as animal feed. Students also collect deposit containers for recycling and keep the revenues for school projects. The town sponsored recycling contests for its students in conjunction with America Recycles Day in November 1997. These contests encouraged students to learn more about recycling and awarded prizes for the best entries.

Costs

Prior to the closing of the landfill, residents annually purchased a $25 dump sticker to pay for its use. However, most of the actual cost of operating the landfill was covered by property taxes. In FY87 the cost to operate the landfill was approximately $55,000 or $84 per household.[1] Tons of waste disposed at this facility were not tracked.

In FY97 Leverett's gross costs for residential waste management were $37,600. This figure includes Recycle/Transfer Station operating costs,

material transfer costs, tip fees, salaries, depreciation, and credit for materials revenues. Of this, about 72% was spent on trash collection and disposal and 28% was spent on recycling. Materials revenues reduced this by $3,200 to $34,300 (or $53 per household served). On a per-ton basis, trash cost $91 and recycling cost $51 ($36 with materials revenues).

The town is very small and employs no full-time workers in the solid waste program. The largest components of the FY97 budget were fees paid to contracted haulers (23%) and disposal tip fees (46%).

Funding & Accounting Systems

The funding for Leverett's solid waste management program comes from the annual $20 fee the city charges residents for use of the Transfer Station, per-bag disposal fees, large item fees, and revenue from the sale of recyclables. All revenues are deposited in the town's general fund. Similarly, all costs for waste management are paid directly out of the town's general fund but are capped at the set annual Recycle/Transfer Station budget. The town's income from annual Station use, per-bag fees and

WASTE REDUCTION COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$10,673	208	$51.29	$16.42
Collection[1]	$1,706	208	$7.20	
Processing[2]	$0	191	$0.00	
Hauling[3]	$5,840	191	$30.66	
Large Item Metal Recycling	$662	9	$73.56	
Administration/Overhead/Depreciation[4]	$2,466	208	$11.85	
Waste Reduction Gross Costs	$10,673	208	$51.29	$16.42
Materials Revenues	($3,237)	191	($16.99)	($4.98)
Net Waste Reduction Costs	$7,436	208	$35.73	$11.44

Note: Figures may not total due to rounding. Recycling tonnage figure above is different than figures in tables on pages 101 and 102 as figure above represents tonnage collected including materials rejected at the MRF. Leverett residents must manage their own yard debris; therefore, the city incurs no costs . Figures above include depreciation costs for equipment. Leverett employs no full-time staff in its solid waste programs. Part-time staff do not receive benefits. Leverett's recycling coordinator estimated that other city staff, such as administrative personnel, devote time worth $600 annually to the waste management program. This cost was apportioned between recycling and trash based on tons handled in each program.

[1]This figure represents salaries of town staff who work at the Recycle/Transfer Station. Staff time was apportioned between recycling and trash based on the average proportion of time employees spend on each task

[2]Leverett pays no tip fee at the Springfield MRF.

[3]Leverett pays Wickel's Trucking $105 per load for recyclables hauled to the Springfield MRF, approximately 50 miles from the town.

[4]Includes part of the recycling coordinator's wages, Recycle/Transfer Station site utilities, costs to maintain the site (such as snow-plowing and road salting), ILSR's estimated depreciation costs for equipment used in the recycling program, and costs for administrative support of program staff.

TOTAL SOLID WASTE MANAGEMENT COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$26,891	296	$91.00	$41.37
Trash Collection[1]	$2,874	293	$9.81	
Hauling[2]	$2,980	293	$10.17	
Landfill Tip Fees	$17,127	293	$58.45	
Tire Disposal Fees	$245	3	$98.00	
Administration/Overhead/Depreciation[3]	$3,664	296	$12.40	
Waste Reduction Gross Costs	$10,673	208	$51.29	$16.42
SWM Gross Costs	$37,564	504	$74.59	$57.79
Materials Revenues	($3,237)	191	($16.99)	($4.98)
Total SWM Net Costs	$34,327	504	$68.16	$52.81

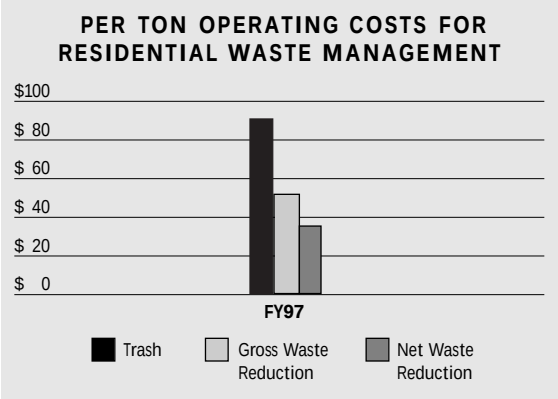
Note: Numbers may not total due to rounding. Disposal tonnage figure differs from the figures in tables on pages 101 and 102 as figure above does not include MRF rejects. Figures above include depreciation costs for equipment. Leverett employs no full-time staff in its solid waste programs. Part-time staff do not receive benefits. Leverett's recycling coordinator estimated that other city staff, such as administrative personnel, devote time worth $600 annually to the waste management program. This cost was apportioned between recycling and trash based on tons handled in each program.

[1]Represents salaries of city staff working at the Recycle/Transfer Station. Staff time was apportioned between recycling and trash based on the average proportion of time employees spend on each task

[2]Leverett pays Wickel's Trucking $85 per load for trash hauled to the landfill, 27 miles from the town in Northampton, MA.

[3]Includes Recycle/Transfer Station site utilities, costs to maintain the site (such as snow-plowing and road salting), ILSR's estimated depreciation costs for equipment used in the trash program, costs for trash stickers, and costs for administrative support of program staff.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

Large Items Weekends, for FY97, was $32,813. This revenue covers most of the costs of waste disposal for the town including: salaries, tipping and hauling fees, operation and maintenance costs, special program costs as well as most recycling-related and household hazardous waste costs.

The town primarily uses cash-flow accounting to track its expenditures, including those for waste management.

Future Plans and Obstacles to Increasing Diversion

Leverett plans to focus on how to offer the community more reuse alternatives, and provide better ways to get rid of items that are difficult to dispose. For example, the town became involved in 1998 with a state-initiated plan to reclaim mercury from fluorescent lamps, thermometers, and other mercury-bearing items. The town is also considering ways to implement building material recycling.

Leverett's recycling coordinator believes most of the obstacles to increasing diversion are psychological and external to the town. Fluctuating markets and bad publicity have raised doubts about the validity of recycling among some residents. In addition, Leverett provides some services, such as hazardous waste collection days, in conjunction with other towns. The schedules and procedures for these services have often changed as the programs expanded and matured. These changes have resulted in confusion among some residents.

Furthermore, Leverett's recycling coordinator believes attention paid to boosting "recycling rates" can actually distract attention from the task of reducing waste. Two examples from the community concern construction debris and reuse programs. Construction debris is not supposed to enter the town's trash compactor and is not considered in the calculation of MSW recycling rates. But, if the attendant does not detect such materials going into the compactor, the material is counted as MSW and lowers the town's calculated waste reduction level. (A resident once disposed of the debris from a roofing job by hiding the materials in dog food bags and bringing it in a little at a time.) In contrast, the weights of many of the materials diverted for reuse in Leverett are not measured or estimated and therefore do not contribute to a higher reported waste reduction level. The effects of Leverett's comprehensive reuse program, which recovers a wide variety of materials and saves residents disposal fees and the costs for many items that would otherwise be purchased new, are not fully reflected in waste reduction level figures.

Tips for Replication

Find out what other people are doing and how they did it; don't waste time reinventing the wheel.

Remember that recycling may not be the center of everyone's life. People have to live with your recycling/reuse program. Make it as easy, and as useful to them, as possible.

Try not to get too caught up in the numbers game (recycling rates); focus on how to help your community deal with the waste issues that are or will be important to them. The recycling rate will take care of itself.

Notes:
[1]This cost has been normalized to 1996 dollars.

CONTACT

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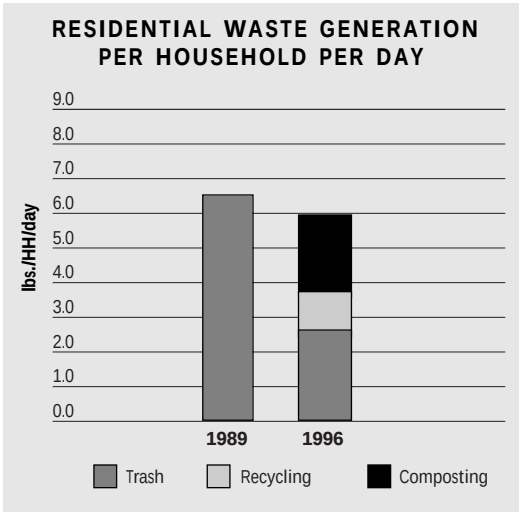
LOVELAND, COLORADO

Residential Waste Reduction **56%**

In the early 1990s, Loveland overhauled its waste management system in response to rising worker compensation insurance rates and aging trash trucks needing replacement. Specially designed semi-automated one-pass trucks with 10-cubic-yard trash packers and two recycling compartments dual-collect recyclables and trash every week. Residents pay a mandatory flat monthly fee for recycling and composting services plus a pay-as-you-throw (PAYT) fee for each bag of trash. They can subscribe to weekly curbside pick-up of yard debris or take the material to a central drop-off site. A drop-off site for recyclables not collected at curbside is also available. In 1996, the city diverted 56% of its residential waste from disposal; 19% was recycled and 37% was composted. Average trash landfilled per household dropped from 6.6 pounds per day in 1989 to 2.6 pounds per day in 1996 — a 60% reduction.



Source: Institute for Local Self-Reliance, 1999.

Keys to high diversion are PAYT trash rates, convenient collection of 11 types of recyclables, and providing several options for yard debris recovery. PAYT trash fees encourage participation in curbside and drop-off programs. The curbside program accounts for 95% of all material collected for recycling and a third of the material collected for composting. About 27% of households subscribe to the yard debris pick-up service (1997); most of the remainder opt for the drop-off, which is free, or they source reduce via mulch mowing and backyard composting.

The new system, completed in 1993, results in fewer staff injuries, integrates recycling with trash collection, and contains costs. Loveland also considers the PAYT trash fees more equitable since customers pay for services based on their level of usage. Lower worker compensation insurance rates[1] and dual-collection have helped minimize costs. Staffing for trash, recyclables, and yard debris collection have remained constant during the changes, due mostly to increased worker productivity from dual-collection. Under the former system, each route served 450 homes per day. Now each serves 950 homes per day. Per household costs are expectedly higher under Loveland's current integrated system than they were before the changes ($63 in 1989; $85 in 1996). Residents receive more services than they previously had and costs likely would have been higher had the city chosen an alternative system.

Waste reduction may also ensure future cost-effectiveness for Loveland's waste management system as it cushions Loveland against expected increases in landfill tip fees.[2]

PROGRAM SUMMARY

	1989	1996
Tons Per Year	15,680	17,973
Disposal	15,680	7,884
Diversion	0	10,089
Percent Diverted	0%	56%
Recycled	0%	19%
Composted	0%	37%
Average lbs./HH/day	6.63	6.00
Disposal	6.63	2.63
Diversion	0.00	3.37
Annual Disposal Fees		
Disposal	$73,861	$78,015
Net Program Costs/HH	$63.16	$85.48
Disposal Services	$63.16	$40.36
Diversion Services	$0	$45.12

Notes: 12,959 households served in 1989; 16,422 in 1996. 1989 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 37,352 (1989), 44,300 (1996)

HOUSEHOLDS: 17,476 (1996); 15,220 single-family households, 2,256 multi-family units

BUSINESSES: 1,800

LAND AREA: 23.5 sq. miles

HOUSEHOLD DENSITY: 744 households/sq. mi.

AVERAGE PER CAPITA INCOME: $13,345 (1989), $18,010 (1996), $18,730 (1997)

MEDIAN HOUSEHOLD INCOME: $30,548 (1989), $41,556 (1996), $43,218 (1997)

COMMUNITY CHARACTER: Small residential city adjacent to Front Range of Rocky Mountains. Major industry includes high-tech & mid-tech manufacturing; publishing; the arts, especially bronze sculpture; agriculture; retail; service; and government

COUNTY: Larimer

RESIDENTIAL WASTE REDUCTION

	Tons (1996)
Recycled	3,503
ONP	2,315
Mixed Containers	1,079
Magazines/Catalogs	122
OCC	121
Mixed Office Paper	46
White Goods	2 (est.)
Automotive Batteries[1]	1
Reusable Items	1 (est.)
MRF Rejects[2]	-184
Composted/Chipped	6,586
Yard Trimmings (Drop-off)[3]	2,770
Yard Trimmings (Curbside)	2,185
Wood (Drop-off)[4]	1,526
Holiday Trees[5]	105 (est.)
Total Waste Reduction	10,089
MSW Disposed[6]	7,884
Landfilled	7,700
MRF Rejects	184
Total Generation	17,973
Percent Reduced	56.1%
Lbs. Waste/HH Served/Day	6.00

Note: Figures include trash and recyclables from 16,422 households served by the city's trash and recycling programs. ILSR reduced total recycling tonnages by 3% to to account for 500 household receiving city recycling but not city trash services.

[1]Based on recovery of 50 auto batteries and a density of 39.4 lbs. each.

[2]Based on MRF reject rate of 5%.

[3]Tonnage estimated by city using periodically checked representative truck weights.

[4]Loveland estimated tonnage based on 65 tons per hour grinder throughput.

[5]The Parks Department collects and mulches the trees. Tonnage estimated by Solid Waste Management Utility staff.

[6]Tip fee at landfill is $3.70/cubic yard. The city estimates tonnage using 750 lbs./cubic yard based on the compaction ratio of its trash trucks.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

Colorado has little solid waste legislation; solid waste management responsibilities are largely left up to local communities. The state has no formal waste diversion goal but, in a 1993 speech, Colorado's Governor challenged Coloradans to cut their waste disposal in half by the year 2000.

The State Office of Energy Conservation supports recycling and waste reduction through a Community Grant program that has distributed $6 million during the last six years.[3] According to the State Office of Energy Conservation, Loveland has "led the state" in recycling and waste diversion, rather than state policies leading Loveland.

In 1992, Loveland implemented PAYT trash fees citywide. Residents must either buy a stamp (85¢ for 30 gallons or 45¢ for 13 gallons) to place on their own trash can or bag, or they must purchase special trash bags printed with the city logo (both are available at local stores). The 32-gallon blue bags sell for $1; 15-gallon green bags sell for 55¢ each.

Private trash collectors operating in Loveland must charge all residential customers volume-based rates.

Source Reduction and Reuse Initiatives

The city's source reduction efforts include pre-cycling education, encouraging backyard composting and mulch mowing, participating in the county's reuse program, and PAYT trash rates.

The city holds periodic sales of home-compost bins at reduced prices (in 1996, bins sold for $37 each). Home composting booklets are given away.

The county landfill has a reuse program, called the "Last Resort." Reusable items such as plumbing fixtures, lumber, bicycles, and building materials are separated from incoming waste by landfill staff and offered for sale at low prices.

Per household residential waste generated has dropped slightly since Loveland implemented its new system. Per-bag trash fees likely played a role.

Recycling Program

In 1996, Loveland recycled 19% of its residential waste stream. Eleven different materials are accepted at curbside and an additional four types are accepted at its drop-off site. The program is convenient for residents. Pick-up is weekly, recycling bins are provided, and only two major segregations are required: paper and commingled containers.

Two-person crews dual-collect recyclables and trash at curbside on the same day using specially designed one-pass vehicles. They first deliver recyclables to the Larimer County MRF (five miles away) and then unload trash at the landfill, which is next door. Recyclables collected at the drop-off site are also processed at the MRF.

Material is processed in two streams: paper and containers. Metals are mechanically separated, leaving glass and plastics to be manually sorted. Paper is also manually sorted. The reject rate at the MRF is 5%; rejects consist mostly of broken glass.

The city has no contract with the county, nor pays it processing fees. Waste Management Inc.

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: City of Loveland Solid Waste Management Utility

Start-up Date: Planning began September 1990; implementation completed March 1993

Mandatory: No

Households Served: 16,922 (1996), 15,220 SFDs, 1,702 MFDs. All single-family households are eligible to be served by city program. Managers of multi-family complexes with four or more units decide whether to use city services or contract privately.

Materials Accepted: Glass bottles and jars; narrow-necked #1 and #2 plastic bottles; aluminum cans; steel cans; clean aluminum foil, pie, or food trays; empty aerosol cans; ONP; brown grocery sacks; white goods; and OCC

Collection Frequency: Weekly

Set-out Method: ONP and brown paper grocery sacks in 12-gallon blue container, and other recyclable materials in a 15-gallon green container. OCC flattened and put under the bins at curbside. Residents are asked to only set out full containers to cut labor costs. Apartments generally have two- to three-cubic-yard dumpsters for trash and 96-gallon carts for recyclables. The city collects white goods, which must have the appropriate number of stamps attached, by prior appointment.

Collection Method: SFDs: two-person crews dual-collect trash and recyclables in dual-side drive Crane Carrier trucks with 10-cubic-yard EZ Pack Apollo packers (for trash) and a Western Curbside Collector (for recyclables). The driver empties paper into the 6.9-cubic-yard semi-automatic side-loading Western Curbside Collector compartment and commingled containers into the other, which is 11.3 cubic yards. The second crew member handles trash. The truck capacity was designed to serve 450 to 500 households before any one of the three compartments fills. Some OCC is put into the ONP compartment, but this can cause it to fill too quickly. A spare packer truck is often positioned along the collection route for the occasional off-loading of OCC.

MFDs: The dual-collection vehicle has a 16-cubic-yard EZ Pack Apollo packer for trash collection and the Western Curbside Collector has dual semi-automated cart lifters that can lift and empty 96-gallon carts. The capacity of the compartment for old newspaper and corrugated cardboard is 6.4 cubic yards, and the capacity for food and beverage containers is 8.6 cubic yards. The truck is a dual drive Crane Carrier.

White Goods: Crew using pick-up truck with a tail-gate lifter.

Participation Rate: 97% monthly participation, 52% weekly set-out rate; based on two-week field observation in 1995, and 1994 data.

Participation Incentives: Reduced trash fees through increased recycling. Free set of recycling bins given to each household.

Enforcement: Feedback cards are left with uncollected materials to inform the resident why material was not collected.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: Planning began September 1990; implementation completed citywide March 1993

Service Provider: City of Loveland Solid Waste Management Utility

Households Served: 4,200 single-family households (1997)

Mandatory: No, subscription-based

Materials Collected: Grass clippings, small branches, leaves, garden trimmings

Collection Frequency: Weekly, available eight months of year

Set-out Method: 96-gallon roll carts. Material must be of such a size that the cart lid will close.

Collection Method: One-person crews use 16-cubic-yard New Way (semi-automated side-loaders) mounted on dual drive Crane Carrier trucks

Participation Rate: 50% weekly set-out rate among subscribers (crew estimate)

Participation Incentives: Reduced trash fees

Enforcement: Overflowing containers not collected

DROP-OFF COLLECTION

Number of sites: One recycling site, one yard debris site. Residents need a pass to use the yard debris site.

Staffing: No

Service Provider: City of Loveland Solid Waste Management Utility (holiday trees: Parks Department)

Materials Accepted: Motor oil, transmission fluid, antifreeze, automotive batteries, fluorescent tubes, OMG, catalogs, phone books, and mixed office papers at the recycling depot, and tree branches, grass clippings, leaves and garden trimmings at the yard debris site

Participation Incentives: Reduced trash disposal costs due to increased recycling and composting

Sectors Served: Signage indicates site for Loveland residents only, but there is no staff to prevent other users

EQUIPMENT COSTS

Item	Cost	Use	Year Incurred
35,671 Recycling Bins	$142,684	Curbside Recycling	1991-1997
4,278 Yard Debris Collection Carts	$222,456	Yard Trimmings Collection	1991-1996
1 Apartment Dual-Collection Truck[1]	$120,000	Trash and Recycling Collection	1994
2 Yard Trimming Collection Trucks[2]	$152,000	Yard Trimmings Collection	1994
1 Roll-off Truck[3]	$95,000	Trash, Recyclables, Green Wastes, Compost & Wood Chips Hauling	1995
5 Dual-collection Trucks[4]	$600,000	Trash and Recycling Collection	1992 and 1993

Note: Loveland's Fleet Division owns all trucks. The Solid Waste Program pays for the use of these vehicles on a per mile basis. This fee, reflected in the 1996 O&M costs, covers actual expenses incurred for vehicle O&M and includes a built-in replacement fee, which is set aside for new vehicle purchase when this becomes necessary.

[1]Crane Carrier chassis with 16-cubic-yard EZ Pack Apollo packer and a May Manufacturing two-bin Western Curbside Collector.
[2]Crane Carrier chassis, 16-cubic-yard New Way side-loader with dual semi-automated cart lifters.
[3]International chassis with AmpliRoll hook-lift system.
[4]Crane Carrier chassis with 10-cubic-yard EZ Pack Apollo rear-loading compactor and a May Manufacturing two-bin Western Curbside Collector.

Source: Institute for Local Self-Reliance, 1999.

(WMI) operates the MRF under contract with the county. It processes and markets the recyclables and shares the revenues with the county. WMI also pays Loveland and other county haulers for its sorted paper (but not for the mixed food and beverage containers). The July 1997 prices paid were: ONP, $14/ton loose; OCC, $28/ton; magazines and catalogs, $10/ton; and mixed office paper, $22/ton. WMI sets these prices monthly.

White goods, used oil, antifreeze, auto batteries, and paints collected at drop-off are sold or given to other recyclers or to the county's HHW center.

Two-person crews dual-collect recyclables and trash using specially designed semi-automated one-pass trucks.

Composting Program

In 1996, Loveland diverted 37% of its residential waste through composting and wood chipping. Its PAYT trash rates encourage residents to either subscribe to the seasonal curbside service, use the drop-off site, or mulch mow and home compost. The curbside and drop-off programs accept all types of yard debris as well as holiday trees.

Curbside pick-up costs $4.25 per month (1997) and operates eight months of the year (April through November). Participants receive a 96-gallon cart for their yard trimmings. Approximately 27% of households subscribe to the service (1997). About one-third of yard debris is collected via curbside; the remainder, through the drop-off site.

The city has found that its 16-cubic-yard yard debris collection vehicles are too small and must unload two to three times a day. Because the compost facility is 20 miles away, the trucks unload at the drop-off center. Yard debris is then occasionally reloaded into a bigger truck and transported to the compost facility, which is owned and operated by A-1 Organics.[4]

The city and A-1 equally share all expenses and revenues. Finished compost from Loveland's yard debris is marketed as "Loveland's Own Compost." It sells for $23 to $29 per cubic yard for bulk retail, $7 to $13 bulk wholesale, and in 40-pound bags for $3.49 retail, $1.82 to $2.22 wholesale. All finished compost is sold. A-1 also produces and sells mulch for $7.50 per cubic yard retail. In 1996, the city earned an average of $6.37 per ton for yard trimmings collected.

Education, Publicity, and Outreach

The city has produced educational materials on mulch mowing, backyard composting, recycling, and pre-cycling. All residents received a set. New residents receive these brochures with recycling bins, a free trash bag, and a free trash stamp.

Most of the city's outreach is targeted at new residents, who are required to sign up with the program at the city utilities office. There, they are given an information packet. Recycling bins are delivered free of charge to new residents and to current residents who have lost or damaged bins.

Staff give presentations to community groups about waste reduction. They also participate in Loveland's annual Earth Day activities. On occasion, information about recycling, source reduction, and trash service, have been included with resident's utility bills, or in advertisements in the local newspaper, usually in response to contamination or other problems. Coupons for a discount on the price of compost have also been distributed this way.

Costs

In 1996, the city spent about $1.48 million to provide trash, recycling, and yard debris services to the 16,422 households using both the city's recycling and trash services — about $90 per household served. Of this, about 45% was spent on trash collection and disposal, 32% was spent on recycling, and 24% was spent on yard debris collection and recovery. Materials revenues reduced this by $81,000 to $1.4 million (or $85 per household served).

On a per-ton basis, net waste reduction costs were $72, $14 per ton less than trash services. Trash costs $86, recycling $128 ($117 with revenues), and yard debris recovery, $53 ($47 with revenues).

The SWM Utility employs 16.5 full-time equivalent workers (12 for residential collection). In 1996, hourly collector wages averaged $14.59 with benefits (or $11.23 without benefits).

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs[1]	$472,784	3,697	$127.88	$28.79
Curbside Collection	$372,133	3,515	$105.87	
Drop-off Collection	$42,943	182	$235.95	
Processing	$0	3,697	$0	
Administration/Education/Planning[2]	$57,708	3,697	$15.61	
Composting Gross Costs	$349,282	6,586	$53.03	$21.27
Curbside Collection	$187,998	2,185	$86.04	
Drop-off Collection	$36,236	4,401	$8.23	
Processing	$71,819	6,586	$10.90	
Administration/Education/Planning[2]	$53,299	6,586	$8.08	
Waste Reduction Gross Costs	$822,066	10,283	$79.94	$50.06
Materials Revenues	($81,165)	10,283	($7.89)	($4.94)
Recyclables	($39,225)	3,697	($10.61)	
Compost	($41,940)	6,586	($6.37)	
Waste Reduction Net Costs	$740,901	10,283	$72.05	$45.12

Note: Figures may not total due to rounding. Recycling tonnage figure differs from figure in table on page 108 as above figure includes MRF rejects and 10 tons of used oil. All figures include debt service. Administrative costs to the city external to the Solid Waste Utility are not included.
[1]Recycling costs also include household hazardous waste collection costs.
[2]Administration, education, and planning costs for the entire SW Utility were allocated to functions based on budget share.

TOTAL SOLID WASTE COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Trash Gross Costs[1]	$662,855	7,700	$86.09	$40.36
Collection	$522,041	7,700	$67.80	
Landfill Tip Fees	$78,015	7,700	$10.13	
Administration/Education/Planning[2]	$62,799	7,700	$8.16	
Waste Reduction Gross Costs	$822,066	10,283	$79.94	$50.06
SWM Gross Costs	$1,484,921	17,983	$82.57	$90.42
Materials Revenues	($81,165)	10,283	($7.89)	($4.94)
Total SWM Net Costs	$1,403,756	17,983	$78.06	$85.48

Note: Figures may not total due to rounding. All figures include debt service. Administrative costs to the city external to the Solid Waste Utility are not included.
[1]Trash costs also include spring cleanup and elderly/disabled aid program costs.
[2]Administration, education, and planning costs for the entire SW Utility were allocated to functions based on budget share.

Source: Institute for Local Self-Reliance, 1999.

Source: Institute for Local Self-Reliance, 1999.

Per household costs for solid waste management services have increased from $63 in 1989 to $85 in 1996. (These figures take into account the cost of inflation.) The increase was due to new services and rising disposal costs. The city estimates it saves $100,000 per year through dual-collection as compared to separate trash and recycling collection.

Funding & Accounting Systems

Loveland's solid waste management program is operated as an enterprise fund with all funding coming completely from user fees. Revenue from the sale of recyclables and compost, and residents' various user fees cover the capital, operating, and maintenance costs of the trash, recycling, and composting programs.

A mandatory flat monthly fee of $4.60 (1997) per single-family household funds the recycling, composting, household hazardous waste, and spring cleanup programs. Per bag charges for trash pay for its collection and disposal. The $4.25 per month fee (1997) for optional yard debris service covers the collection costs.

Future Plans and Obstacles to Increasing Diversion

The city did not anticipate the volume of corrugated cardboard households would recycle. Because the cardboard compartments on the dual-collection trucks are sometimes too small to collect all of the routes' cardboard set-outs without filling up too fast, the dual-collection crews sometimes must off-load their cardboard mid-route into a "mother truck"; i.e., a spare packer truck which is centrally parked for convenient access by all four dual-collection crews.[5] As the city adds new routes or retires and replaces trucks, it will purchase new larger capacity trucks to alleviate this problem.

Tips for Replication

Loveland's Solid Waste staff believe success of Loveland's program is due principally to the PAYT trash fees, dual-collection, and yard debris recovery components. They also believe that municipalities served only by private waste haulers should consider franchising or districting to give them needed clout to set service requirements and establish community-wide waste reduction programs.

Be prepared for resistance to change. Be very clear about the "whys" of a program change to increase client buy-in. Anticipate likely questions.

Enact PAYT trash rates; they are a powerful incentive to recycle and source reduce.

Do your own homework to fit program to your community. Do not simply attempt to replicate another community's program without considering your community's similarities and differences.

Sell program to those active in community (such as service and civic clubs) to build influential allies.

Notes:

[1] Worker compensation rates peaked at $200,000 per year due to back injuries to trash collectors but were $38,000 per year in 1997. Injuries have been minimized through semi-automated collection of yard debris and the bag-based trash program.

[2] Landfill tip fees are expected to increase from the current level of $3.70 per cubic yard (about $10 per ton) to $4.30 per cubic yard in early 1998.

[3] Loveland received grants of $15,000 in 1991 and $50,000 in 1994.

[4] Originally A-1 operated a composting site within Loveland. The site closed because of odor problems and because it was too small. This old site now serves as the yard debris drop-off center and transfer facility.

[5] The city had run the pilot program and collected many data specifically to avoid this type of problem but it had not gathered data on cardboard. The decision to add corrugated was made immediately prior to implementation of the dual-collection program.

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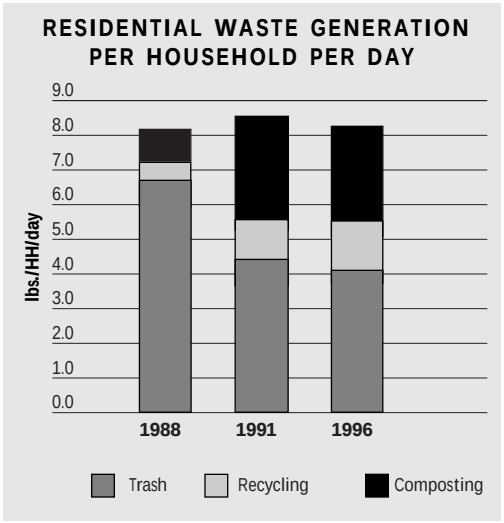
MADISON, WISCONSIN

Residential Waste Reduction **50%**

In 1968, Madison became the first U.S. city to curbside recycle when it began collecting newspapers. The city now collects 13 types of recyclables weekly at curbside, the same day as trash. It also offers seasonal curbside collection of yard debris (brush, April to October; other materials, five times a year). Drop-off sites augment the curbside program and accept yard debris and large items such as appliances. In 1996, the city diverted 50% of its residential waste; 16% through recycling and 34% through composting.



Source: Institute for Local Self-Reliance, 1999.

Yard debris recovery is a key to Madison's success, accounting for 67% of materials diverted in 1996. Targeting a wide range of recyclable materials, requiring participation, and offering convenient curbside collection are important too. The diversion rate jumped from 18% in 1988 to 34% in 1989, when the city mandated that all businesses and residents source separate materials for composting. In 1991, when cardboard and containers were added and recycling became mandatory, recyclables more than doubled from the previous year.

The net cost of solid waste services has increased from $163 per household served in 1988 to $175 in 1996. During the same period, landfill disposal fees more than doubled in constant dollars. Cost-effectiveness is enhanced by high diversion levels, low diversion costs for yard trimmings, the use of large capacity clear bags for recycling, a revenue-sharing contract with the MRF, and no drop-off site for commingled materials collected at curbside.

High diversion levels decreased the number of trash routes and helped to hold landfill tip fees in check. Seasonal curbside yard debris collection combined with drop-off collection diverts these materials at a lower per-ton cost than recycling or trash. While per-ton recycling costs are twice composting costs, the city considers its program cost-effective and efficient. Residents use bags for recyclables set-out thereby avoiding the cost of purchasing bins, reducing collection costs, and increasing collection efficiency by allowing some residents to set out recycling only every other week. The clear bags also enable collection crews to visually identify bags not meeting regulations; this reduces contamination, educates residents, and increases diversion. Under its MRF contract, the city receives 80% of revenues from sale of recyclables. The city also reduced costs by closing its drop-off site for recyclables collected at curbside.

PROGRAM SUMMARY

	1988	1996
Tons Per Year	71,640	88,583
Disposal	59,031	44,272
Diversion	12,608	44,311
Percent Diverted	18%	50%
Recycled	5%	16%
Composted	12%	34%
Average lbs./HH/day	8.19	8.38
Disposal	6.75	4.19
Diversion	1.44	4.19
Annual Disposal Fees		
Disposal	$590,185	$1,475,508
Net Program Costs/HH	$162.55	$174.79
Disposal Services	$132.97	$103.20
Diversion Services	$29.58	$71.59

Notes: 47,945 households served in 1988; 57,949 in 1996. 1988 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 191,000 (1989), 200,920 (1996)
HOUSEHOLDS: 82,949 (1996); 40,314 single-family households, 42,635 multi-family units
BUSINESSES: 7,000
LAND AREA: 66 sq. miles
HOUSEHOLD DENSITY: 1,257 households/sq. mi.
AVERAGE PER CAPITA INCOME: $15,143 (1989)
MEDIAN HOUSEHOLD INCOME: $29,420 (1989)
COMMUNITY CHARACTER: Urban; college town, state capitol. Major businesses: High tech industries, financial service firms, Oscar Meyer, Rayovac
COUNTY: Dane

RESIDENTIAL WASTE REDUCTION

	Tons (1996)
Recycled	14,485
ONP, OCC, Mags.	8,721
Mixed Containers	5,499
Scrap Metal	1,091
Phone Books	41
MRF Rejects	-867
Composted/Chipped	29,826
Leaves	14,430
Brush and Chips	7,897
Yard Trimmings (Drop-off)	6,179
Backyard Composting[1]	1,320
Total Waste Reduction	44,311
MSW Disposed	44,272
Landfilled	42,055
MSW Composting[2]	1,179
MRF Rejects[3]	867
Tires[4]	171
Total Generation	88,583
Percent Reduced	50.0%
Lbs. Waste/HH Served/Day	8.38

Note: Figures include 200 small businesses provided with city trash services. These businesses total well less than 1% of the number of households in the program and are not believed to perceptibly affect the waste reduction rate.

[1]Tonnage based on a city study which found that on average each household participating in backyard composting diverts 660 pounds of material per year. By 1996, the city had sold and given away more than 5,000 bins and city staff estimated 4,000 of them were used regularly.

[2]Represents mixed trash mechanically processed and composted. For this study, this type of waste is not considered waste reduction.

[3]Based on 6.1% reject rate for material sent to MRF.

[4]171 tons of tires were shredded and burned at WI Power & Light.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

In 1989, Madison enacted a recycling ordinance mandating all businesses and residents of both single- and multi-family households source-separate designated materials. The law is periodically revised to include additional materials.

To encourage waste reduction, in 1989, Dane County banned newsprint from its landfill.[1] In 1993, the state of Wisconsin modeled its laws on the Dane County ordinance when it banned yard debris from Wisconsin landfills. Effective 1995, all plastic, steel, glass, and aluminum containers; paperboard; polystyrene packaging; corrugated cardboard; newspaper and other paper; and tires were banned from Wisconsin landfills. The state has subsequently allowed a temporary exemption for #3 through #7 type plastics. Exemption to all the bans is allowed for communities determined by the Wisconsin Department of Natural Resources to have an "effective recycling program." The state has established no statewide recycling goal.

Source Reduction Initiatives

In 1992, the Street Division began encouraging home composting by distributing, at no charge, 750 Soilsaver composting bins. A study estimated that each participating household composted 660 pounds per year. The following year, the city gave away 410 more bins, after which it began selling them below cost for $22.50 to $25 each. About 2,000 bins are sold each year. Recycling program staff offer a free home composting course as well as free trouble-shooting advice. Residents home-compost an estimated 1,320 tons of material each year.[2]

Recycling Program

Madison recycles 16% of its residential waste. With the exception of appliances and metals collected at drop-off, all recyclables are collected at curbside. The city stopped accepting food and beverage containers and paper at its drop-off site because tonnage delivered there decreased significantly when these materials were added to the curbside program.

Most recyclables are processed at Recycle America of Madison, a MRF owned and operated by Waste Management Inc. The MRF mechanically sorts fiber and metals and manually sorts other commodities. Under its contract with the facility (due to end in 2005), the city pays $67.77 per ton for bagged containers (this includes a $5 per ton de-bagging fee) and $26.58 per ton for paper. These fees are adjusted annually according to the Consumer Price Index for the Milwaukee region. Revenue from materials sales is shared; Madison receives 80%, the MRF 20%. The 1996 reject rate for material delivered to the MRF was 6.1% by weight.

The city recycles only materials for which markets exist. It must negotiate additional processing fees for any new materials.

Scrap metal, white goods, tires, and used oil are recycled by private contractors with whom the city has directly forged agreements.

Composting Program

Madison's yard debris recovery program is the heart of its waste reduction efforts, diverting 34% of its residential waste. Fall leaf collection at curbside

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: Street Division, City of Madison Department of Public Works

Start-up Date: 1968, newspapers; 1991, containers and corrugated cardboard; 1994, magazines and catalogs

Mandatory: Yes, for all materials (1991)

Households Served: All SFDs and 17,635 multi-family dwellings (Total: 56,450 in 1994, 57,419 in 1995, and 57,949 in 1996)

Materials Accepted: Newspapers and inserts, corrugated cardboard, magazines and catalogs, brown paper bags, phone books (January to mid-March), glass bottles and jars, aluminum cans, tin/steel cans, #1 & #2 plastic containers, appliances, scrap metal, tires

Collection Frequency: Weekly, same day as trash collection

Set-out Method: Clean commingled containers in clear bags; old newspapers bundled or in brown paper bags; corrugated boxes must be flattened and tied in bundles; magazines must be tied in bundles or placed in a brown paper bag; appliances (a fee up to $20 is charged) and large metal items set at curb away from trash and recyclables; tires set out with large items

Collection Method: Dual-side drive, 30- or 33-cubic-yard enclosed collection trucks, with two compartments, one for paper products and one for bagged containers, single-person crew. Each truck averages two trips to the MRF per day and a daily collection of 9,000 to 11,000 pounds of material. Appliances and large metal items collected using truck mounted cranes; tires collected with large items

Participation Rate: 97%, based on random sample in spring and fall of each year

Participation Incentives: Enforcement and fines ($200 first and second offense; $400 for additional offenses)

Enforcement: Workers only collect recyclables that meet city guidelines and attach a sticker explaining violations to recycling bags not in compliance. "Nasty-grams," or notification letters, are sent to those who consistently mix trash with recyclables. City can issue tickets for failure to recycle but so far has not done so. It has issued tickets for leaving trash on front terraces as well as for scavenging and illegal dumping.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: 1980 for leaves; 1989 for other materials

Service Provider: City of Madison Street Division

Households Served: All for leaves and yard trimmings, residents not using landscaping contractor for brush

Mandatory: Yes, 1980 for leaves; 1989 for other materials

Materials Collected: Leaves, brush, grass clippings, garden and other organic yard debris, holiday trees

Collection Frequency: Leaves, grass clippings, garden and other organic yard debris, twice in spring, three times in fall; January collection for holiday trees; brush, monthly April-October

Set-out Method: Leaves and other yard trimmings piled loose at curb; if bagged, bags must be left open. Brush, stacked and bundled, pieces must be less than eight feet in length and eight inches in diameter

Collection Method: City trash trucks. Most wood and brush are chipped at the curb using open-bed trucks and tow-behind chippers; leaves and yard trimmings pushed into rear-loader trucks using plows and front-end loaders

Participation Rate: NA

Participation Incentives: Enforcement and fines ($50 first offense; $100 second offense; $200 additional offenses)

Enforcement: Improperly prepared materials not collected

DROP-OFF COLLECTION

Number of sites: Seven; four for used oil (beginning 1978); three for leaves and other yard trimmings (open April through the first week in December, start-up 1989). Two of these sites also accept large items and brush (appliance fee applies at drop-offs). City residents can also drop off leaves and other yard trimmings at the three Dane County Compost sites. Drop-off sites for other recyclables discontinued in 1992 after expanding curbside recycling.

Staffing: Organics sites, one staff member whenever open; oil sites, unstaffed

Service Provider: City of Madison Street Division

Materials Accepted: Leaves, other yard trimmings, used oil, appliances, other large items

Participation Incentives: Free compost at county sites

Sectors Served: Residential, commercial landscapers serving residences

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
4 Recycling Trucks[1]	$320,000	Recycling Collection	1997
4 Recycling Trucks[2]	$248,000	Recycling Collection	1995
13 Recycling Trucks[3]	$1,045,000	Recycling Collection	1991
Morbark Chipper	NA	Composting	1985
Chippers	NA	Brush Collection	NA
Soilsaver Composting Bins	NA	Home Composting	NA
Trash Trucks	NA	Trash Collection	NA

Note: Equipment was paid in full at the time of purchase. Madison's Motor Equipment agency owns and administers the city's trash and recycling fleet; the Street Division purchases their use. All costs related to the purchase, operation, and maintenance of these vehicles are included in the fee the Street Division pays to Motor Equipment, which is reflected in the city's O&M costs for 1996.
[1]Two International trucks, 2 Freightliner trucks, all with 33-cubic-yard Kann Commingler bodies.
[2]Crane Carrier trucks with 33-cubic-yard Kann Commingler bodies.
[3]Crane Carrier trucks with 30-cubic-yard Crane bodies.

Source: Institute for Local Self-Reliance, 1999.

accounts for nearly half of this; seasonal curbside collection of brush, more than a quarter; and drop-off sites (available eight months of the year) and backyard composting capture the rest.

Most brush is chipped at the curb using tow-behind chippers. Large piles of brush and tree trimmings are chipped at a central site. The city transports larger logs to the Oak Hill Correctional Facility where inmates convert them to firewood. The city gives away wood chips to area residents, and hauls large truck loads to farmers for use as animal bedding or as base for composting.

City vehicles transport yard trimmings and leaves to Dane County's composting site. The city pays no direct tipping fees. By fall 1997, the county will start charging municipalities a fee for site use.

Education, Publicity, and Outreach

Madison's recycling coordinator gives talks at schools, clubs, and neighborhood associations. He also helps produce a quarterly cable TV program entitled "Madison Works." Every other year, the city produces a "Recyclopedia," a 36-page booklet describing the city's waste management system. The Recyclopedia lists recyclers who accept material not collected by the city. The city sends this booklet to residents, libraries, realtors, and landlords, and posts information from the booklet on the Internet. The city also runs paid TV advertisements on a local station and airs public service announcements, called "Earth Alerts," during children's programming.

Brush collection in Madison using tow-behind chipper

Costs

In 1996, the city spent about $10.7 million for trash, recycling, and yard debris services — about $184 per household served. Of this, about 56% was spent on trash collection and disposal, 23% was spent on recycling, and 21% was spent on yard debris collection and recovery. Materials revenues reduced this by $555,000 to $10.1 million (or $175 per household served).

On a per-ton basis, trash cost $138, recycling $160 ($124 with materials revenues), and yard debris recovery, $79.

The largest components of the 1996 Street Division budget were personnel costs (54%), fees paid to Motor Equipment (25%), and disposal tip fees (14%). The Street Division employs 126 full-time employees and an additional 12 seasonal employees who receive no benefits and work full time 9.5 months per year. Hourly wages average $18 for recycling and trash services.

The DPW's budget has risen during the last decade, but so has the population and the number of households served. When the cost of inflation is taken into account, average per household costs for waste management services have increased from $163 in 1988 to $175 in 1996.[3] During this same period, landfill tip fees more than doubled in real dollars.

Madison's recycling coordinator believes landfill tip fees are now dropping (after years of increasing) because of over-capacity resulting from successful recycling. If material recovery had not helped contain costs, increased tip fees would have driven Madison's waste management budget higher than its current level. Collection routes have changed from 26 trash routes, served with dual-rear-axle trucks, in 1991 to 20 trash routes, served with single-rear-axle trash trucks, and 12 recycling routes in 1996. Increased trash routes would have been necessary during this time because of population growth. Instead the system was reconfigured to integrate recycling. The change to single-rear-axle trash trucks saves approximately $10,000 on the purchase price of each truck and decreases maintenance costs.

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$2,457,885	15,352	$160.10	$42.41
Curbside Collection	$1,588,187	14,261	$111.37	
Scrap Metal Collection (Drop-off)	$171,306	1,091	$156.96	
Processing	$640,714	15,352	$41.73	
Administration[1]	NA	15,352	NA	
Education/Publicity[2]	$57,677	15,352	$3.76	
Composting Gross Costs	$2,245,298	28,506	$78.77	$38.75
Curbside Collection	$1,955,088	18,969	$103.07	
Drop-off Collection/Processing	$286,642	28,506	$10.06	
Administration[1]	NA	28,506	NA	
Education/Publicity[3]	$3,567	28,506	$0.13	
Waste Reduction Gross Costs	$4,703,182	43,858	$107.24	$81.16
Materials Revenues	($554,722)	43,858	($12.65)	($9.57)
Net Waste Reduction Costs	$4,164,960	43,858	$94.97	$71.59

Note: Figures may not total due to rounding. Recycling and composting tonnage figures differs from figure in table on page 114 as above figures include MRF rejects and exclude estimated tonnage backyard composted. Figures above include debt service on equipment and overhead and administration costs for the Street Division. Overhead/administrative costs above the Division level are not included.
[1]Within the Street Division, administrative costs are allocated to services based on estimated percentage of work spent on each service center and are already included in the collection and processing costs presented.
[2]Includes advertising and charges for local cable channel access only.
[3]Includes advertising fees only.

TOTAL SOLID WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$5,980,522	43,405	$137.78	$103.20
Trash Collection[1]	$3,899,011	43,405	$89.83	
Trash Transfer Station Processing/Hauling[2]	$603,003	43,405	$13.96	
MSW Composting Tip Fees[3]	$38,912	1,179	$33.00	
Landfill Tip Fees[4]	$1,436,596	42,055	$34.16	
Administration[5]	NA	43,405	NA	
Education/Publicity[6]	NA	43,405	NA	
Waste Reduction Gross Costs	$4,703,182	43,858	$107.24	$81.16
SWM Gross Costs	$10,683,704	87,263	$122.43	$184.36
Materials Revenues	($554,722)	43,858	($12.65)	($9.57)
Total SWM Net Costs	$10,128,982	87,263	$116.07	$174.79

Note: Numbers may not total due to rounding. Tonnage figures above do not include estimated tonnage backyard composted. Figures above include debt service on equipment and overhead and administration costs for the Street Division. Overhead/administrative costs above the Division level are not included.
[1]Trash collected weekly by Street Division, collection separate from recycling collection.
[2]Costs include transfer station debt. This facility is in Madison.
[3]Tip fee $33 per ton. This facility is 29 miles away from Madison.
[4]Tip fee $36 per ton Jan. through July, then $32 per ton. The landfill is three miles away from Madison.
[5]Within the Street Division, administrative costs are allocated to services based on estimated percentage of work spent on each service center and are already included in the collection and processing/hauling costs presented.
[6]Trash education and publicity not separable from waste reduction education activities and are included in these figures.

Source: Institute for Local Self-Reliance, 1999.

Source: Institute for Local Self-Reliance, 1999.

In addition, the number of employees responsible for trash and recycling has not increased as recycling has expanded and the city has grown in population.

Funding & Accounting Systems

The Street Division receives its funds each year directly from the city's general fund, where state aid[4] for recycling and waste management is deposited.

The Street Division uses cash-flow accounting techniques. Within the Solid Waste Management service center, employee and Motor Equipment costs are allocated to recycling, trash, or composting functions according to actual usage. Revenues generated from the sale of recyclables, tip fees at the transfer station and brush site, and the appliance disposal fees are not deposited in the general fund but credited against the gross costs of the function.

Future Plans and Obstacles to Increasing Diversion

Currently, markets are not favorable near Madison for recycling of mixed paper. Madison's recycling coordinator plans to add mixed paper recovery when it becomes economically feasible.

The biggest obstacle to continued waste reduction success has been to maintain recycling and composting among the large transient student population of the University of Wisconsin. The city targets areas with high student resident concentrations. At the beginning of the year, the city provides students with information on waste reduction programs and how to properly participate; and at the end of the year, the city reminds students to comply with program requirements as they move.

Tips for Replication

Know what everything costs. Don't fudge numbers to sell a program or community alienation may result if higher costs are incurred.

Know your markets. While certain commodities may be present in great enough quantities to make collection appear attractive, lack of markets can disrupt the system.

Not collecting a material is better than collecting it for recycling and then landfilling it.

Build political support. While grassroots organizing can accomplish many tasks, the process is much easier with political support. For 20 years, local politicians and staff in the Streets Department in Madison have been committed to recycling and innovation in the solid waste management system.

Notes:

[1]Ferrous and aluminum cans, corrugated cardboard, glass bottles and jars, HDPE bottles and tubs, PET plastic bottles, large appliances, used oil, grass clippings, leaves, brush, tires, and lead-acid batteries were banned in 1991.

[2]Madison's recycling coordinator estimates that 4,000 of the bins distributed and sold are currently in use and that each participating household is diverting 660 pounds per year.

[3]Costs were normalized to 1996 dollars using the GDP deflator for state and local government expenditures.

[4]Wisconsin uses a gross receipts tax on businesses to fund recycling ($200 million over eight years). From 1992 to 1994, any Wisconsin jurisdiction responsible for municipal solid waste management could apply for funds, which had to be used for the planning, constructing, or operating of a recycling program in compliance with the state recycling statute. After 1995, only organizations deemed to operate an "effective" recycling program, as defined in the state recycling statute, became eligible for funds. On January 1, 1995, every municipality in Wisconsin was part of an organization with a state recognized "effective" recycling program. Funding is scheduled to decline in 1998 and expire in 2000. Madison has received $1.3 million in aid from these funds.

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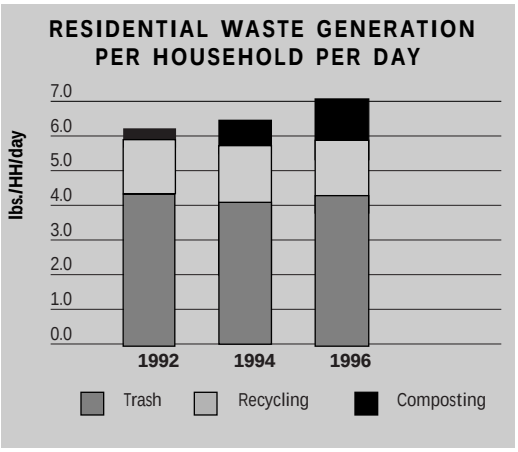
PORTLAND, OREGON

Municipal Solid Waste Reduction **50%**

Portland's mandatory commercial recycling program, instituted in 1996, and its well-established residential waste diversion programs complement each other; the programs resulted in the city diverting nearly half its total municipal solid waste in 1996. Portland switched to a franchising system for residential waste management services in 1992.[1] Companies must offer customers volume-based pay-as-you-throw (PAYT) trash rates, weekly same-day collection of 18 recyclable materials and trash, and biweekly yard debris collection.[2] These service requirements, the state's bottle bill, and commercial recycling programs were key elements in Portland reaching 50% municipal solid waste reduction in 1996.



Source: Institute for Local Self-Reliance, 1999.

PAYT trash fees encourage residents to reduce their trash. Portland set the fee for the lowest weekly service level, the 20-gallon "mini-can," below the cost of providing the service. The Portland Bureau of Environmental Services (BES) reports the city's per household trash disposal amount is lowest among large American cities. In 1996, Portland diverted 40% of its residential waste; 21% through curbside recycling, 17% through yard debris programs, and 2% through the bottle bill.

Portland BES provided businesses assistance in meeting the city's 50% requirement for commercial recycling, instituted in 1996. BES helped businesses develop recycling plans. In the first year, businesses exceeded the goal; recovering 52% of their waste.[3]

Cost-effectiveness of Portland's waste management program has been enhanced by reducing haulers' franchise fees (from 5% to 4% of gross receipts), decreasing operating costs for trash collection, limiting yard debris collection to biweekly rather than weekly, and decreasing average trash can weights at most service levels.

Net costs households pay for residential solid waste management services decreased from $241 in 1992 to $211 per household in 1996. Reduced franchise fees resulted in savings for all waste management services. Even though the amount of trash disposed increased, improved collection efficiency and a drop in average trash can weights produced a reduction in trash management costs from $187 to $144 per household. Diversion costs have increased from $54 per household in 1992 to $67 per household in 1996. Costs only rose 25% while diversion increased 74%.

RESIDENTIAL PROGRAM SUMMARY

	1992	1996
Tons Per Year	136,929	172,830
Disposal	97,242	103,897
Diversion	39,687	68,933
Percent Diverted[1]	29%	40%
Recycled	24%	23%
Composted	5%	17%
Average lbs./HH/day	6.14	7.10
Disposal	4.36	4.27
Diversion	1.78	2.83
Annual Disposal Fees		
Disposal	$6,884,745	$6,407,396
Net Program Costs/HH	$240.55	$210.83
Disposal Services	$186.56	$143.52
Diversion Services	$54.00	$67.30

Notes: Figures above represent single-family residential sector only and exclude self-haul recyclables. 122,245 households served in1992; 129,698 in 1996. 1992 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding. Figures represent fees paid to haulers by residents, not costs to the City of Portland. 1996 figures are actual expenditures, 1992 figures are based on costs assuming all households subscribed to weekly 32-gallon trash collection service.

[1]1992 generation and diversion may actually have been higher as yard debris delivered to drop-off sites was not tracked.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 437,319 (1989), 503,000 (1996)
HOUSEHOLDS: 198,368 (1996); 130,755 SFDs, 59,613 MFDs
BUSINESSES: 50,000
LAND AREA: 138 square miles
HOUSEHOLD DENSITY: 1,437 households/sq. mile
AVERAGE PER CAPITA INCOME: $14,478 (1989)
MEDIAN HOUSEHOLD INCOME: $25,592 (1989)
COMMUNITY CHARACTER: Urban city with manufacturing economy. Principle businesses include Fred Meyer, Inc., Tektronix, Inc., and lumber and wood manufacturing. The city has many parks and is nationally known for its location near numerous outdoor recreation areas.
COUNTY: Multnomah

MUNICIPAL WASTE REDUCTION (1996)

	Residential Tons[1]	Commercial Tons[2]	Total
Recycled	40,040	310,091	350,131
Newspaper	17,911		
High-Grade Paper	7,617		
Glass	4,360		
Corrugated Cardboard	4,138		
Aluminum	1,657		
Other Paper	1,452		
PET/HDPE	802		
Metal	6		
Deposit Containers[3]	3,994	6,091	
MRF Rejects[4]	-1,897		
Composted/Chipped	28,893	100,000	128,893
Curbside Collection	17,793		
Self-Haul[5]	7,500	100,000+	
Fall Leaf Collection[6]	3,600		
Total Waste Reduction	68,933	410,091	479,024
MSW Disposed	103,897	384,000	487,897
Trash	102,000		
MRF Rejects	1,897		
Total Generation	172,830	794,091	966,921
Percent Reduced	39.9%	51.6%	49.5%
Lbs. Waste/HH Served/Day	7.10		

Notes:
[1]Represents dwellings with four units or less. Self-haul recyclables are not tracked and therefore not included.
[2]Commercial trash and recycling estimated based on information provided to Bureau of Environmental Services by commercial haulers, independent recyclers, and four MRFs serving Portland. Also included is an estimate of material delivered to self-haul disposal and recycling facilities. Commercial tonnage includes materials from MFD (five or more units) recycling programs.
[3]ILSR calculated tonnage based on Container Recycling Institute's reported average 40.1 pounds per capita recovery through Oregon's bottle bill. Tonnage was split 60:40 between residential and commercial sectors.
[4]ILSR calculated rejects as 5% of material collected in curbside program. Portland's Solid Waste and Program Specialist reported the average reject rate at facilities processing these materials to be 5% or less.
[5]Portland estimated self-haul tons from data reported by private composters.
[6]Portland's Bureau of Maintenance reports average annual collection of leaves to be 24,000 cubic yards. ILSR converted this to weight using one cubic yard of compacted leaves = 300 pounds.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

Oregon's Bottle Bill, enacted in 1971, requires a 5¢ deposit on most carbonated beverage containers. Oregon's 1983 Recycling Opportunity Act, the first state law to mandate recycling, requires municipalities with populations of at least 4,000 to provide curbside collection of recyclable materials. Oregon's Recycling Act (1991) set a statewide recycling goal of 50% by 2000 and a 45% goal for the Portland metropolitan area by 1995. Portland City set its own goals of 10% reduction in per capita waste generation by 1997 and 60% recycling of all solid waste by 1997.[4]

State law requires each jurisdiction to offer weekly yard debris collection unless it can demonstrate the existence of an alternative program that diverts a similar percent of materials as do those jurisdictions with weekly programs. Portland's biweekly program meets this requirement.

State law and Portland City Code require owners of rental property to subscribe to and pay for trash service for their tenants. Multi-family complexes (defined as those with five or more units) must recycle at least five materials; newspapers and scrap paper are two of these. The other three materials can be corrugated cardboard, magazines, tin cans, glass containers, or plastic bottles.

By ordinance effective January 1996, Portland requires its businesses to recycle 50% of their waste. The ordinance allows the city to levy civil fines of up to $500 for non-compliance although BES staff report, as of December 1997, compliance has been high and no need to issue a fine has arisen.

Portland instituted PAYT trash rates in 1992. To encourage residents to reduce waste, a 20-gallon mini-can service, the lowest level of weekly service available, is priced below the cost of service at $14.80 per month. Fees for 60- and 90-gallon roll cart service and multiple-can services include a disincentive premium to discourage high levels of disposal. The city sets all rates for the various levels.[5] (See table on page 122.)

Source Reduction Initiatives

Portland uses information resources to encourage source reduction. Brochure topics include shopping smart and grasscycling. Waste prevention topics will also be addressed on the city's Web page, under development as of mid 1997.

Metro offers discounted price compost bins in its service area. Since 1993 it has distributed approximately 5,000 bins a year.

Residential Recycling Program

Portland requires franchised trash hauling companies to provide weekly recycling collection to all residences with four or fewer units. Thirty-four franchised trash hauling companies have formed two co-ops to provide recycling services to their trash customers, the remaining 13 trash franchisees provide their own recycling services. The co-ops

CURBSIDE COLLECTION OF RESIDENTIAL RECYCLABLES

Service Provider: Geographically franchised private companies, currently 47 residential franchisees for trash; 34 companies have formed two co-ops serving their trash customers, remaining 13 trash franchisees provide their own recycling services, companies must have an approved recycling plan on file with the city

Start-up Date: June 1987 for citywide program, franchising system began February 1992

Mandatory: Provision of services mandatory but individual participation is not

Households Served: 129,698 in 1996; all SFDs and MFDs with four units or less are eligible

Materials Accepted: Newspapers, glass bottles and jars, ferrous cans and lids, corrugated cardboard, kraft paper bags, aluminum cans, other clean aluminum, ferrous and non-ferrous scrap (less than 30 pounds and 30" in any dimension; no appliances, bicycles, or car parts), used motor oil, all plastic bottles, magazines, paperboard, mail, mixed paper, paper egg cartons, milk cartons, aseptic containers, aerosol cans, and phone books

Collection Frequency: Weekly, same day as trash collection

Set-out Method: Each recyclable material must be sorted into separate brown paper bags and placed in 14-gallon yellow city-provided recycling bin(s).[6] Cardboard must be flattened and multiple pieces bundled. Some haulers allow customers to combine certain materials but the city discourages this practice. Portland officials made the decision to require source-separation so the participation instructions would be consistent in all parts of the city and over time.

Collection Method: Varies by contractor, city requires trucks used to have been originally manufactured for purpose of collecting recyclables and have capacity to serve 3,000 customers per week.

Participation Rate: 81%, set-outs counted and participation is defined as total monthly customer set-outs/customers in program/3 (in this way participation is counted as recycling three times per month out of a potential 4.33 opportunities), 65% of households set out something each week in 1996 study by Waste Matters Consulting for American Plastics Council

Participation Incentives: Two free recycling containers to every household, reduced trash fees through increased recycling

Enforcement: Improperly prepared materials are not collected and customer is given city-provided notice, log book records missed set-outs, recycler retains copy of notice

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: 1992

Service Provider: 47 trash haulers, Portland Bureau of Maintenance collects leaves

Households Served: 127,500 in 1996; all SFDs and MFDs with four units or less

Mandatory: Provision of services mandatory but individual participation is not

Materials Collected: Yard debris, including leaves, grass clippings, brush less than four inches in diameter and 36 inches long, and other yard debris

Collection Frequency: Biweekly for hauler programs; usually during November and December for leaf collection, more often if needed to clear storm drains

Set-out Method: Material must be placed in a 32-gallon can marked with city-provided "Yard Debris Only" sticker or in biodegradable bag. Brush can be bundled. Each extra container of yard debris collected costs $1. Residents push leaves into street for city collection.

Collection Method: Varies by contractor; the city uses various methods to collect leaves including vacuum trucks and manual loading into dump trucks. Crew size varies.

Participation Rate: NA

Participation Incentives: Reduced trash fees through increased waste diversion

Enforcement: "We can't haul it" strip attached to improperly prepared materials and left at curb

DROP-OFF COLLECTION

Number of sites: Approximately 30

Staffing: Varies

Service Provider: Private companies or regional government. Metro runs two drop-off sites for recyclables at its transfer stations. All yard debris drop-off sites run by private companies. Deposit containers can be returned for refund to any merchant that sells the product.

Materials Accepted: Varies by site

Participation Incentives: Reduced trash fees through increased trash reduction

Sectors Served: Residential and commercial/institutional

RESIDENTIAL RATE SCHEDULE

Waste Can Volume	Collection Frequency	Monthly Charge	% Customer Enrollment
20-Gallon	Weekly	$14.80	18.6
32-Gallon	Weekly	$17.50	48.2
35-Gallon	Weekly	$18.90	10.5
60-Gallon	Weekly	$22.85	8.2
90-Gallon	Weekly	$27.85	4.6
32-Gallon	Monthly	$9.95	5.6
On-Call 32-Gallon[1]	Must be more than 35 days apart	--	1.2
Recycling Only	Weekly	$4.00	0.4

Note: Rates effective July 1, 1996. Unless otherwise noted, customers receive the indicated trash service, weekly curbside recycling collection, and biweekly yard debris collection. Other levels of service are available to residents, for example, residents can subscribe to collection service for two, three, or four 32-gallon cans weekly. These service levels and charges are not listed here because these levels have very few subscribers.
[1]Does not include recycling or yard debris collection. $5.50 fee is charged per collection, not monthly.

Source: Institute for Local Self-Reliance, 1999.

allow the hauling companies, especially smaller companies, to share capital costs for recycling equipment, increase collection efficiency, and enjoy economies of scale in processing and marketing of collected materials. Each company must have an approved recycling plan on file with the city.

Recycling companies collect 18 materials in the weekly program. Haulers must ensure the materials they collect are processed and marketed, not disposed. Source-separation by residents allows some haulers to deliver material directly to markets without further processing. Portland diverted 21% of its residential waste through this program.

Portland ordinance requires multi-family complexes have recycling programs that collect scrap paper and newspaper as well as three additional materials. As of early 1997, the city had sent 5,000 letters to owners of rental properties. About 3,000 new trash and recycling subscriptions at rental properties resulted from this effort.[7] BES studies revealed the proportion of complexes with no recycling program dropped from 10% in 1995 to 2% in 1996 as a result of the mandatory ordinance.

Most haulers collect materials source-separated and can deliver them directly to markets. EZ Recycling, Oregon Recycling Systems, Energy Reclamation, Inc., and Recycle America operate MRFs that process the majority of material that need to be processed. The facilities employ a variety of sorting techniques, both automated and manual.

The Metropolitan Service District (Metro), a regional government agency, owns and operates two solid waste transfer stations in the Portland area. Portland residents who self-haul recyclable materials to these facilities pay no tip fee and can receive up to a $6 rebate.

Commercial Recycling Program

All Portland businesses must separate recyclable materials from mixed waste, recovering a minimum of 50% of their waste. Businesses may recycle any materials they choose. BES staff assisted companies in devising recycling programs to meet the 50% requirement.[8] BES conducts unannounced inspections of businesses. If the recycling system does not meet requirements, staff specify needed improvements and offer free technical assistance. To date, no businesses contacted have refused to work toward compliance and no penalties have been issued. The program has been well received but is too new to have reliable, definitive data about its success. Surveys of businesses have shown 29% of businesses reported they did not recycle in 1993 as compared to only 7% in 1996.

Composting Program

According to Portland's franchising agreements, haulers must collect yard debris from residential customers biweekly (in FY94, collection service was monthly) and deliver material to a "City Approved Processor." Residents place material at the curb in reusable cans up to 32 gallons, in kraft paper bags, or in biodegradable Novon® bags. Residents can also opt to deliver their material to privately operated composting sites or to a Metro transfer station.

Portland's Bureau of Maintenance collects leaves from the streets in the autumn (about 24,000 cubic yards of leaves a year.) In 1996, Portland diverted 17% of its residential waste through curbside collection, fall leaf collection programs, and private composters.

Education, Publicity, and Outreach

Portland uses a multi-media approach to promote its waste reduction programs including a Web page (under development), a recycling hotline, and a quarterly newsletter for single-family households with recycling service. The Complex Recycler quarterly newsletter is distributed to 1,200 multi-family dwelling owners and managers.

Portland contracts with a private company, Master Recyclers, to do presentations and information booths about the city's waste management programs.

Costs

Portland BES only incurs costs to administer the city's waste management programs. The tables below reflect a breakdown of fees paid by residents to haulers. The city employs nine full-time and one part-time staff.

Haulers must charge variable rates for trash services as set by the BES.[9] BES determines rate structures to allow haulers to recover collection, handling, and disposal costs for trash, recycling costs after revenues are received, yard debris collection and handling costs, general and administrative costs, and costs for depreciation, interest, and repairs and maintenance on capital equipment. Service levels above weekly 32-gallon trash collection include a disincentive premium to discourage disposal and the 20-gallon mini-can service rates include an incentive discount. After setting costs to cover actual expected hauler expenditures, an operating margin of 9.5%

WASTE REDUCTION FEES PAID BY RESIDENTS (1996)

	Cost	Tons	Cost/HH/YR
Recycling Gross Costs	$7,445,649	37,943	$55.84
Recycling Collection and Processing[1]	$4,705,374	37,943	
Hauler Admin./Overhead/Operating Margin[2]	$2,317,154	37,943	
City Administration/Overhead/Education[3]	$423,121	37,943	
Composting Gross Costs[4]	$2,343,537	17,793	$17.58
Yard Trimmings Collection/Processing	$1,486,253	17,793	
Hauler Admin./Overhead/Operating Margin[5]	$731,903	17,793	
City Administration/Overhead/Education[3]	$125,381	17,793	
Waste Reduction Gross Costs	$9,789,186	55,736	$73.42
Materials Revenues[6]	($815,980)	55,736	($6.12)
Net Waste Reduction Costs	$8,973,206	55,736	$67.30

Note: Portland does not measure program effectiveness on a cost per ton basis. Instead the city analyzes cost on a per household basis. Figures may not total due to rounding. Composting tonnage above differs from figure in table on page 120 as above figure excludes fall leaves. All figures above represent cumulative payments by customers to haulers for waste services during 1996.

[1]Recycling charges for 1996 included credit of $0.70 per household for projected recycling revenues. This cost figure represents actual payments to haulers plus the credit.

[2]ILSR calculated hauler administration and overhead costs by pro-rating total overhead and administration, fees paid by customers by the proportion of service fees paid for recycling.

[3]ILSR calculated city costs by pro-rating total franchise fees paid to the city by the proportion of tons recycled, composted, and disposed.

[4]Leaf collection costs not included in cost figures. Leaf collection performed by Bureau of Maintenance and cost figures are not available.

[5]ILSR calculated hauler administration and overhead costs by pro-rating total overhead and administration fees paid by customers by the proportion of service fees paid for yard debris services.

[6]Represents actual revenues haulers earned from the sale of residential recyclables during 1996.

TOTAL SOLID WASTE MANAGEMENT FEES PAID BY RESIDENTS (1996)

	Cost	Tons	Cost/HH/YR
Disposal Gross Costs	$19,136,148	102,000	$143.52
Trash Collection	$5,932,992	102,000	
Trash Disposal	$6,407,396	102,000	
Hauler Administration/Overhead[1]	$6,077,004	102,000	
City Administration/Overhead/Education[2]	$718,757	102,000	
Waste Reduction Gross Costs	$9,789,186	55,736	$73.42
SWM Gross Costs	$28,925,334	157,736	$216.95
Materials Revenues	($815,980)	55,736	($6.12)
Total SWM Net Costs	$28,109,354	157,736	$210.83

Note: Portland does not measure program effectiveness on a cost per ton basis. Instead the city analyzes cost on a per household basis. Figures may not total due to rounding. All figures above represent cumulative payments by customers to haulers for waste services during 1996.

[1]ILSR calculated hauler administration and overhead costs by pro-rating total overhead and administration fees paid by customers by the proportion of service fees paid for trash collection and disposal.

[2]ILSR calculated city costs by pro-rating total franchise fees paid to the city by the proportion of tons recycled, composted, and disposed.

Source: Institute for Local Self-Reliance, 1999.

SOLID WASTE SERVICES RATE STRUCTURE

32-Gallon Weekly Trash Service	FY92[1]	FY97
Collection Charge	$5.31	$4.05
Disposal Charge	$4.27	$3.89
Recycling Charge	$2.20	$2.36
Yard Debris Charge	$0.55	$0.97
General and Administrative Costs	$2.63	$3.87
Operating Margin	$1.66	$1.66
Franchise Fee	$0.88	$0.70
Total	$17.50	$17.50

[1]Represents rates in effect for the second half of 1992 after rates were adjusted to reflect costs of added yard debris service.

Source: Institute for Local Self-Reliance, 1999.

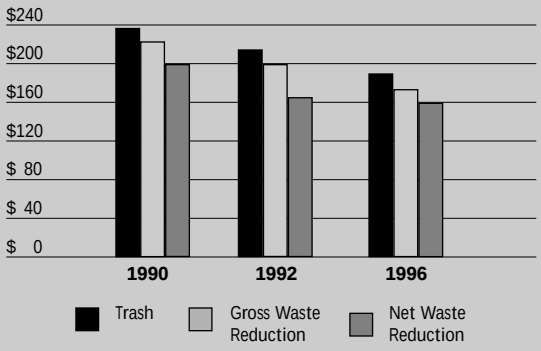
and the franchise fee are added to arrive at the final monthly charge to customers at each service level.

Since 1992, yard debris collection frequency has increased and additional materials have been added to the recycling program. Rates have fluctuated slightly because of volatile material markets but the prices for the various service levels are currently near to the prices set in 1992. Average trash can weights have dropped, inflation has been low, and tip fees for trash and yard debris have remained constant for the previous few years. Collection efficiencies for trash have increased while costs for recycling and yard debris services have grown at less than the rate of inflation. The net result has been that operating costs for haulers have remained relatively stable.

Funding & Accounting Systems

Haulers pay the city franchise fees (4% of their gross receipts in FY97). These funds finance the city's residential trash, recycling, and composting program administration, education programs, publicity, and franchise oversight.

PER TON COSTS TO RESIDENTS FOR WASTE MANAGEMENT



Source: Institute for Local Self-Reliance, 1999.

A $2.80 per ton tax on tip fees charged for commercial waste disposal is returned to the city. This tax funds the city's cost to promote, administer, and enforce business recycling programs.

Future Plans and Obstacles to Increasing Diversion

The BES is considering a number of changes such as switching to commingled collection of recyclables in order to increase convenience, participation, and collection efficiency. The challenge for city planners is to ensure changes will not add costs or reduce waste diversion.

According to residential waste stream analysis, paper is still the most predominant material in trash. Maximizing paper recycling could significantly increase the city's waste reduction rate.

Tips for Replication

PAYT trash rates encourage customers to reduce waste and increase diversion.

Know the public and conditions in your jurisdiction and plan accordingly.

Be responsive to the public.

Focus on convenience, striving to continuously make participation easier over time.

Notes:

[1]Under this system, waste management companies receive exclusive rights to provide services within specified areas. Before 1992, waste services providers operated in an open market and set their own fees. City and state regulations required haulers to offer collection of eight recyclable materials but not yard debris.

[2]The Metropolitan Service District (Metro, a regional government agency) offers drop-off recycling and yard debris recovery opportunities. Materials recovered by it are not included in the reported recovery rates.

[3]Portland did not track commercial recycling levels prior to 1996.

[4]The city recycling goal will probably not be reached, in part due to the failure of a mixed organic waste composting facility in which the city planned to recover 10% or more of its waste.

[5]Rates for most service levels increased in fiscal year 1997 to offset a drop in market prices paid for recyclable materials.

[6]The City of Portland and Metro split the $3.50 each purchase cost for 350,000 of these bins in 1992. Portland has purchased an additional 95,000 bins, using franchise fee funds, in the intervening years.

[7]The remaining buildings were either vacant or being referred to the city agency responsible for the enforcement process.

[8]BES allowed businesses a grace period to implement their programs, then began enforcement in June 1996.

[9]The fee for trash, recycling, and yard debris collection of a weekly 32-gallon trash can service is $17.50 per month, the same rate households paid in 1992 when the franchise system began. In the intervening years, this rate has dropped as low as $17.20 and risen as high as $17.60.

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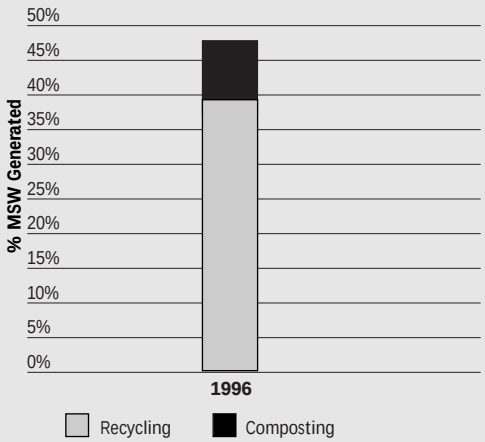
RAMSEY COUNTY, MINNESOTA

Municipal Solid Waste Reduction

47%

In 1996, Ramsey County diverted 47% of its municipal solid waste from disposal (8% through composting and 40% through recycling).[1] County MSW activities include providing grants, technical assistance, and educational resources; ownership of a material recovery facility and a network of yard trimmings drop-off and processing facilities; and tracking data about waste management activities.[2] The 17 communities reporting to Ramsey County each operate their own waste management system.[3] These vary widely. Saint Paul, the largest of the 17 communities with over half the county population, for example, contracts with the Saint Paul Neighborhood Energy Consortium (NEC) and Macalester Groveland Community Council to provide residential recycling services. The city has an open trash hauling system in which haulers compete for customers. These haulers also offer yard trimmings collection at an additional cost. Residents can use the county yard trimmings drop-off sites free of charge.



Note: MSW disposed is not measured separately by residential vs. commercial sources. Therefore pounds per household per day for residential waste has not been determined.

Source: Institute for Local Self-Reliance, 1999.

Ramsey County's waste reduction level is due to commercial sector recycling, pay-as-you-throw (PAYT) trash fees, state disposal bans (yard trimmings, tires, lead-acid batteries, used oil and oil filters, major appliances, and rechargeable batteries), and requiring recycling services to single- and multi-family homes.[4] Highlights of Saint Paul's recycling programs are the curbside collection of 12 materials (including mixed paper, durables, and textiles) and mandatory commercial sector recycling of at least three materials.[5]

According to a study performed by the Saint Paul-Ramsey County Department of Public Health, Ramsey County single-family households spent approximately $237 in 1996 for regular municipal solid waste services. Equivalent data from previous years are not available. PAYT trash rates and low-cost drop-off yard debris collection help residents keep costs in check.

The Saint Paul NEC recycling costs have remained relatively stable with per ton costs being $115 in 1996 compared to $116 in 1988.

PROGRAM SUMMARY

	1991	1996
Tons Per Year	483,929	673,298
Disposal	285,334	356,187
Diversion	198,595	317,111
Percent Diverted	41%	47%
Recycled	32%	40%
Composted	9%	8%
Average lbs./HH/day	NA	NA
Disposal	NA	NA
Diversion	NA	NA
Annual Disposal Fees		
Disposal	NA	NA
Net Program Costs/HH	NA	NA
Disposal Services	NA	NA
Diversion Services	NA	NA

Notes: Figures above cover Ramsey County total MSW. Numbers may not add to total due to rounding.

Source: Institute for Local Self-Reliance, 1999.

RAMSEY COUNTY

POPULATION: 496,068 (1996)
HOUSEHOLDS: 197,500 (1996, est.); ~138,250 SFDs (three or fewer units per building), ~59,250 MFDs (includes all condominiums)
BUSINESSES: 14,417 (1996, est.)
LAND AREA: 155.8 sq. miles
HOUSEHOLD DENSITY: 1,268 per sq. mile
AVERAGE PER CAPITA INCOME: $15,645 (1989) $23,862 (1995)
MEDIAN HOUSEHOLD INCOME: $32,043 (1989)
COUNTY CHARACTER: Most urbanized and racially and ethnically diverse county in Minnesota. The county contains part or all of 19 municipalities. (See footnote 3.)

SAINT PAUL

POPULATION: 270,441 (1996)
HOUSEHOLDS: 100,327, 73,745 in 1-11 unit properties, 26,582 in apartment complexes with 12 or more units
BUSINESSES: 7,794 (1996, est.)
LAND AREA: 52.8 sq. miles
HOUSEHOLD DENSITY: 2,094 per sq. mile
AVERAGE PER CAPITA INCOME: $13,727 (1989)
MEDIAN HOUSEHOLD INCOME: $26,498 (1989)
CITY CHARACTER: City with strong, historic, and diverse neighborhoods. Recent development has centered on the waterfront re-connecting the city with the Mississippi River.

WASTE REDUCTION

Tons (1996)	St. Paul Residential[1]	Ramsey Co. Residential[2]	Ramsey Co. Commercial[3]	Ramsey Co. Total MSW
Recycled/Reused	19,342	61,630	204,679	266,309
Other		2,087	191,887	253,517
Food Discards			12,792	12,792
Newspaper	10,496	23,637		
Other Metals		12,460		
Glass	2,735	7,813		
Mixed/Other Paper	2,247	3,660		
Lead-Acid Batteries[4]		3,036		
White Goods[4]		2,968		
Steel/Tin Cans	687	1,272		
Tires[4]		989		
Corrugated Cardboard	1,257	975		
Aluminum	354	803		
Commingled Plastics	117	629		
Textiles	219	410		
Commingled Cans		344		
Magazines	1,191	316		
Oil Filters[4]		231		
Phone Books	39	2		
Composted/Chipped[5]	NA	50,802	0	50,802
Total Waste Reduction	NA	114,123	204,679	317,111
MSW Disposed	NA	NA	NA	356,187
Refuse-derived Fuel	NA	NA	NA	232,414
Landfilled	NA	NA	NA	123,773
Total Generation	NA	NA	NA	673,298
Percent Reduced	NA	NA	NA	47.1%
Lbs. Waste/HH Served/Day	NA	NA		

Note: Figures reflect calendar year actual tons unless otherwise noted.

[1]Saint Paul recycling figures include materials collected at curbside by Saint Paul NEC and Macalester Groveland Community Council, and plastics collected at drop-off sites. Total tonnage reflects scale weights. The Saint Paul NEC estimated the breakdown of material by commodity using data from a hauler who sampled random loads and reported percentage of each commodity in the sample loads. Using this methodology has resulted in Saint Paul's reported residential tonnages for corrugated cardboard, magazines, and phone books to be greater than the county's reported recovery for these commodities, although Saint Paul residential recovery is a subset of Ramsey County residential recovery.

[2]Saint Paul residential recycling is included in the Ramsey County figures.

[3]Ramsey County commercial figures include both documented and estimated tonnage. County staff have estimated 133,300 tons of recycling based on previous recycling studies and surveys performed in the metropolitan area, coupled with annual updates that are based on surveys of haulers, end markets, and some major waste generators in the metropolitan area.

[4]Ramsey County recycled tonnage calculated by using a state-developed estimate of total generation and percentage recycled. These figures were pro-rated based on county population.

[5]Represents the tonnage of yard debris for 1994, the last year for which complete information was gathered. Tonnage of leaves and grass clippings, managed at the county sites, by the city of Roseville, and by private haulers and sites is included. Ramsey County staff estimate tons of materials delivered to county sites by first estimating material volumes, and then converting the figure to weight using conversion factors, which vary by month, developed by one of the county's yard debris handlers.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

In 1989, Minnesota's legislature passed the Select Committee on Recycling and the Environment (SCORE) legislation, which set a seven county metropolitan area municipal solid waste recycling goal of 35% by December 31, 1993. Amendments established an additional goal of 50% by December 31, 1996, which can include a 5% yard debris credit and a 3% source reduction credit, based on county program activities. The new regional Solid Waste Management Policy Plan for the seven county area, adopted in October 1997 by the Minnesota Office of Environmental Assistance, provides that this 50% recycling goal is extended through 2003.

Minnesota Statute §115A.931 effectively bans leaves, grass clippings, garden debris, and tree and shrub waste from state landfills and incinerators.[6] The state also prohibits tires, lead-acid batteries, motor vehicle fluids, used oil filters, major appliances, phone books, fluorescent and high-intensity discharge lamps, some mercury containing devices, and rechargeable batteries from disposal.

Minnesota law, in effect since the 1970s, requires the seven metropolitan counties to prepare master plans for solid waste management. These must be in accordance with the regional solid waste policy plan, which in turn must be in accordance with state legislation and policy. The state requires all counties to provide its citizens with the "opportunity to recycle."[7]

Ramsey County directs municipalities to ensure curbside recycling is available to all residents, including provision of a long-term funding mechanism.[8] Since 1990, the county has distributed $1 million of its state SCORE grants to municipalities, based on population, to provide partial funding to help establish and maintain recycling programs. Since 1987, the county has distributed over $13 million to municipalities in SCORE grants and other funds for recycling programs.

The state and county require trash haulers to provide residential and commercial volume-based trash rates. Saint Paul passed a similar ordinance, effective July 1, 1991. Of the 17 municipalities, 12, including Saint Paul, have open trash hauling systems, in which fees can vary by hauler and by the neighborhood in which service is offered. Five municipalities have organized residential trash hauling in which the municipality contracts with one or more haulers for collection. Haulers operating in Saint Paul offer four levels of service: low volume/senior rate (price range effective October, 1997: $8.76-$14.99 per month), one 30-gallon can ($10.83-$16.25), two cans ($13.80-$17.33), and three cans/unlimited/full service ($17.03-$22.23).

Saint Paul's mandatory recycling ordinance requires occupants of all properties in the city to recycle at least three materials. The requirement became effective on July 1, 1991, for single-family dwellings and January 1, 1992, for multi-family dwellings and commercial establishments. Three other municipalities in the county also require residents to separate recyclables, and another municipality requires commercial recycling.

Source Reduction & Reuse Initiatives

Ramsey County encourages source reduction through PAYT trash rates and yard trimmings reduction programs, promoting shopping practices that avoid waste and excess packaging, and encouraging consumers to buy wisely and share usable but unwanted products to help minimize waste. Media campaigns highlight reduction and reuse opportunities for businesses. The county's Business Waste Assistance (BWA) Program provides technical assistance to help reduce packaging, office paper, and other waste materials. Ramsey County, along with the other six metropolitan counties, also contracts with the Minnesota Technical Assistance Program to operate the Metro Area eXchange (MAX), a regional materials exchange program.

The county encourages grass cut-it-and-leave-it, backyard composting, and avoiding over-fertilization to reduce yard trimmings. It spreads these messages primarily through a contract with the Extension Service Master Gardener program. Saint Paul NEC offers backyard composting workshops and runs two composting demonstration sites.

Saint Paul offers a unique product reuse program to its single-family homes. The project is a joint effort between NEC and Goodwill Industries. Residents simply bag reusable household durables and textiles for donation and set them out with their recyclables. Super Cycle and EZ Recycling collect these reusable items on the same truck as recyclables. Goodwill processes the collected materials along with its other donations.

Residential Recycling Programs

In 1996, Ramsey County recycled 40% of its municipal solid waste. The county requires each municipality to offer residential recycling services. Communities operate their own programs.

Haulers deliver most, but not all, materials collected in county residential curbside recycling programs to a county-owned MRF in Saint Paul. Super Cycle, Inc. operates the MRF through a lease agreement, which expires in 1999. The facility also has a drop-off center. A magnetic separator removes ferrous materials. Other materials are manually sorted. The county and Super Cycle, Inc. share the risks and benefits of recycling markets.

Other recycling options include drop-off sites (operated by municipalities and private firms), which collect mixed or single types of recyclables.

A separate system for recovery of lead-acid batteries, used oil and oil filters, tires, white goods, rechargeable batteries, certain dry cell batteries, and some items containing mercury has evolved. Private sector companies run most of the recovery efforts. The county maintains a list of private recyclers for these materials.

Since 1986, the city of Saint Paul has contracted with the Saint Paul NEC and Macalester Groveland Community Council to administer residential recycling programs. NEC manages the programs for all of the city except in the Macalester Groveland neighborhood. NEC hires two private contractors, Super Cycle Inc. and EZ Recycling, to collect materials. Macalester Groveland Community Council hires Eagle Environmental to collect recyclables at curbside in that neighborhood. NEC administers the program, conducts outreach, and runs a hotline. This program serves residents in single- and multi-family homes. Complementing the residential collection program are a network of drop-off collection points for plastic containers, annual neighborhood clean-up days that emphasize reuse and recycling, waste reduction outreach programs, and public education and information programs that target schools and segments of the population with lower-than-average participation.

Since 1987, Saint Paul Public Works has coordinated a city-sponsored neighborhood clean-up program through the city's 17 planning district councils. Each district offers a drop-off site for hard-to-handle household discards (such as tires, furniture, appliances, concrete, brush) once per year in the spring or fall. Primary objectives of the program are to minimize trash nuisances in backyards and along alleys; to offer an inexpensive disposal option for citizens; and to maximize recovery of the materials dropped off. Due to economies of scale and use of neighborhood volunteers, the 1996 expenditure of $108,700 was a fraction of what residents would otherwise have paid on their own for disposal of items accepted at clean-ups. The program recovered over 1,800 tons of materials in 1996, saving an additional $75,000 in disposal fees. NEC helps the

RAMSEY COUNTY COMMUNITY CURBSIDE RECYCLING PROGRAMS

	Population (1996)	Collection Frequency	Funding Mechanism
Arden Hills	9,678	2/month	Recycling Service Charge
Blaine[1]	0	NA	NA
Falcon Heights	5,384	2/month	City Utility Bills
Gem Lake	452	2/month	Property Tax
Lauderdale	2,716	2/month	Recycling Service Charge
Little Canada	9,469	2/month	Hauler Bills
Maplewood	34,008	2/month	Utility Bills
Mounds View	12,789	2/month	Hauler Bills
New Brighton	22,584	1/two weeks	Recycling Service Charge
North Oaks	3,718	1/month	Recycling Service Charge
North Saint Paul[2]	12,764	weekly	Recycling Service Charge
Roseville	34,014	1/two weeks	Utility Bills
Saint Anthony[1]	2,614	2/month	Hauler Bills
Saint Paul	270,441	1/two weeks or 1/week	Recycling Service Charge
Shoreview	26,118	2/month	Recycling Service Charge
Spring Lake Park[1]	103	NA	NA
Vadnais Heights	12,895	2/month	Hauler Bills
White Bear Lake[1]	25,611	2/month	City Bills
White Bear Township	10,703	2/month	Hauler Bills

Notes:
[1]These communities are only partially in Ramsey County. The population represents only the proportion of population residing in Ramsey County.
[2]North Saint Paul increased collection from two times a month to weekly in 1997.

Source: Institute for Local Self-Reliance, 1999.

city to coordinate the neighborhood clean-up program.

Commercial Recycling Programs

Commercial waste reduction is supported by a county-sponsored waste education and technical assistance program for businesses and a mandatory commercial recycling ordinance in Saint Paul and one suburb, Arden Hills. Government monies are not spent on collection of commercial recyclables.

Municipalities do not provide recycling collection services to businesses. The county supports business recycling through the Ramsey County BWA Program, begun in 1991. The BWA Program focuses on small to medium businesses but provides on-site and telephone consultation and technical assistance to help all businesses in waste reduction and recycling efforts. It also distributes information at business expositions, through the mail, during door-to-door visits, and through the mass media. The BWA Program worked in conjunction with other metropolitan counties to produce the booklet *Resourceful Waste Management: A Guide for Minnesota/Metropolitan Businesses and Industries*. The first edition was mailed in 1992 to all county businesses of record. Through February 1997, the county provided more than 3,800 copies in response to requests. Results of collaborations between the BWA Program and other organizations include establishing the Metro Area eXchange (MAX), promoting Minnesota's Waste Wise program among area businesses, and developing a statewide networking body for government employees working with businesses on waste and environmental issues.

In 1996, businesses in Ramsey County diverted over 12,500 tons of food discards for use by farmers as hog food, accounting for 6% of recycling in the commercial sector. The recovered food primarily comes from restaurants, supermarkets, and food distribution warehouses. Several farmers in the region collect and process the material.

A Saint Paul city ordinance requires all businesses to recycle at least three materials. As the overall countywide recycling goal is being met, the city is not enforcing the ordinance except on a complaint basis. Businesses requesting technical assistance from the city are referred to the BWA Program.

Composting Programs

In 1994, the last year for which complete data were collected, 50,802 tons of leaves and grass clippings were diverted from disposal through composting in Ramsey County. Based on the assumption that recovery has remained constant at this level, in 1996, Ramsey County diverted 8% of its waste through yard debris recovery. Most county residents have four options for recovering grass clippings, leaves, and other garden debris: backyard composting, contracting with a private company for collection service for an extra charge, delivering the material to a private company for a fee, or taking it to a county site for free. One community, Roseville, offers residents fall leaf collection as a part of its residential waste program. Tree and shrub debris is typically handled by private companies.

The vast majority of leaves and grass clippings is taken to the county's eight yard debris drop-off sites. During 1996, county residents made 329,228 visits to these sites and delivered 98,752 cubic yards of yard debris. The county hires contractors to (1) windrow compost leaves at five of its yard debris drop-off sites, (2) transfer some material from sites that are for collection only to sites with compost facilities, and (3) transport some materials to private processors. Almost all materials for which there is no processing space are hauled to out-of-county

CURBSIDE COLLECTION OF RECYCLABLES (ST. PAUL)

Service Provider: Super Cycle, Inc. under contract with The Saint Paul Neighborhood Energy Consortium (NEC), which is, in turn, a contractor for the City of Saint Paul

Start-up Date: Four neighborhoods began collection in September 1986, program went citywide in 1988

Mandatory: Yes. The city ordinance requires recycling of at least three materials but does not specify which materials.

Households Served: 100,327 total; 73,745 units in dwellings with up to eleven units; 26,582 units in buildings or complexes of twelve or more units

Materials Accepted: SFDs: Mixed paper (mail, office paper, magazines and catalogs, and paperboard), glass bottles and jars, newspaper, corrugated cardboard, aluminum cans, steel and tin food and beverage cans, durable household goods (including textiles, books, working small appliances, hardware and tools, unbreakable kitchen goods, games, and toys). MFDs: Same materials as curbside program excluding durable goods.

Collection Frequency: Twice a month, some MFDs receive weekly collection

Set-out Method: SFDs: Each unit is given a 14-gallon blue recycling bin, residents provide additional bins if needed. Materials must be set out in six categories: glass, ONP, OCC, mixed paper, cans, and durable goods. Durable goods go in one or two 30-gallon plastic bags; one for "clean rags," the other for good clothes and household goods. All other materials must be in separate recycling bins or bags. MFDs: each building gets from six to eight 90-gallon toters. Materials are sorted into six streams: clear glass; green and brown glass; newspaper, phone books, and kraft paper bags; other mixed paper; corrugated cardboard; and cans. Larger buildings often get multiple toters for newspaper.

Collection Method: SFDs: Single-person crews place materials into six compartment trucks: ONP, OCC, cans, mixed paper and, clear, brown, and green glass. Driver sorts glass into appropriate compartments. Crews place durable goods in a cage on the top of the truck. MFDs: Single-person crews collect materials using semi-automated side-loading trucks to empty toters.

Participation Rate: 62%, with some neighborhoods as high as 95%

Participation Incentives: Potential reduction in PAYT trash rates through increased diversion

Enforcement: City staff follow up on complaints with letters explaining requirements

CURBSIDE COLLECTION OF YARD TRIMMINGS (RAMSEY COUNTY)

Start-up Date: Banned from disposal in 1990

Service Provider: Most residential trash haulers offer curbside yard trimmings collection in Ramsey County. Only one community provides curbside yard trimmings collection services; the town of Roseville collects fall leaves at curbside from its residents.

Households Served: NA

Mandatory: Material cannot be mixed with MSW or disposed in incinerators and landfills per state law.

Materials Collected: Varies by hauler

Collection Frequency: Varies by hauler

Set-out Method: Varies by hauler

Collection Method: Varies by hauler

Participation Rate: NA

Participation Incentives: Potential reduction in PAYT trash rates through increased diversion.

Enforcement: No enforcement at individual residences. Disposal facility staff report haulers that deliver banned materials to County for enforcement.

DROP-OFF COLLECTION (RAMSEY COUNTY)

Number of Sites: Eight yard trimmings sites, open April-November, 38 hours/week

Staffing: Each yard debris site has at least one county employee present at all times. Extension Service Master Gardeners are also present at the sites periodically to discuss composting, lawn and other garden-related, and other horticultural questions.

Service Provider: Saint Paul - Ramsey County Department of Public Health, Environmental Health Section

Materials Accepted: Grass clippings, leaves, and other soft-bodied yard debris

Participation Incentives: Free compost and wood chips for residents; illegal to mix yard debris with trash

Sectors Served: Ramsey County residents only

processors. All sites offer residents free compost and wood chips. The county also gives compost to cities, schools, and nonprofit organizations for use in public areas and gardens.

Some lawn services provide yard debris collection services to their customers. Residential trash haulers throughout the county offer yard trimmings collection as part of regular service or for an extra fee. All Saint Paul trash haulers offer yard trimmings collection for an extra fee.

Education, Publicity, and Outreach

Saint Paul - Ramsey County Department of Public Health, Environmental Health Section contracts with NEC to answer a waste management phone line and provide callers with information on how to recover or dispose materials. The county also contracts with the County Extension Service to provide information on yard debris reduction and composting (see Source Reduction section). It also maintains a phone line with recorded messages in three languages on proper handling of yard trimmings and household hazardous waste. Written information is distributed at public events, in property tax bills, through mass mailings, and in schools.

The BWA Program provides commercial sector education and outreach to businesses (see Commercial Recycling Programs section).

Recyclables set out at curbside in St. Paul

Saint Paul NEC produces its own educational materials including a recycling guide in English, Spanish, Hmong, Cambodian, Chinese, and Russian. Many of the hotlines available also include messages in these languages.

Costs

Major county budget items for MSW include administration, SCORE grants to municipalities, technical assistance, recyclables processing costs, household hazardous waste management programs, yard debris management, education programs, and remedial action at the Lake Jane Landfill.

The county paid $247,320 to Supercycle in 1996 to operate the MRF. This cost was offset by $49,860 in rent which Supercycle paid the city and revenues from the sale of recyclables returned to the county as part of the county and Supercycle's revenue/cost sharing agreement.

Ramsey County calculated 1996 estimated single-family household costs for trash collection and disposal to be $196 (including a $19 subsidy of the Resource Recovery facility paid through the county Waste Management Service Charge (WMSC)). It cost the average household $4 for yard debris management, $28 for recycling collection and processing, and $5 for administration and education.

Ramsey County employs 17.5 FTE staff: 7.75 for composting, 4.0 for education and outreach, 1.25 focusing on hazardous waste and "problem materials," and 4.5 for planning and administration.

In 1996, the Saint Paul NEC spent $115 per ton to operate and manage Saint Paul's recycling program, compared to $116 in 1988. The 1996 per household cost was $26. Of this, $3 was spent on outreach and publicity, and $17 on curbside collection and processing of recyclables. The city spent $108,700 on community clean-up days. Trash collection and disposal costs are not available due to Saint Paul's open trash hauling system.

The City of Saint Paul incurs the capital costs of recycling bins. The city directly purchases bins used in the single-family programs. SuperCycle and NEC purchase multi-family bins and are reimbursed by the city.

The Saint Paul NEC employs 10 staff to administer programs and provide program assistance.

Funding & Accounting Systems

In 1996, county waste program funds came from state SCORE9 and Local Recycling Development Grant funds (39%); the WMSC levied on all improved parcels in the county (57%); revenue from the recycling center (0.4%); and other sources (including license fees paid by waste haulers and solid waste facilities)10 (3%). The county maintains these funds in dedicated SWM accounts that generally correspond to each funding source.

Washington and Ramsey Counties financed the RDF facility with a $27.7 million bond. Northern States Power was responsible for repaying both principal and interest on the bonds using revenues from the facility. From 1990 to 1993, Ramsey/Washington County Resource Recovery project costs were 100% paid by tip fees. Since that time, county residents have subsidized the fees. The county collects the subsidy through the WMSC.

SAINT PAUL WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$2,450,700	21,220	$115.49	$25.93
Collection and Processing Contracts	$1,616,000	19,342	$83.55	
Community Clean-up	$108,700	1,878	$57.88	
Administration	$442,000	21,220	$20.83	
Education/Publicity	$284,000	21,220	$13.38	
Waste Reduction Gross Costs	$2,450,700	21,220	$115.49	$25.93
Materials Revenues	($0)	21,220	($0)	($0)
Net Waste Reduction Costs	$2,450,700	21,220	$115.49	$25.93

Note: The Saint Paul NEC supplied ILSR with cost figures. Figures include only NEC's costs. Excluded are recycling costs for services provided to the 6% of Saint Paul households served by Macalester Groveland Community Council and city costs including program and contract administration and capital costs of recycling bins. Households served were 94,527; 67,945 SFDs and 26,582 MFDs.

Source: Institute for Local Self-Reliance, 1999.

Most haulers operating in Ramsey County signed contracts with the Resource Recovery facility, effective June 1996 through December 1998, setting the tip fee at $38.

The capital cost of Ramsey County's MRF was funded with a loan and state funds ($277,250 each, for facility development) and Ramsey County and Saint Paul funds ($61,750 each, for land and building purchase).

Saint Paul's state and county mandated recycling program is budgeted at $2,317,953 in 1997. Funding is through a SCORE grant of $551,000 and a $21 per household recycling service fee ($13 per apartment unit) collected by Ramsey County and transferred to the City of Saint Paul. The service fee has decreased from $21.26 ($23.35 in constant 1996 dollars) since it was first collected in 1992. Residents pay the service fee directly to the county through the property tax system. Saint Paul uses the modified accrual method of accounting to track expenditures. NEC uses accrual accounting.

Future Plans and Obstacles to Increasing Diversion

A Saint Paul Public Works' recycling and waste management survey of 700 citizens, completed in September 1996, shows strong support for and participation in the city's recycling and neighborhood clean-up programs. A majority of respondents (40-64%, depending on material or service) would be willing to pay higher fees, if necessary, to add materials or services to the programs. Survey information will help the city plan for or modify its programs in accordance with citizens' responses. Saint Paul's overall program objectives are: expanding the program by adding materials with favorable cost/benefit ratios, which will increase tonnage and participation; emphasizing source reduction in promotional efforts; and working with district councils to decrease neighborhood clean-up disposal costs by increasing the proportion of material recovered.

Saint Paul is planning a program entitled "WoodWins," which will divert scrap wood from the waste stream. The project will include a small manufacturing facility to create value-added products from recycled wood and provide jobs for local unemployed and under-employed residents.

Ramsey County reports the two biggest obstacles to increasing diversion are the nature of recyclables markets and the cost of collecting small quantities of recyclables in the business sector. MRFs often will not accept materials for which steady markets do not exist. Communities and businesses generally will not collect material not processed at the MRF to which they send recyclables. Market price fluctuations also affect program costs. Many businesses choose to only recycle materials that have traditionally generated high revenue, such as aluminum. Private recyclers often do not collect materials with low or no value. Businesses also often choose to only recycle materials that they produce in large quantity. The cost of collecting small quanti-

HOUSEHOLD MSW COSTS

Function	Cost per Household
Trash Collection and Disposal	$176.64
Recycling Collection and Processing	$28.06
Yard Debris Management	$3.70
Administration and Education	$4.61
Resource Recovery[1]	$19.39
HHW and Problem Materials	$4.95
Total	$237.35

Note: Ramsey County supplied data above. County staff developed the cost figures for inclusion in a report to the Minnesota Office of Environmental Assistance. Estimated costs are for single-family households only and do not include charges borne by residents above and beyond regular services (such as separate collection of an appliance), state or federal expenditures, and possibly some costs borne by cities.

[1]Portion of county WMSC set aside to fund the Ramsey/Washington County Resource Recovery Project.

Source: Institute for Local Self-Reliance, 1999.

ties can be prohibitive, easily costing more than disposing of the same material. Ramsey County staff report businesses could overcome these barriers by forming locally organized recycling collection programs, in shopping plazas for example, but many businesses have been resistant to doing so.

Ramsey County is studying ways to reinforce the benefits of source reduction and recycling. Flow control had allowed communities to set disposal costs at facilities to which communities were required to deliver trash, in such a way that a strong economic message in favor of waste diversion was sent to waste generators. The striking down of flow control has disrupted the system and planners must find another way to promote waste reduction.

Tips for Replication

Talk to your customers — solicit input, obtain feedback. Consider their needs and constraints when designing a program.

Use consumer data research to keep abreast of trends in attitudes related to the environment, such as purchasing, so you can adjust marketing approaches.

Keep promotion simple, targeted to your audience. Use culturally sensitive language and images.

Repeat information in a variety of media.

One-to-one outreach is most effective.

Reaching children can be a way to educate entire households.

Consistent, dependable, cost-effective collection service will create loyal recyclers.

Give the public on-going feedback.

Volunteers have many skills — recruit and reward them.

Collection worker in St. Paul. The cage on the truck is used to collect cardboard and bags of reusable household goods.

Notes:

[1]In 1996, Ramsey County met the 50% recycling goal set by state law for counties in the Twin Cities metropolitan area. Of the total amount of mixed solid waste, which by the state definition includes recycling and disposal but excludes yard debris, 42% was recycled. The county earned additional credits of 5% for yard debris recovery and 3% in source reduction credits because it met certain criteria for yard debris and source reduction programs. In Minnesota, tonnages of yard debris managed are no longer included in the numerator or denominator for purposes of calculating recycling percentages. For the purpose of calculating a waste diversion rate for this publication, ILSR used the tonnage of yard debris composted in 1994, the most recent year for which figures are available.

[2]County solid waste services are administered through its Department of Public Health Environmental Health Section.

[3]Ramsey County contains the entirety of 15 communities. Four other communities are partly in Ramsey County and partly in a neighboring county; two of these report to Ramsey County and two report to a neighboring county for data management purposes.

[4]Minnesota defines "waste reduction" to be equivalent to source reduction. In this report, waste reduction reflects recycling and composting too.

[5]Durables and textiles are collected from single-family homes only.

[6]The initial ban went into effect on January 1, 1990, and was revised to incorporate tree and shrub debris effective August 1, 1992.

[7]"Opportunity to recycle" is defined as ensuring there is at least one recycling center within the county and that there is curbside monthly collection of at least four recyclable materials in all cities in the Metropolitan area with a population of 5,000 or more.

[8]This requirement is not an ordinance but a policy directive in the county's 1987 and 1992 Solid Waste Master Plans and its 1988 Recycling Implementation Strategy.

[9]The state has collected funds through a tax on garbage collection, which has then been distributed as SCORE funds to counties and for state agency purposes. Ramsey County has been allocated about $1,400,000 each year in SCORE funds.

[10]Haulers pay license fees to the county in which they are based. The fees, as of the end of 1997, were $50 per truck used. Facilities pay license fees based on the type of waste handled and the facility throughput.

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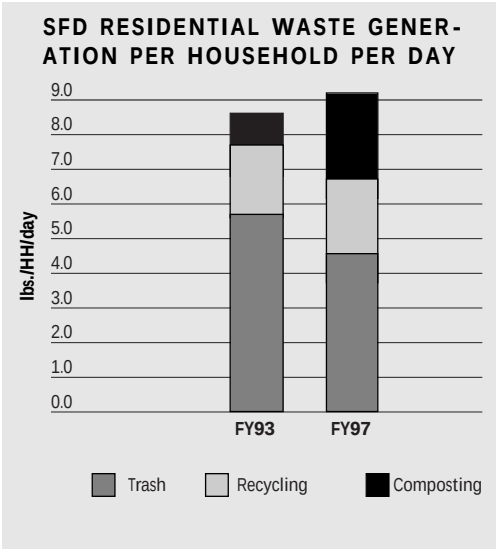
SAN JOSE, CALIFORNIA

Municipal Solid Waste Reduction

43%

Prior to implementation of the Recycle Plus Program in 1993 — part of San Jose's Integrated Waste Management (IWM) Program — residents set out unlimited trash for a flat monthly fee and only recycled five material categories.[1] Now they can set out more types of recyclables, multi-family dwellings (MFDs) have service, and contractors are paid per household *and* per ton recycled.[2] Under the old recycling program participation by single-family households was 66% and the waste reduction level achieved was 33%. By the end of the first year of the new curbside program, these figures increased to 83% and 55%, respectively. San Jose diverted 45% of its residential waste in FY97 and 42% of its commercial waste in calendar year 1996. Overall diversion was 43% (34% was recycled and 9% was composted).



Source: Institute for Local Self-Reliance, 1999.

Key elements of the IWM Program are weekly residential curbside collection of 19 categories of materials (also available to all MFDs),[3] pay-as-you-throw (PAYT) fees for SFD trash pick-up, weekly year-round residential yard trimmings collection, and financial incentives for businesses to recycle and reduce waste. To encourage participation, the city's contractors provide recycling containers to residents of single-family homes and to MFD complexes. PAYT trash fees provide an economic incentive to participate. Yard trimmings collection accounts for about two-thirds of material recovered and is available to residents of single- and multi-family dwellings. The city's "loose-in-the-street" collection system allows residents to set out more material than would fit in a typical cart.

The financial arrangements of the IWM Program are varied and complex. There are numerous funding sources, multiple programs serving a variety of customers, and oversight of more then 25 residential and commercial contracts and franchise agreements. The city's residential contracts have been set up to maximize recycling. Its residential recycling contractors, for instance, receive additional payments for each ton they actually market to an end user. As a result, the city's recycling costs are $206 per ton, more than twice as high as per ton trash or yard trimmings management costs. However, the net cost of single-family residential waste services has remained nearly constant ($207 per household in FY93 compared to $210 in FY97).

RESIDENTIAL PROGRAM SUMMARY

	FY93	FY97
Tons Per Year	283,000	433,576
Disposal	188,500	236,640
Diversion	94,500	196,936
Percent Diverted	33%	45%
Recycled	10%	19%
Composted	23%	26%
Average lbs./HH/day	8.61	8.82
Disposal	5.74	4.81
Diversion	2.88	4.01
Annual Disposal Fees		
Disposal	$5,405,542	$6,527,084
Net Program Costs/HH[1]	$206.85	$187.03
Disposal Services	$142.78	$81.95
Diversion Services	$64.07	$105.09

Notes: Figures above reflect residential sector only. FY93 tonnage data represents 180,000 SFDs only; MFDs were included in commercial service at that time. In FY97, 269,340 SFDs and MFDs were served. 1992 dollars adjusted to 1996 dollars using the GDP deflator.

[1]In FY97, Net Program Costs/HH for SFD services were ~$210. Per HH cost for MFDs were lower; $187 is the average for all HHs.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 873,300 (1997)
HOUSEHOLDS: 259,365 (1993), 269,340 (1996); 188,900 single-family households, 80,440 multi-family units
BUSINESSES: 27,000
LAND AREA: 175 sq. miles
HOUSEHOLD DENSITY: 1,539 households/sq. mi.
AVERAGE PER CAPITA INCOME: $16,905 (1989)
MEDIAN HOUSEHOLD INCOME: $46,206 (1989)
COMMUNITY CHARACTER: Urban; third largest city on the West Coast; 11th largest in the U.S. San Jose is culturally diverse; 27% of the population is Hispanic, 14% is Asian. The city is the center of the Silicon Valley's commerce and culture. IBM, Pac Bell, and Hewlett Packard are among its largest business employers.
COUNTY: Santa Clara

WASTE REDUCTION (FY97/CALENDAR YEAR 1996)

	Residential Tons	Commercial/Inst. Tons	Total MSW Tons
Recycled	84,496	367,871	452,367
Newspaper	30,750		
Mixed Paper and Cardboard	28,440		
Commingled	15,420		
Glass	10,520		
Deposit Containers[1]	3,786		
MRF Rejects[2]	-4,420		
Composted/Chipped	112,440		112,440
Yard Trimmings (GreenWaste Recovery)	72,330		
Yard Trimmings (BFI)	40,110		
Total Waste Reduction	196,936	367,871	564,807
MSW Disposed	236,640	513,989	750,629
GreenTeam SFD	75,440		
GreenTeam MFD	75,490		
Western/USA Waste	81,290		
MRF Rejects	4,420		
Total Generation	433,576	881,860	1,315,436
Percent Reduced	45.4%	41.7%	42.9%
Lbs. Waste/HH Served/Day	8.82		

Note: Residential figures reflect San Jose's FY97 (July 1996 through June 1997) unless otherwise noted; and commercial/institutional figures reflect calendar year 1996 (from annual report to CA Integrated Waste Management Board).

[1]In calendar year 1996, 64,576,400 deposit containers were redeemed at 26 different San Jose locations. City staff converted this figure into tonnage using Jan.-June 1996 state data on the percentage breakdown of redeemed containers by type and using average container weights for each type.

[2]Represents the tonnage of material rejected as nonrecyclable at GreenTeam of San Jose's and USA Waste's MRFs.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

California's Integrated Waste Management Act of 1989 (AB939) requires all California jurisdictions to divert 25% of their waste from landfills by 1995 and 50% by the year 2000.

The California Beverage Container Recycling and Litter Reduction Act (AB2020), enacted in 1986 and implemented in 1987, requires distributors to pay a 2¢ deposit on beer and other malt beverages, soft drinks, wine and distilled spirit coolers, carbonated mineral water, and soda water containers. Consumers pay a container deposit, which they can redeem for 2.5¢ (<24 oz.) and 5¢ (24 oz. and larger) at redemption centers (rather than retailers).

The city has a long history of waste reduction efforts. In 1983, San Jose's City Council established Solid Waste Program Goals and Principles that encouraged waste reduction activities through rate structure and program design. The set of goals and principles included 25% reduction of the city's waste stream by 1990. A revised 1987 strategy called for a $25 million effort and a 36% waste reduction by 1992.

As part of the waste reduction plan for AB939, the city implemented PAYT trash fees as a direct economic incentive for single-family residents to reduce their waste as much as possible. The monthly rates, based on trash cart volumes, are: 32 gallons, $13.95; 64 gallons, $24.95; 96 gallons, $37.50; and 128 gallons, $55.80.[4] Eighty-seven percent of single-family households subscribe to the 32-gallon carts. If on a periodic basis, residents have more trash than can fit in their carts, they may buy special extra trash stickers at $3.50 each to attach to 32-gallon plastic trash bags. Residents then set the extra bags out with their regular garbage carts. City libraries, Lucky Food Centers, Safeway Stores, and most 7-Eleven Food Stores in San Jose sell stickers.

Source Reduction Initiatives

San Jose promotes source reduction through its San Jose Home Composting Program and a waste prevention campaign.

The Home Composting Program sells composting bins (for $29.90) at large events held several times during the year. In FY97, the city sold 1,842 Biostack and Can-O-Worms vermicomposting bins and required residents to attend a composting workshop at the the time of the purchase.

RESIDENTIAL CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: USA Waste serves the southern section; GreenTeam of San Jose serves SFDs in the northern section and all MFDs

Start-up Date: Curbside began in 1985 and became citywide by 1986; mixed paper pilot program began in 1990; the Recycle Plus Program started citywide July 1, 1993 (materials added, MFD service, and PAYT trash fees); empty aerosol containers were added and plastics collection was expanded July 1997 to include all containers and other plastics #1-7 (e.g., meat trays)

Mandatory: No

Households Served: All: 188,900 SFDs (fewer than four units) and 80,440 MFDs (four or more units). Condos, townhomes, mobile home parks, and apartments with four to eight units can opt for either SFD or MFD service. The city serves approx. 190 small businesses.[5]

Materials Accepted: ONP and inserts, OCC, mixed paper (OMG, catalogs, bags, phone books, paperboard, colored and white paper, envelopes, mail, egg cartons), glass containers, cans, juice and milk cartons, plastic bottles/jugs and polystyrene packaging, scrap metals (e.g., aluminum foil and plates, small metal appliances, hubcaps, metal pots), textiles, used motor oil.[6] Bulky goods (such as appliances and furniture) are collected for a nominal fee ($18 for three items).

Collection Frequency: Weekly, same day as trash collection

Set-out Method: SFDs: Haulers provide residents with three 18-gallon yellow nesting containers. One is for ONP, one is for mixed paper, and the other is for glass. OCC (no longer than four feet by four feet) is flattened and placed against recycling bins. Residents commingle cans, juice and milk cartons, plastics, and scrap metals in a 32-gallon conventional trash can (which they provide). Textiles are placed in plastic grocery bags in with the mixed recyclables container. Residents place used motor oil in city-issued recycling jugs (with screw-on tops) and set these at the curb.

MFDs: Haulers provide each complex with sets of three 96-gallon recycling carts. Each set serves approximately 25 units. Each complex determines the number of carts and their locations, typically near dumpsters. Residents place ONP in one cart, mixed paper in the second, and commingled materials (the same as SFDs but also including glass) in the third. MFDs do not have collection of used motor oil. Bulky goods collection costs $55.50 for up to three items.

Collection Method: USA Waste collects SFD recyclables using one-person crews in various capacity side-loaders. The average side-loader has a 32-cubic-yard capacity and four compartments: 10-cubic-yards for commingled material, four-cubic-yards for glass, eight-cubic-yards for ONP, and 10-cubic-yards for RMP and OCC. The collector places motor oil containers on special leak-proof trays on the side and underneath the truck bodies. The GreenTeam collects SFD recyclables using one-person crews in 40-cubic-yard capacity side-loaders with six compartments. The collector sorts glass by color en route. Commingled materials go in a 19-cubic-yard compartment, ONP and RMP each in seven-cubic-yard bins, and glass in three bins, 5.5-cubic-yards total. For MFDs, one-person crews empty recycling carts into a three compartment 35-cubic-yard front-loader.

Participation Rate: Approx. 83% of households recycle each month, based on the number of set-outs divided by service recipients[7]

Participation Incentives: PAYT trash fees

Enforcement: Haulers leave non-collection notices and do not collect incorrectly set out materials. The notice indicates how to fix error.

RESIDENTIAL CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: Pilot began in 1989; citywide by 1991

Service Provider: GreenWaste Recovery serves southern section and Browning Ferris Industries the northern sections

Households Served: All

Mandatory: No

Materials Collected: Leaves, branches, grass clippings, small prunings, flowers, and holiday trees (clean and green)

Collection Frequency: Weekly, year-round

Set-out Method: Residents place yard trimmings loose in street, in a burlap tarp (provided by the hauler), or in resident-provided trash cans labeled with a sticker indicating the cans are for yard trimmings. Piles should be no larger than five feet wide and five feet high, and 12 inches from curb and five feet from trash carts.

Collection Method: Two-person crews collect yard trimmings. One worker operates a tractor with a claw attachment that places yard trimmings into a 32-cubic-yard capacity rear-loading compactor truck, operated by the second worker. GreenWaste collects tarps on the same routes as claw collection. The rear loader driver collects the tarps. BFI has one separate tarp route. Both crew ride on the rear loader truck and collect the tarps.

Participation Rate: On average, residents set out their yard trimmings for collection 2.5 times per month

Participation Incentives: PAYT trash fees

Enforcement: Haulers leave non-collection notices when residents incorrectly set out materials. The notice indicates how to fix error.

DROP-OFF COLLECTION

Number of sites:	Many private recycling centers operate in the city, and three of the four private landfills in San Jose have recyclables drop-off, sorting, and processing facilities. At least 14 gas stations and auto shops accept used oil. Another 26 San Jose locations (mostly near Lucky Stores and Safeway Stores) accept and redeem deposit containers.
Staffing:	Varies
Service Provider:	Private sector
Materials Accepted:	Varies
Participation Incentives:	Redemption value of designated containers; PAYT trash fees
Sectors Served:	Residential and commercial

The waste prevention campaign, created in FY96, included waste prevention kits, brochures, children's activity books, public service announcements, and television and radio interviews.

Residential Recycling Program

The heart of San Jose's successful residential recycling program is targeting a wide range of materials for recycling and offering the service to all of its households. The city contracts with two companies to provide residential trash and recycling services. USA Waste services the south/west sections of the city, and GreenTeam of San Jose services the north/east sections and all multi-family dwellings that use bin service.

In FY97, GreenTeam used 30 recycling trucks and 25 trash trucks for its single-family service. Each recycling truck made about 400 pick-ups per day; each trash truck made about 600 pick-ups. Trash trucks unloaded one to two times, while recycling trucks unloaded two to three times per day. For its multi-family dwelling service, the GreenTeam used 13 front-loaders for trash and six recycling vehicles. Drivers earned $16.50 to $17 per hour in union wages.

Recyclables set out at curbside in San Jose

USA Waste used 45 recycling vehicles and 35 trash trucks for its single-family service. Each recycling truck made about 530 pick-ups per day; each trash truck made about 765 pick-ups. Recycling trucks unloaded twice a day on average, trash trucks once a day. Union drivers earned $17.50 per hour in wages.

Each contractor owns and operates its own MRF. USA Waste's 220 ton-per-day capacity MRF employs 30 full-time equivalent workers (all union). Sorters earn $7.95 per hour; equipment operators, $9.95 per hour; and scale operators, $10.95 per hour. Worker turnover is low. Trucks empty materials directly into hoppers, which feed two sort lines Once sorted, material is transferred to silos until ready for baling. The first sort line is for mixed recyclables and uses automated and manual sorting. A vacuum system removes plastic jugs and bags; a magnet removes metal cans. Ten sorters then manually process remaining material. The second line is for mixed paper. Two sorters separate corrugated cardboard from mixed paper. Newspaper, used motor oil, and glass are processed directly from the trucks to appropriate containers such as roll-offs and oil tanks. The reject rate at the MRF averages 4% by weight.

GreenTeam uses a relatively low-tech 200 ton-per-day capacity processing system, which relies largely on manual sorting. Glass comes in color-sorted. The heart of its MRF is a 115-foot vibrating conveyor, which is used to sort commingled materials during the day shift and mixed paper at night. The reject rate at the MRF is 4% to 7% by weight, and consists mostly of film plastics. GreenTeam employs 50 full-time equivalent workers; starting employees earn $5.40 per hour (the lowest paid permanent employee earns $9.15 while the highest paid earns $18 per hour). Turnover is also low.

Residential Composting Program

The city contracts with two companies to provide weekly, year-round curbside pick-up of yard trimmings. The system is unique. Residents set out their yard trimmings in loose piles along the curb in front of their houses. Collection crews use a tractor with a claw attachment to load the piles into rear-loading compactor trucks. Where "loose-in-the-street" is not feasible, residents place their yard trimmings in burlap tarps (provided by haulers) or in cans (provided by residents and labeled with a sticker indicating cans are for yard trimmings).

The city contracts with two composting sites for processing: BFI and Zanker Road Management. These facilities grind materials into a mulch or windrow compost them. Finished mulch and compost is sold to the public, nurseries, and farms; and is used on farms and city parks.

Commercial/Institutional Recycling

The city uses financial incentives, public education, and technical assistance to encourage waste reduction in the commercial/institutional sector. In a 1996 survey, 64% of respondents stated that their business recycled. Approximately 17,000 businesses have recycling service. Businesses contract directly with private haulers and recyclers for this service.

As a financial incentive for businesses to recycle, the city used a fee structure that encourages companies to have materials collected as recyclables instead of trash. The city fees on the collection of commercial garbage in FY97 were $1.64 per cubic yard in franchise fees and $1.77 per cubic yard in source reduction and recycling fees.[8] In contrast, there are no fees associated with recycling collection. The relatively higher cost of trash service is a direct financial incentive for businesses to recycle and reduce their solid waste. City staff manage the franchises, ensure that franchised haulers remit proper fees, periodically audit haulers, and tabulate monthly data from haulers and recyclers on the amount of materials collected.

City staff also provide technical assistance to businesses by helping them implement in-house recycling programs, performing "waste assessments," and identifying end users for recycled materials. Businesses can receive a packet that includes information on how to start recycling, waste reduction ideas, waste characterization analysis, a directory of recyclers, and a list of commercial solid waste services.

The city also runs Recycle at Work, a recycling program serving all city-run facilities such as government offices, libraries, and the police station. In June 1997, the city eliminated desk-side trash baskets and replaced these with mini desk-top bins. Employees are now responsible for moving their recyclables and trash to central containers.

Education, Publicity, and Outreach

The city does extensive outreach for its waste reduction programs: posters, brochures, bill inserts, direct mail pieces, print advertisements, public service announcements, television and radio interviews, and booths at community events. The city has also initiated several interactive outreach activities such as: holiday gift-wrapping tables using recycled materials at malls; "the three Rs" word scramble games at community events; and shopping cart "waste prevention assessments" at local supermarkets. All outreach is done in three languages: English, Spanish, and Vietnamese.

Yard trimmings set out loose near curb

Costs

In FY97, the IWM Program cost a total of $55.6 million. Of this, $50.4 million was for the residential program, which consisted of five major categories: (1) payments to two haulers for SFD trash and recycling service (51%); (2) payment to hauler for MFD trash and recycling service (11%); (3) payments to two haulers and two

USA Waste collector unloading recyclables into side-loading vehicle

processors for yard trimmings collection and composting (20%); (4) landfill fees to the Newby Island Landfill for disposal of residential and civic trash[9] (13%); and (5) overhead and administration costs (5%).

Capital costs for new equipment purchased by the city's contractors are included in the fees charged by these contractors. The city did pay for 1,500 Can-O-Worms home composting bins at $48 each, and 2,000 Biostack home composting bins at $55 each.

RESIDENTIAL WASTE REDUCTION COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$17,561,044	85,130	$206.29	$65.20
SFD Curbside Collection/Processing[1]	$4,843,585	76,415	$63.39	
MFD Curbside Collection/Processing[1]	$468,584	8,715	$53.77	
SFD Marketing Incentive Fees[1]	$10,861,570	76,415	$142.14	
MFD Marketing Incentive Fees[1]	$834,375	8,715	$95.74	
Admin./Billing/Education/Publicity[2]	$552,930	85,130	$6.50	
Composting Gross Costs	$10,742,778	112,440	$95.54	$39.89
Curbside Collection and Processing[3]	$10,023,969	112,440	$89.15	
Admin./Billing/Education/Publicity[2]	$718,809	112,440	$6.39	
Waste Reduction Gross Costs	$28,303,822	197,570	$143.26	$105.09
Materials Revenues	$0	197,570	$0	$0
Net Waste Reduction Costs	$28,303,822	197,570	$143.26	$105.09

Note: Tonnage figures differ from those on page 134 as deposit containers and MRF rejects are not included above. Figures reflect San Jose's FY97 (July 1996 through June 1997) and may not total due to rounding. Costs for collection and processing reflect the city's costs to contract with private haulers and processors. All contracts extend to June 30, 2002.

[1]The city's contract with Western/USA Waste and the GreenTeam of San Jose is for collection of both recyclables and trash and processing of recyclables. The split between recycling and trash collection costs is based on the average per ton cost of total service. Contracts, however, are based on two components: a base $/household rate and a $/ton recycled incentive rate. For USA Waste, the base rate is $6.64/household and the incentive rate is $60.02/ton; for GreenTeam of San Jose, the base rate is $5/household and the incentive rate is $277.80/ton for SFDs and $100/ton for MFDs.

[2]Within the Integrated Waste Management Program, administrative costs include staff salaries and benefits, billing services, general fund overhead, direct payments to other city departments for goods and services rendered, and administrative support. Administration costs for the Integrated Waste Management Program were allocated to the residential waste program based on the percentage of total staff working in residential programs. Administrative costs were further split among recycling, composting, and trash based on tonnage handled in each program. Education and publicity costs are largely borne by contractors. The city's education and publicity costs are included in Administrative costs.

[3]Costs represent tip fees the city pays to composting site contractors (BFI and Zanker Road) for each ton of material delivered by collectors (BFI and GreenWaste Recovery) and the city's contract costs with the two haulers.

TOTAL RESIDENTIAL WASTE MANAGEMENT COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$22,071,195	232,220	$95.04	$81.95
SFD Trash Collection[1]	$9,833,946	156,730	$62.74	
MFD Trash Collection[1]	$4,217,254	75,490	$55.87	
Landfill Tip Fees[2]	$6,527,084	232,220	$28.11	
Admin./Billing/Education/Publicity[3]	1,492,911	232,220	$6.43	
Waste Reduction Gross Costs	$28,303,822	197,570	$143.26	$105.09
SWM Gross Costs	$50,375,017	429,790	$117.21	$187.03
Materials Revenues	$0	197,570	$0	$0
Total SWM Net Costs	$50,375,017	429,790	$117.21	$187.03

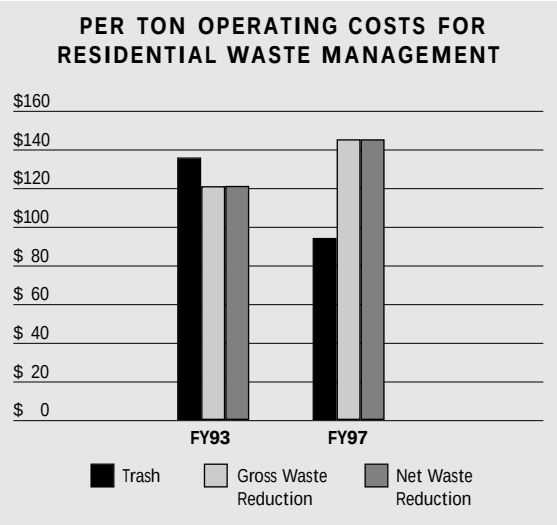
Note: Figures reflect San Jose's FY97 (July 1996 through June 1997) and may not total due to rounding.

[1]Costs represent the city's costs for contracting with Western/USA Waste and the GreenTeam of San Jose. The split between recycling and trash collection costs is based on the average per ton cost of total service. Trash collection is now automated (previous to 1993, it was manual). Haulers deliver trash to the Newby Island Landfill, which is approximately 10 miles away.

[2]During FY96, the city renegotiated its 30-year contract with International Disposal Corporation, which operates the Newby Island Landfill. The contract now extends to 2020 and no longer includes a put-or-pay clause requiring the city to pay for a fixed amount of tonnage—needed or not. In FY97, the city paid $27.18 per ton for residential and small business commercial waste and $14.88 per ton for disposal of city-facility generated waste.

[3]Within the Integrated Waste Management Program, administrative costs include staff salaries and benefits, billing services, general fund overhead, direct payments to other city departments for goods and services rendered, and administrative support. Administration costs for the Integrated Waste Management Program were allocated to the residential waste program based on the percentage of total staff working in residential programs. Administrative costs were further split among recycling, composting, and trash based on tonnage handled in each program. Education and publicity costs are largely borne by contractors. The city's education and publicity costs are included in Administrative costs.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

On a per-ton basis, trash cost $95, while waste reduction programs cost $143 (recycling $206, and yard trimmings recovery, $96). Recycling costs more than twice as much as trash and yard trimmings service due to how the city has structured its contracts with its haulers and processors, specifically the city's incentive payments for marketing recyclables. Trash and recycling collection services alone range from $54 to $63 per ton on average. Yet, landfill disposal fees for trash are below $30 per ton, while the city pays its recyclers an incentive fee ($60 to USA Waste and $278 to GreenTeam of San Jose) for each ton of recyclables they actually market to end users.

The Environmental Services Department's budget has risen during the last decade, but so has the population and the number of households served. When the cost of inflation is taken into account, average per household costs for SFD waste management services have remained nearly constant from $207 in FY93 to $210 in FY97.

Although contracts for residential trash, recycling, and yard trimmings service are not due to expire until June 2002, the city has already renegotiated existing contracts to reduce costs. GreenTeam agreed to a monthly reduction in fees for the rest of the contract term. USA Waste will start revenue sharing with the city July 1, 1999.

The IWM Program employs 20 full-time city employees.

Funding & Accounting Systems

San Jose's IWM Program provides revenues for two funds: The IWM Fund (a special enterprise fund established in 1994) and the City of San Jose's General Fund. The IWM Fund's revenues come from five main sources: SFD rate charges (60%); MFD rate charges (21%); Source Reduction and Recycling fees on commercial businesses (15%);[10] miscellaneous residential service fees such as extra trash stickers and bulky good collection services (5%); and interest earned during the year (1%).

Revenue sources from the IWM Program that support the General Fund are the commercial franchise fees and a disposal facility tax. (Source reduction and recycling fees support the IWM Fund.) The city uses a volume-based franchise fee, which, for FY97, was $1.64 per cubic yard of trash collected by haulers. The city assesses a Disposal Facility Tax of $13 per ton on waste landfilled in San Jose. In FY96, the five landfills in the city paid $17.9 million to the General Fund.

Residential trash rates pay for about 82% of the total $50.4 million cost to provide residential trash and recycling services. Fees placed on businesses' waste provide an additional 14%.

The General Fund provides $500,000 to cover costs of the Recycle Plus Special Rate Program, which provides reduced rates to low-income households and persons with disabilities.

The Environmental Services Department uses accrual accounting techniques to track its expenditures.

Future Plans and Obstacles to Increasing Diversion

The Environmental Services Department's long-term strategy to meet and exceed 50% diversion focuses on increased waste reduction efforts at businesses and multi-family dwellings.

Vibrating conveyor sort line at GreenTeam of San Jose's materials processing facility

Windrows at BFI's composting facility in San Jose

In July 1997, the types of materials collected from the SFD and MFD programs were expanded to include all plastic containers numbered 1-7, foam food packaging, aerosol cans, and some metal car parts. The city is adding oil filters to the SFD program in fall 1998.

Increased emphasis is being placed on enhancing the MFD program to achieve a higher diversion rate. Technical assistance will be provided along with additional tools to encourage recycling such as in-house containers. During summer 1998, sorting requirements for MFD residents will be simplified from three streams to two streams: paper and mixed recyclables. GreenTeam and the city are also looking at adding container options for MFD complexes with space constraints.

As the commercial sector generates 65% of San Jose's waste, city staff are evaluating how to increase waste diversion from businesses.

Recycle Plus staff are also working toward making the residential program more self-sustaining by cutting costs. In addition to the City Council adopting a cost recovery rate strategy, residential staff have cut program costs by reducing the outreach budget by 65% for FY97 and renegotiating the Residential Plus contracts for a savings of $8 million over the remaining period of the contracts.

Tips for Replication

Set up a cost structure that encourages recycling and waste reduction (for households, for businesses, and for contractors).

Know customers and implement a program that balances needs of city and customers.

Create a relationship with haulers that is conducive to continuous improvement.

Pilot programs and collect data (put reporting requirements in contracts).

Notes:

[1]These materials were newspaper, glass bottles and jars, aluminum and steel cans, and PET bottles.

[2]The contractor serving MFDs is paid per ton, not per household. There is also a service level of payment to the GreenTeam (based on the total types of bin services that complexes have).

[3]Multi-family dwellings can recycle the same materials at "curbside" with the exception of used oil.

[4]These rates were in effect as of January 1998.

[5]To be eligible, businesses much generate less than one cubic yard of solid waste per week, must have a waste stream similar to single-family residential households, and must be located within the city's contractors' service districts. The city must also be able to lien individual parcels in case of unpaid bills. Tonnages collected from these businesses are included with SFD figures.

[6]While collection was expanded to include aerosol cans, drained auto parts, and all plastic containers and other plastics #1-7 in July 1997, these are excluded from this list as tonnage numbers for FY97 only include the old materials targeted.

[7]The average participation rate is higher (88% or high 80s) for areas served by USA Waste than for areas served by Green Team (77% or high 70s).

[8]Both trash haulers and recyclers compete on a customer-by-customer basis citywide, and are not limited to collection districts. The city does not set the rates that commercial haulers and recyclers charge their customers.

[9]Civic trash is trash the city picks up from municipal buildings such as city office and libraries.

[10]Trash haulers serving businesses with on-site compactors pay the city franchise fees of $4.92 per cubic yard collected. Those businesses using on-site compactors also pay higher source reduction and recycling fees (the AB939 fees)—$5.31 per cubic yard. Commercial waste generators pay AB939 fees to the city via their trash haulers, who remit the fees to the city along with their franchise fees. Actual FY97 revenue from commercial AB939 fees totaled $8,253,764.

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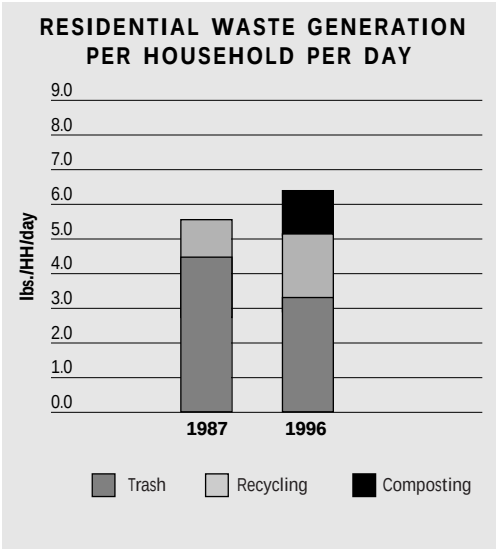
SEATTLE, WASHINGTON

Municipal Solid Waste Reduction

44%

Seattle faced a trash disposal crisis in the late 1980s after two city-operated landfills closed. Disposal fees at the county-operated landfill were nearly three times what city fees had been. Twice, the city considered building a trash incinerator but citizen objections overruled the plans. The city opted to pursue an aggressive waste reduction program, setting a goal of recycling 60% of the waste stream by 1998. In 1996, Seattle approached this goal. It diverted 49% of its residential waste stream, 48% of its commercial waste stream, and 18% of materials delivered to its drop-off sites. Overall diversion was 44% (34% through recycling and 10% through composting). The current system uses city-hired contractors to collect trash, recyclables, and yard trimmings.



Source: Institute for Local Self-Reliance, 1999.

Curbside recycling and yard debris systems that divert many categories of materials (including mixed paper), pay-as-you-throw (PAYT) trash rates, comprehensive educational programs, strong private sector recycling promoted by financial incentives, and multi-family recycling service contribute to program success. Seattle's single-family curbside recycling program accepts 16 categories of materials; the apartment program accepts 13. The yard debris subscription service collects four additional materials and three additional categories are accepted at the city's transfer stations. PAYT trash rates encourage residents to divert waste. Many companies provide private sector recycling collection in a free-market environment. Strong local markets (especially for paper and glass) provide outlets for collected materials. In addition, the private sector receives financial incentives to reduce its trash through a commercial hauling fee structure that charges less for source-separated recyclables than trash. More than 40% of Seattle households are located in multi-family units and providing recycling service to these households is a critical element in the city's efforts to maximize diversion.

Cost-effectiveness of Seattle's waste reduction efforts is due to the city's pay-as-you-throw trash fees and lower per ton costs for recycling and composting as compared to trash disposal.[1] In 1996, per household waste management costs averaged $155, the same as in 1987. On a per ton basis, total waste management cost $154 per ton; trash cost $173 per ton; recycling, $121 per ton; and composting, $142 per ton.

RESIDENTIAL PROGRAM SUMMARY

	1987	1996
Tons Per Year	233,230	288,106
Disposal	188,800	146,773
Diversion	44,430	141,333
Percent Diverted	19%	49%
Recycled	19%	29%
Composted	0%	20%
Average lbs./HH/day	5.61	6.34
Disposal	4.54	3.23
Diversion	1.07	3.11
Annual Disposal Fees		
Disposal	$11,266,099	$6,504,749
Net Program Costs/HH	$155.33	$154.93
Disposal Services	$155.33	$101.14
Diversion Services	$0.00[1]	$53.79

Notes: Figures above represent residential sector collection only. 227,890 households served in 1987, 248,970 in 1996. 1987 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

[1]Reported 19% recycling in private sector. The city incurred no costs for this recycling.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 534,700 (1996)

HOUSEHOLDS: 248,970 total units (1996): 149,500 SFDs (four or fewer units in building), 99,470 MFDs

BUSINESSES: 45,000

LAND AREA: 92 square mi.

HOUSEHOLD DENSITY: 2,706/square mile

AVERAGE PER CAPITA INCOME: $18,308 (1989)

MEDIAN HOUSEHOLD INCOME: $29,353 (1989), $28,941 (1995)

COMMUNITY CHARACTER: Urban, major industries: computer software and hardware, aircraft manufacturing, financial management, insurance, real estate, and tourism

COUNTY: King

WASTE REDUCTION (1996)

	Private Residential[1]	Curbside Residential[2]	Total Residential	Self-Haul[3]	Commercial[4]	Total
Recycled	17,684	64,709	82,393	5,280	172,443	260,116
Corrugated Cardboard	6,204	5,834	12,038	387	96,653	109,078
Mixed Paper	4,459	19,413	23,872	499	31,254	55,625
Newspaper	3,900	24,171	28,071	143	13,351	41,565
Glass	10	12,338	12,348	206	1,989	14,543
Office Paper	3	0	3		13,928	13,931
Miscellaneous	687	0	687	149	11,188	12,024
Ferrous Scrap	0	68	68	2,909	1,160	4,137
Aluminum/Non-ferrous Scrap	725	877	1,602	54	733	2,389
Ferrous Cans	0	1,321	1,321		174	1,495
Plastics	251	635	886	16	693	1,595
Wood	0	0	0	917	1,320	2,237
Textiles	1,445	0	1,445		0	1,445
MRF Rejects	NA[5]	959[6]	NA[5]		NA[5]	NA[5]
Composted/Chipped	19,607	39,333	58,940	12,323	9,119	80,382
Yard Debris[7]	17,159	39,333	56,492	12,323	3,783	72,598
Food Discards[8]	2,448	0	2,375		5,336	7,711
Total Waste Reduction	37,291	104,042	141,333	17,603	181,562	340,498
MSW Disposed	0	146,773	146,773	82,240	197,604	426,617
Trash	0	145,814	145,814	82,240	197,604	425,658
Contaminants		959	959			959
Total Generation		250,815	288,106	99,843	379,166	767,144
Percent Reduced		41.5%	49.1%	17.6%	47.9%	44.4%
Lbs. Waste/HH Served/Day			6.34			

Notes: Numbers may not add to total due to rounding.

[1]Data are actual tonnage from 1996 and represent material generated by Seattle residents and recovered through private drop-off and buy-back centers. Private recyclers report these data to the state. The state, in turn, reports the tonnages to localities.

[2]Data represent single-family and multi-family materials collected at curbside.

[3]Data represent materials delivered in both cars and trucks to drop-off sites. The material originates in both the residential and commercial sectors but is not separable.

[4]Data are actual tonnages from 1996 and represent material generated by Seattle commercial sector and recovered by private recycling companies. Private recyclers report these data to the state. The state, in turn, reports the tonnages to localities.

[5]Materials are processed at many different facilities and the reject rate is impossible to establish.

[6]Seattle Public Utilities reported 898 tons of contaminants in the SFD curbside residential programs, based on a sampling of bins at the curbside. General Disposal reported 62 tons of contaminants from its MFD recycling program. Nuts and Bolts reported recycling tonnages from its MFD recycling program as marketed, i.e. after rejects were removed. The recycling tonnages reported are net of the rejects.

[7]Private residential yard debris represents an estimate of backyard composting and grasscycling. Seattle Public Utilities estimates tonnage based on the number of bins in use and an average recovery rate for each household composting. Seattle staff calculated the average recovery rate per household of 562 pounds based on waste composition studies, composting program evaluations, and surveys of bin users. Self-haul yard debris includes material delivered in cars and trucks. Cars are not weighed and tonnage is estimated based on the number of cars and an average weight of 258 pounds per car. This figure is based on a sampling conducted in 1995.

[8]Private residential food discards represent an estimate of backyard food composting. Seattle Public Utilities estimates tonnage based on the number of bins in use and an average recovery rate for each household composting. Seattle staff calculated the average recovery rate per household of 290 pounds based on waste composition studies, composting program evaluations, and surveys of bin users.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

In 1989, the Washington State Legislature passed the "Waste Not Washington Act," which established a waste management hierarchy: (1) waste reduction; (2) recycling with source separation of materials preferred; (3) energy recovery, incineration, or landfilling of separated waste; and (4) energy recovery, incineration, or landfilling of mixed waste. The Act also set a state 50% recycling goal by 1995. The state did not meet this goal but has made consistent progress toward it; the state calculated recycling rate was 39% in 1995, up from 30% in 1989.

The Act required county governments to prepare solid waste management plans that incorporated waste reduction and recycling. The state provided local governments over $25 million in grant funds to revise their waste management plans and to implement waste reduction and recycling

programs. The Clean Washington Center was formed to focus on markets for recyclable materials.[2]

In 1988, Seattle set a goal to recycle 60% of its residential and commercial waste by 1998 with interim goals of 40% by 1991 and 50% by 1993.

A local ordinance, enacted in 1988, prohibits mixing yard debris and trash at the curb or at transfer stations.

Since 1981 Seattle has charged PAYT rates for residential trash collection and disposal. (See table below for rate schedule.)

Source Reduction & Reuse Initiatives

The Seattle Public Utilities promotes home composting. From December 1989 to April 1998, more than 50,000 free and reduced-price home compost bins were distributed to Seattle residents. The program also sponsors free composting workshops, trains volunteers to become Master Composters, and operates the city's "Compost Hotline."

Seattle began its Master Composter program in 1986. Each year city staff choose approximately 25 people to train as Master Composters. Program volunteers are required to perform 40 hours of outreach on composting following their training. Examples of outreach performed include school programs, composting demonstrations to community groups, staffing composting information booths, and writing articles for publication.

The Seattle Public Utilities' Green Neighborhoods program sponsors "Less is More" grants, which fund innovative waste reduction projects in Seattle.

Micro-can and 32-gallon trash can sizes used in Seattle's pay-as-you-throw trash program.

The Seattle Public Utilities encourages grasscycling and has worked with local lawn and garden care retailers to offer demonstrations, discounts, and rebates on mulching mowers.

The Seattle Public Utilities and King County have joined together to sponsor the "Waste Free Fridays" program. On Fridays only, this campaign promotes special discounts that area retailers offer on waste-preventing products and services. Examples of promotions include a copying company that offered discounts on double-sided copies and a shop that offered free coffee to customers who brought their own reusable cups. The Seattle Public Utilities and King County provide education and publicity for Waste Free Fridays.

Residential Recycling Program

In 1996, Seattle recycled 29% of its residential waste.[3] The Seattle Public Utilities contracts with Recycle America and Recycle Seattle to provide

1996 PAY-AS-YOU-THROW TRASH COLLECTION RATES

	Collection Frequency	Cost	Billing Period
12-Gallon Micro-Can	Weekly	$10.05	Monthly
19-Gallon Mini-Can	Weekly	$12.35	Monthly
32-Gallon Can	Weekly	$16.19	Monthly
2 32-Gallon Cans	Weekly	$32.15	Monthly
Additional 32-Gallon Cans	Weekly	$16.10	Monthly
Curbside Yard Debris	Varies	$4.25	Monthly
Self-Haul Trash, Carload	As Needed	$8.50	Per Trip
Self-Haul Trash, Truckload	As Needed	$93.65	Per Trip
Self-Haul Yard Debris, Carload	As Needed	$6.50	Per Trip
Self-Haul Yard Debris, Truckload	As Needed	$68.70	Per Trip

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: The Seattle Public Utilities contracts with two private haulers to serve residences with up to four units: north section, Recycle America (RA); south section, Recycle Seattle (RS). Four private recyclers service apartment buildings: north section, Nuts 'n' Bolts Recycling (N&B) and General Disposal (GD); south section, West Seattle Recycling (WSR) and Recycle Seattle II (RSII). Total Reclaim collects large items for the entire city.

Start-up Date: Curbside program began February 1988; apartment program May 1989. N&B (May 1989), WSR (January 1991), GD (July 1993), RSII (July 1993)

Mandatory: No

Households Served: 54,899 average MFDs for 1996; 148,300 SFDs, SFD curbside program includes dwellings with up to four units, remainder in apartment recycling program. Building management sign up their buildings for participation in the MFD program

Materials Accepted: SFDs: ONP, OCC, RMP (including catalogs, magazines, mail, paperboard, phone books, paperback books, office paper, and paper bags), glass bottles and jars, aluminum and tin cans, PET & HDPE bottles, ferrous metals, white goods

MFDs: Aluminum and tin cans, glass bottles and jars, RMP, ONP, white goods. GD & RSII also collect #1 and #2 plastic bottles.

Collection Frequency: SFDs: North section of city, weekly; south section, monthly. MFDs: Varies, building works with collector to arrange a schedule. White goods and other bulky items collected on-call for a $25 per item fee.

Set-out Method: North: Residents set out three 12-gallon bins: yellow bin for cans, bottles, and jars; dark green bin for newspaper; light green bin for mixed paper and OCC. A small cardboard box next to the bins can be used for scrap metal. South: Most materials are commingled in 60- or 90-gallon toters with a separate (approximately 15-gallon) bin for glass. MFDs: Residents served by RSII and GD commingle recyclables in a dumpster, with three toters for collection of glass by color. N&B and WSR provide separate containers for each material category. Collection contractors provide all bins, dumpsters, and toters as part of their contracts.

Collection Method: SFDs: north section of city; compartmentalized recycling trucks. South: Rear-loading packer trucks, retrofitted with bins for glass, driver sorts glass by color en route. MFDs: GD and RSII collect dumpsters using an automated truck. RSII collects glass on the same truck as commingled materials. GD collects glass in a separate three-compartment side-loading truck. N&B and WSR collect each material on its own route in a separate truck. N&B uses flat-bed trucks to collect material in 55-gallon barrels. WSR collects in a rear-load packer truck.

Participation Rate: Proportion of eligible households signed up: >90% of SFDs (estimate). In 1996, 43% of MFD buildings (56% of units).

Participation Incentives: Reduced trash fees through increased diversion

Enforcement: SFDs: north section of city, improper materials left in recycling bins with a notice explaining problem. South section of city, recyclables in toters with noticeable contamination are not collected, notice explaining left with toter. Haulers are supposed to report to the city the number and location of notices given. On average, the city receives reports of less than one notice issued per day. MFDs: Seattle tries to use an incentive program to encourage recycling rather than enforcement. The city has sponsored reward programs for recycling achievement and maintains an on-going education program about the apartment recycling program. In cases of consistently contaminated recyclables at an apartment building, recycling service has been terminated as a last resort. Service has been terminated at between 50 and 100 buildings.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: 1989

Service Provider: Contractors hired by city. North section of city: General Disposal; south section of city: US Disposal

Households Served: 85,294 subscribers as of December 1996

Mandatory: Yes, banned from disposing with trash

Materials Collected: Leaves, grass clippings, prunings, holiday trees, brush

Collection Frequency: South: Every other week March-November, monthly December-February; north: Weekly March-October, two November collections, monthly December-February. No more than twenty 60-pound bags, cans, or bundles will be collected from a household in a month, maximum number of units per collection is twenty divided by the number of collections in a month.

Set-out Method: All material must be either in a paper or plastic bag, a can separate from trash, or tied with twine. Holiday trees must be trimmed down to less than 6' long by 4' across and bundled. Participants must provide their own clearly marked containers.

Collection Method: Rear-loading trash trucks, drivers remove material from plastic bags. Contractors use one or two person crews and seasonally change the number of routes.

Participation Rate: NA

Participation Incentives: Reduced trash fees

Enforcement: Trash crews do not collect trash containing yard debris. The crews leave a notice explaining why the material was not collected. On average, the city receives reports of less than one notice issued per day.

DROP-OFF COLLECTION

Number of sites:	Two public recycling and yard debris drop-off centers at the city's transfer stations. Numerous other private-sector drop-off and buy-back recycling centers exist throughout the city.
Staffing:	Always present at transfer station facilities
Service Provider:	Seattle Public Utilities
Materials Accepted:	Newspapers, mixed paper, corrugated cardboard, glass, aluminum and tin containers, plastic bottles, white goods, scrap metal, lead-acid batteries, used motor oil, oil filters, brush, clean wood, grass clippings, leaves, holiday trees (free drop-off first two weeks of January)
Participation Incentives:	Reduced trash disposal fees through increased waste reduction, yard debris and clean wood tip fees are lower than trash tip fee and recycling is free
Sectors Served:	All, anyone can use the sites if fees are paid. Seattle Public Utilities staff believe fewer people come into the city to manage these materials than city residents who go out of the city to the county transfer stations at the city's edge. Prior to January 1,1997, tip fees for trash and yard debris were cheaper for cars and trucks at the county site.

recycling services to its residents living in buildings with four or fewer units. The city contracts with four other companies to provide a separate apartment recycling program serving residents in buildings with five or more units.

Seattle is divided into north and south sections and its curbside recycling program is different in each section. Recycle America (a Waste Management, Inc. owned company) provides curbside recycling services in the north section. Recycle Seattle (owned by Rabanco, a local waste management company) serves the southern section. Four private contractors (Nuts 'n' Bolts Recycling, General Disposal, West Seattle Recycling, and Recycle Seattle II) offer apartment recycling collection services to buildings with five or more units.

Recyclable materials collected through the city's residential collection programs are processed at two private facilities: the Rabanco Recycling Center and the Recycle America Processing Center. The Rabanco Recycling Center (capacity 500-700 tons per day) processes recyclables from Recycle Seattle's residential collection program, from General Disposal's and Recycle Seattle II's MFD recycling programs, and from commercial sources. The facility uses conveyors, trommel and disc screens, magnetic separation, air classification, and hand-sorting to separate materials. The Recycle America Processing Center (capacity 350 tons per day) processes material

Curbside recycling set-out in north section of city. Residents receive weekly collection of materials.

Curbside recycling set-out in south section of city. Residents receive monthly collection service.

EQUIPMENT COSTS

Item	Cost	Use	Year Incurred
14 Busby Truck Chassis[1]	$462,000	Trash Hauling	1994-1996
14 Kenilworth Semi-Trucks[2]	$1,140,000	Trash Hauling/Yard Debris	1989-1996
29 Star Trailers[3]	$1,305,000	Yard Debris Hauling	1985-1996
2.75-cubic-yard Caterpillar Wheel Loader	$150,000	Trash	1995
4 Pettibone Walking Floor Trailers[4]	$480,000	Recycling/Composting	1979-1995
2 2.75-cubic-yard Caterpillar Track Loaders	$350,000	Trash	1994
Ace Diesel Fuel Tank	$13,000	Trash/Recycling/Composting	1994
2 Case Bulldozers	$350,000	Trash	1993
7 DeWalt Self-Dumping Hoppers	$7,000	Recycling	1992
2 1/4-cubic-yard Toyota Skid Steer Loaders	$40,000	Trash	1992
2 Peterbilt Ecology Trucks	$240,000	Recycling/Trash	1989, 1992
45 Drop Boxes[5]	$180,000	Recycling/Trash	1985-1992
2 Amfab Compactors	$1,400,000	Trash	1991
2.5-cubic-yard Caterpillar Track Loader	$175,000	Trash	1991
2 Komatsu Clamshell Backhoes	$160,000	Recycling	1991
2 1/2-cubic-yard Case Wheel Loaders	$120,000	Recycling/Composting	1990
2 Ottawa Yard Goats	$130,000	Trash/Composting	1990
2 Cardboard Compactors[6]	$40,000	Recycling	1986, 1989
2 Cardboard Drop Boxes[7]	unknown	Recycling	1986, 1989
Athey/Broom Street Sweeper	$125,000	Transfer Station Site Maintenance	1988
GMC Step Van	$35,000	Trash/Recycling/Yard Debris	1987
Toro Lawn Mower	$19,000	Transfer Station Site Maintenance	1987
Ford Flatbed Truck	$50,000	Trash/Recycling/Yard Debris	1986
1 King LowBoy	$75,000	Equipment Hauling	1985
Ford Flusher Truck	$110,000	Transfer Station Site Maintenance	1985

Notes: All costs represent 1996 replacement costs. Listed equipment is owned by Seattle Public Utilities and is primarily used in the operation of its transfer stations and for hauling of materials.
[1]Ten purchased in 1994; two in 1995; and two in 1996.
[2]Four purchased in 1989; five in 1991; one in 1992; two in 1994; two in 1995; and two in 1996.
[3]Three purchased in 1985; nine in 1987; four in 1988; ten in 1990; one in 1995; and two in 1996.
[4]One purchased in 1979, 1980, 1981, and 1995.
[5]Two purchased in 1985; one in 1988; 23 in 1989; and 19 in 1992. Those purchased in 1992 are DeWalt; all others are Capital.
[6]Marathon Compactor purchased in 1986; Masterpak Compactor in 1989.
[7]Marathon box purchased in 1986; Masterpak box in 1989.

Source: Institute for Local Self-Reliance, 1999.

Recycling truck servicing north section of city.

collected by Recycle America from the north end of Seattle. Paper is hand-sorted and baled. Magnets and hand-sorting are employed to separate glass, tin, and aluminum. Nuts 'n' Bolts Recycling and West Seattle Recycling collect materials already separated and deliver them directly to markets.

Total Reclaim provides bulky waste collection to all residents who request the service. Residents must pay $25 for each item collected. The city pays an additional $10 for each item collected and pays for material processing. Appliances collected by Total Reclaim are recycled.

Commercial Recycling

Commercial and institutional waste generators can self-haul their trash and recyclables to a transfer

station or contract privately for trash and recycling collection. Businesses that self-haul recyclables to city transfer stations can tip them for free. At city transfer stations, the per ton tip fee for a load of yard debris is 25% lower than the tip fee charged for trash. Private trash haulers offer their commercial customers separate recycling service for source-separated materials. The rate schedule for recycling is generally lower than for trash service. In addition, trash haulers and recycling companies sometimes pay businesses for high-value recovered materials. A number of private recycling companies provide collection service. These companies range from local paper companies collecting only high-grade paper to companies collecting a broad range of materials. Seattle excludes revenues from collection of commercial recyclables from the city Business and Occupation Tax that haulers must pay on trash collection revenues. In 1996, Seattle diverted 48% of its commercial and institutional waste through private recyclers, up from 44% in 1989 and 1993.

The Seattle Public Utilities and the Greater Seattle Chamber of Commerce sponsor the Business and Industry Recycling Venture (BIRV). This program encourages waste prevention, recycling, and purchasing of recycled-content products within Seattle's business community. BIRV offers businesses a hotline, informational materials, and technical assistance; and conducts presentations and seminars.

Composting Program

Seattle residents can choose to divert yard debris either through curbside subscription service (for which the city charges a $4.10 per month fee), through drop-off sites, or by home composting. A local ordinance prohibits disposal of yard debris with trash. Residents' trash haulers (General Disposal on the north side of the city and US Disposal in the southern portion), as part of their contracts with the city, provide the curbside yard debris service for subscribers on the same day as trash collection. In 1996, Seattle diverted 14% of its residential waste stream (excluding self-haul residential waste) through the subscription program and an additional 7% of its waste stream through backyard composting. General Disposal delivers collected materials to one of the city-owned transfer stations. US Disposal transfers material collected in the curbside and drop-off programs to the Cedar Grove processing facility located in rural Maple Valley, 30 miles from Seattle. Cedar Grove composts both yard and food debris at this site. Cedar Grove composts the material in mechanically turned windrows. Finished compost is sold through local retail outlets in the Puget Sound area.

The Cedar Grove composting facility has experienced some odor problems and is facing potential court action from its neighbors. In order to address this problem, Cedar Grove is constructing a covered grinding area and diverting some materials (particularly grass clippings) to small independent composters.

Education, Publicity, and Outreach

The Seattle Public Utilities sponsors the "Informed Neighborhoods" programs aimed at spreading information about waste management to members of the community. This program has two main components, the "Friends of Recycling" and a school grant program. Friends of Recycling provides free training to residents interested in serving their neighborhood for one year as a community resource on Seattle Public Utilities' waste programs. The volunteers share information on recycling, waste reduction, and composting. The school grants program provides money to elementary through high schools to fund development of solid waste class projects.

The Seattle Public Utilities has worked with King, Pierce, and Snohomish Counties on a grasscycling campaign. The campaign featured television advertisements promoting grasscycling and distribution of coupons for rebates on mulching mowers.

Twice a year the Seattle Public Utilities produces and direct mails to all residential

Yard debris containers set out for collection.

households a newsletter, called The Curb Waste News. The city also distributes information concerning its waste management programs through utility bill inserts.

The Seattle Public Utilities maintains a Web site with information about waste management programs, such as recycling preparation guidelines, transfer station hours, locations, and fees, and the numerous informational and grant programs it supports. Also presented are solid waste and recycling data, market prices, waste composition data, and other general planning information.

Costs

City contractors perform many public sector waste management functions in Seattle. Seattle pays per ton contract fees for curbside collection and processing of recyclable materials from single- and multi-family residences, curbside collection and processing of yard debris, and residential trash collection and disposal. The city incurs no direct capital costs for these activities, rather contractors pass on capital costs in the form of fees. City staff's main functions are operating two transfer stations, performing closure of the city's old landfill, hauling trash to the railhead, providing education and publicity, performing data analysis, providing customer service and billing for the residential waste management programs, performing waste inspections, and providing contractor oversight. The Seattle Public Utilities employs 190 people in its waste management programs.

The city paid an average of $173 per ton for residential trash services and $129 per ton for residential waste reduction (recycling, $121 per ton; composting $142 per ton) in 1996. Total residential waste management cost over $38.5 million, for an average per household cost of $155 ($31 for recycling services, $22 for the composting program, and $101 for trash management). In comparison, in 1987, the city paid $187 per ton for trash collection and disposal, averaging $155 per household.

Funding & Accounting Systems

Funds for Seattle Public Utilities' solid waste management programs are raised through the monthly rates paid by residential customers, tip fees paid at transfer stations, tip fees paid at the railhead for Institutional/Commercial trash, solid waste taxes, and through state grants. The grants average $300,000 per year. Revenues from the sale of recyclables can partially offset the per ton fees contractors charge the city.

Seattle Public Utilities uses accrual accounting techniques to track solid waste management costs.

Future Plans and Obstacles to Increasing Diversion

A 1995 study estimated more than 50,000 tons of residential materials and 60,000 tons of commercial materials that could be recycled in the city's existing programs were disposed. Most of the recoverable material was cardboard and other paper. The study estimated that residents of multi-family dwellings could recycle nearly half of the material they disposed and that self-haulers, single-family residents, and businesses could have recycled nearly one-third. The city is planning to initiate an intensive educational campaign in the residential and commercial sectors targeting paper recovery as a prelude to potential bans if new sector specific recovery goals are not met.

Obstacles to increasing diversion in MFDs include limited space in apartments and common areas for storing recyclables and lack of the financial incentive of PAYT rates to encourage trash reduction.

The Seattle Public Utilities is currently engaged in a comprehensive planning process. All of the city's waste management contracts expire in March 2000 and city planners are considering adding small businesses to the curbside recycling program and allowing contractors to propose innovative collection systems, such as dual-collection of waste streams, among many possible options. Other potential program changes include adding collection of food discards, polycoated paper, and all plastics to the curbside recycling program.

The Seattle Public Utilities may need to find a new facility to accept compostable materials. Cedar Grove is facing a class action lawsuit brought by neighboring residents. Residents want the facility to close because of persistent odor problems.

A current focus of Seattle's source reduction program is promotion of the concept of "voluntary simplicity." The city has contracted with a consultant for the development of educational materials intended to reach diverse audiences.

RESIDENTIAL CURBSIDE WASTE REDUCTION PROGRAM COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$7,815,196	64,709	$120.78	$31.39
SFD Curbside Collection and Processing[1]	$4,926,729	56,416	$87.33	
Apartment Collection and Processing[2]	$932,542	8,293	$112.46	
Administration/Education/Publicity[3]	$1,955,924	64,709	$30.23	
Composting Gross Costs	$5,577,806	39,333	$141.81	$22.40
Yard Trimmings Collection[4]	$3,109,239	39,333	$79.05	
Transfer Station Costs[5]	$170,169	27,491	$6.19	
Yard Debris Hauling[6]	$313,947	27,491	$11.42	
Yard Trimmings Processing[7]	$479,863	39,333	$12.20	
Administration/Education/Publicity[3]	$1,504,588	39,333	$38.25	
Waste Reduction Gross Costs	$13,393,001	104,042	$128.73	$53.79
Materials Revenues[8]	NA		NA	NA
Net Waste Reduction Costs	$13,393,001	104,042	$128.73	$53.79

Key: NA = not applicable

Note: Figures may not total due to rounding.

[1]Represents net contract payments by city to contractors. The city paid its contractors on a per ton basis ($93.08 per ton in the north section of the city and $86.42 in the south section) with per ton offsets based on market prices.

[2]Apartment recycling collection contracts are based on a per ton rate for collection and include provisions for the contractor to return revenues if commodity prices rise above a set base price and for the city to pay extra to the contractors if commodity prices fall below a set level. Figures represent net contract payments by city to contractors.

[3]Represents costs of city administration of program based on a 1995 study plus a pro-rated amount of city expenditures for general and administrative costs, depreciation, and taxes. The cost figures from the study include costs for customer service, education, planning, inspectors, and contract administration staff only. The general and administrative costs include rent, utilities, departmental overhead, information technology, and overhead for other city government departments including the mayor and council.

[4]Represents contract payments by city to contractors for collection of yard debris.

[5]Represents costs for handling yard debris collected from the north of the city at transfer stations. City staff calculated per ton costs in a 1995 study.

[6]Represents costs for hauling yard debris collected from the north of the city to the Cedar Grove compost facility located in Maple Valley, 30 miles from Seattle. City staff calculated per ton costs for a 1995 study.

[7]Represents payments to contractor for processing yard debris at $12.20 per ton.

[8]Contracts include complicated formulae for (1) reducing charges to the city if commodity prices are above a pre-set level and (2) increasing amounts due if prices fall below a set level. The per ton base rates and commodity prices vary among contractors. Recycling collection costs presented above represent net contract payments and as such include any offsets from revenues earned or lost.

TOTAL RESIDENTIAL CURBSIDE WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Trash Gross Costs	$25,180,317	145,814	$172.69	$101.14
Trash Collection[1]	$10,909,771	145,814	$74.82	
Trash Transfer Station[2]	$1,010,489	145,814	$6.93	
Hauling[3]	$420,647	145,221	$2.90	
Large Item Collection[4]	$4,340	NA	NA	
Railhead Tip Fees[5]	$6,504,749	145,814	$44.61	
Administration/Education/Publicity[6]	$6,330,321	145,814	$43.41	
Waste Reduction Gross Costs	$13,393,001	104,042	$128.73	$53.79
SWM Gross Costs	$38,573,318	249,855	$154.38	$154.93
Materials Revenues	NA		NA	NA
Total SWM Net Costs	$38,573,318	249,855	$154.38	$154.93

Key: NA = not applicable

Note: Figures may not total due to rounding. Trash tonnage figure above is different than figure in table, page 141, as figure above excludes MRF rejects.

[1]Represents contract payments by city to contractors.

[2]Represents costs to city for trash handling at city transfer stations. Per ton costs were calculated in a 1995 city study. This study revealed per ton operation and maintenance costs at city transfer stations for handling trash averaged $6.93 plus $0.97 per ton for capital costs.

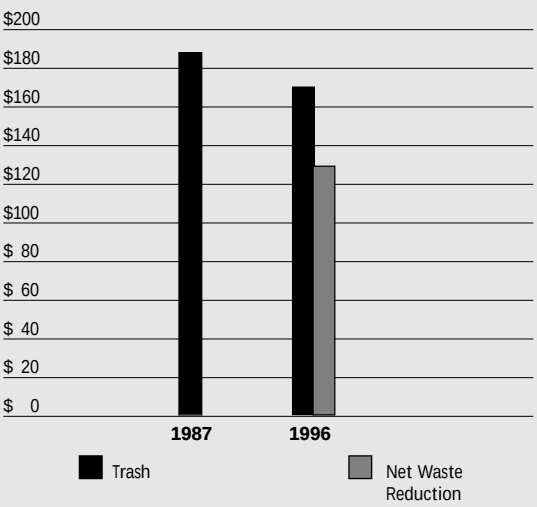
[3]Represents cost to city for trash hauling from transfer station to railhead. City staff calculated per ton costs in a 1995 study to be $3.79 per ton hauled from the north transfer station and $2.39 per ton hauled from the south transfer station.

[4]Represents costs to city for bulky item collection in residential sector. This service is provided by a contractor, Total Reclaim, at a cost of $10 to the city and $25 to the resident for each item collected. Total Reclaim performed 124 bulk item collections in 1996. Some of this material is recycled, particularly white goods. Tons recycled versus disposed are not tracked but are included in the recycling and disposal tonnage totals.

[5]Represents tip fees paid to tip trash at a railhead. Costs include rail transport and tipping at a landfill in Eastern Oregon.

[6]Represents costs of city administration of program based on a 1995 study plus a pro-rated amount of city expenditures for general and administrative costs, depreciation, and taxes. The cost figures from the study include costs for customer service, education, planning, inspectors, and contract administration staff only. The general and administrative costs include rent, utilities, departmental overhead, information technology, and overhead for other city government departments including the mayor and council.

Source: Institute for Local Self-Reliance, 1999.



Notes: In 1987, all recycling occurred in the private sector, at no cost to the city.

Source: Institute for Local Self-Reliance, 1999.

Tips for Replication

Recover mixed paper for recycling.

Distribute bins to all participants when starting waste recovery programs.

Institute PAYT rates for trash service.

Invest in public education programs.

Target educational messages to people of all ethnicities.

Support education programs with market research to most efficiently target resources.

Accept some or all the risk of secondary materials prices by paying contractors more when market prices are low and less when prices are high.

Pay trash haulers partly based on tons collected so as recycling increases, savings result.

Notes:

[1]All of Seattle's waste management contracts are based on per ton fees, therefore each ton of material handled in the recycling or composting programs results in a lower cost than if materials had been disposed as trash.

[2]The Clean Washington Center was initially funded by the state. In 1997, state funding ended but the Center has continued to operate with private funding.

[3]This figure represents residential trash and recyclables handled by private recyclers and city curbside programs. Some materials self-hauled to city transfer stations are residential in origin but the residential versus commercial split is unknown.

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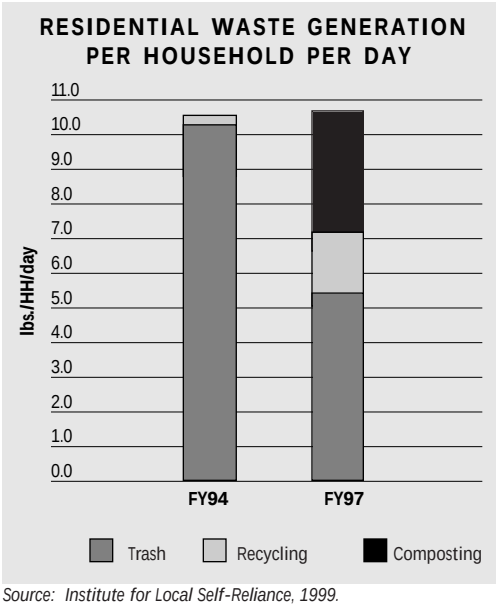
VISALIA, CALIFORNIA

Residential Waste Reduction

50%

Visalia, located in the southern portion of the Great Central Valley of California, began its waste reduction programs in order to meet state law requirements. Today, Visalia is diverting 50% of its residential waste from landfill disposal — 33% through composting and 16% through recycling. The heart of the program is an innovative automated dual-collection system that targets a wide range of recyclable and compostable materials.

City staff, unhappy with the result of several pilot recycling programs, decided to pursue a fully automated recycling system that would mirror the efficiency of its fully automated trash collection system. It opted for a dual-collection system in which recyclables would be collected at the same time and with the same vehicle as trash. The city teamed with the distributor of its trash trucks to design a special 110-gallon split container and a dual compartmented automated collection vehicle. The container and the vehicle have two compartments; one for commingled recyclables and the other for trash. Following a successful pilot program, the city switched to the new dual-collection system citywide April 1996. At the same time it substituted the previous second day trash collection with a "green waste" collection day. Residents can recycle 15 categories of materials including mixed paper, all plastic containers, and milk and juice cartons. All types of yard trimmings and even scrap wood and lumber are accepted in the green waste program.



Source: Institute for Local Self-Reliance, 1999.

The efficiency of the split container collection is identical to the old automated system — it eliminates time-consuming manual systems, additional trucks and crews, and worker compensation claims for back injuries from lifting bins or bags. The system provides residents with an easy way to recycle virtually all paper products, all metals, and all glass with just one wheeled container. The program has a high diversion rate and a high degree of public acceptance because it is easy to use.

Net solid waste management costs per household have increased from $190 in FY94 to $202 in FY97. In FY94, per ton trash costs were $101 per ton, now waste reduction and trash services cost $106 per ton. Recyclables processing and composting costs are less expensive per ton than landfill tip fees, helping to contain costs.

PROGRAM SUMMARY

	FY94	FY97
Tons Per Year	45,395	50,806
Disposal	44,319	25,538
Diversion	1,076	25,268
Percent Diverted	2%	50%
Recycled	2%	16%
Composted	0%	33%
Average lbs./HH/day	10.58	10.71
Disposal	10.33	5.38
Diversion	0.25	5.33
Annual Disposal Fees		
Disposal	$1,334,479	$801,810
Net Program Costs/HH	$190.33	$202.20
Disposal Services	$190.33	$108.77
Diversion Services[1]	$0	$93.43

Notes: 23,500 households served in 1994; 26,000 in 1996 and 1997. 1994 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

[1]Diversion represents deposit container recovery only in FY94; therefore, there were no direct costs to the city.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 91,314 (1996), 92,677 (1997)

HOUSEHOLDS: 28,869 (1996); 25,346 single-family households, 3,523 multi-family units

BUSINESSES: 1,200

LAND AREA: 28.6 sq. miles

HOUSEHOLD DENSITY: 1,009 households/sq. mi.

AVERAGE PER CAPITA INCOME: $12,994 (1989)

MEDIAN HOUSEHOLD INCOME: $35,575 (1989)

COMMUNITY CHARACTER: Urban. Visalia is the county seat for Tulare County and an economic hub for agriculture, industry, and other government services

COUNTY: Tulare

RESIDENTIAL WASTE REDUCTION

	Tons (FY97)
Recycled[1]	8,316
ONP	1,801
Mixed Paper	2,686
Old Corrugated Cardboard	1,650
Glass	375
Aluminum and Tin	195
PET and HDPE	241
Other Plastics	12
Deposit Containers[2]	1,356
Composted	16,952
Green Waste (curbside)	14,435
Green Waste (drop-off)	2,517
Total Waste Reduction	25,268
Waste Disposed	25,538
Landfilled	24,174
MRF Rejects	1,364
Total Generation	50,806
Percent Reduced	49.7%
Lbs. Waste/HH Served/Day	10.71

Note: Figures represent residential waste generated and recovered from 26,000 households (single-family households through households up to three units). Visalia's FY97 extends from July 1996 through June 1997.

[1]Recycled figures represent material recovered and already take into account the 19.6% by weight reject rate of residential recyclables at the MRF.

[2]ILSR calculated bottle bill tonnage using actual pounds per capita of bottle bill recovery in Visalia (figure supplied by the Container Recycling Institute), of which 60% was counted in the residential sector.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

In 1989, the State of California passed the Integrated Waste Management Act of 1989 (AB939). The Act mandates recycling goals for all California cities: 25% waste reduction by 1995 and 50% by 2000. The year 1990 is the base year for all diversion calculations.

The California Beverage Container Recycling and Litter Reduction Act (AB2020), enacted in 1986 and implemented in 1987, requires distributors to pay a 2¢ deposit on beer and other malt beverages, soft drinks, wine and distilled spirit coolers, carbonated mineral water, and soda water containers. Consumers pay a container deposit, which they can redeem for 2.5¢ (<24 oz.) and 5¢ (24 oz. and larger) at redemption centers (rather than retailers).

Source Reduction & Reuse Initiatives

Visalia has yet to implement a source reduction or reuse program. Households generating more waste than can fit in their 110-gallon container can pay an additional $8.45 per month for an extra container (extra green waste containers cost $4 per month). This is an economic incentive to reduce waste.

Recycling Program

In 1991, the city's Solid Waste Division tried several curbside recycling pilot programs that used either stackable recycling bins or bags. These pilots required manual collection of recyclables, which resulted in poor productivity and higher worker compensation rates as compared to the city's automated trash collection system at the time. Thus, the city decided to pursue a fully automated dual-collection system. A private-public development team, made of Ruckstell California Sales (the local Heil Equipment distributor) and city staff, designed a special 110-gallon split container (patented by the city) and a dual compartmented automated collection vehicle. Following a successful 1992 pilot, the city implemented the dual-collection system citywide April 1996. In FY97,Visalia recovered 16% of its residential waste through the curbside recycling and state container deposit programs.

The heart of Visalia's residential recycling program is the split container, which enables residents to conveniently commingle a wide range of recyclables and set these out together with trash. (The carts are made with 50% post-consumer recycled plastics.) One-person city crews empty the container into a dual compartmented automated collection vehicle.

The truck first empties trash at the landfill. Crews then unload recyclables onto an asphalt pad at a separate recycling transfer site located at the landfill. A front-end loader then loads recyclables into roll-off boxes, which are transported by truck to a privately run 350 ton-per-day capacity processing facility, Tulare County Recycling. Distance to the MRF is five miles from the center of town. Here the recyclables are emptied onto a cement pad and then transferred to a conveyor belt, where workers hand sort materials. Once separated, materials are baled and transported to end markets.

The MRF, which employs 87 full-time workers, also processes materials from other cities as well as from the commercial sector. In addition to processing source-separated recyclables, the MRF accepts loads of mixed waste as these are rich in recyclable materials. Only 55% of incoming commercial waste is recovered. As a result, the

CURBSIDE DUAL-COLLECTION OF RECYCLABLES & TRASH

Service Provider: Public Works Department

Start-up Date: First recycling pilot route, 1991. Pilot complete in 1992, began city implementation in 1994. Citywide, April 1996.

Mandatory: No

Households Served: Approximately 26,000 households (single-family households through households up to three units)

Materials Accepted: Aluminum containers, glass bottles and jars, tins cans, all plastic containers, newspapers, cardboard boxes, gray chipboard boxes, milk and juice cartons, mixed paper (including mail and magazines)

Collection Frequency: Weekly

Set-out Method: Residents receive a split 110-gallon container. They place commingled recyclables on one side (with a green lid). The other side has a brown lid and holds remaining trash. Outreach materials encourage residents to empty and flatten boxes and cartons and to remove tops and any solid/liquid residue from glass and metal containers. Newspapers can be loose or in paper bags.

Collection Method: A specially designed dual compartmented 33-cubic-yard truck collects both recyclables and trash at the same time (one crew member). As the split container empties its contents into the truck, the center divider in the container lines up with an inner divider in the truck. The recyclables drop into a top compartment while the waste empties into a lower compartment. The top compartment (with 40% of the truck's volume capacity) has a packing ratio of two to one; the lower compartment (with 60% of the truck's volume capacity) has a packing ratio of eight to one. Trucks serve an average of 900 households per day.

Participation Rate: 98-100% (drivers turn in sheets on how many containers are emptied)

Participation Incentives: Convenience

Enforcement: NA

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: Started in 1992; new program began citywide April 1996

Service Provider: Public Works Department

Households Served: 26,000

Mandatory: No

Materials Collected: Scrap wood and lumber (except for creosote or treated wood), grass clippings, tree trimmings, weeds, leaves, faded blossoms, fallen fruit and limbs from fruit trees, and other green waste

Collection Frequency: Weekly, different day than recyclables and trash

Set-out Method: Residents place their green waste loose (not bagged) in green 60- or 105-gallon roll-out carts provided by the city (these carts were previously used for trash collection under the old system). Larger tree limbs and branches should be cut into four-foot lengths in order to fit into green waste container.

Collection Method: The same dual compartmented truck used for trash and recyclables collection also collects green waste (one crew member).

Participation Rate: During winter about 50%, during spring and summer about 95%

Participation Incentives: Convenience

Enforcement: NA

DROP-OFF COLLECTION

Number of sites: Four city-run sites with roll-off bins for recyclables (located at supermarkets and shopping centers); during the fall and from the week before Thanksgiving to after the New Year, residents can take yard trimmings for free to the Tulare County Compost and Biomass. For approximately two weeks following Christmas, the city places roll-offs around town to collect holiday trees.

Staffing: Unstaffed

Service Provider: City (with help from the Conservation Corps for holiday tree collection)

Materials Accepted: Same materials as curbside plus holiday trees

Participation Incentives: none

Sectors Served: Residents and businesses (but not commercial contractors)

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
12 Dual-collection Vehicles[1]	$1,974,000	Recycling & Trash Collection	1994, 1995
26,520 110-Gallon Split Containers[2]	$2,173,500	Recycling & Trash Collection	1994-95
12 Green Waste Collection Vehicles[3]	$1,734,000	Yard Trimmings Collection	1990, 1993
26,520 90- and 100-Gallon Roll-Out Carts[4]	$1,642,200	Yard Trimmings Collection	1986-87

Note: Trucks and containers were financed with a lease/purchase agreement over seven years at a 5.5% annual interest rate.
[1]Various Chassis/modified side-loading automated Heil 7000 packers at $164,500 each. They have a life-span of seven years.
[2]The split containers cost $90 each and are expected to have a life-span of 10 years.
[3]Various Chassis/automated side-loading Heil 7000 packers at $144,500 each. These trucks were previously used for trash collection on the old automated system.
[4]The roll-out carts cost $68 each.

Source: Institute for Local Self-Reliance, 1999.

MRF's overall reject rate is quite high at 20 to 30% by weight.

For Visalia's residential recyclables, residual materials average 19.6% by weight. (The high amount of mixed paper in each load acts to cushion and protect glass. As a result, less than 2% of the glass collected breaks.) The 5.5 acre site and facility cost $3.5 million and has operated since 1994.

Composting Program

At the same time it unveiled its dual-collection program, Visalia substituted the previous second day trash pick-up with a green waste collection day. The program diverts 33% of the city's residential waste. Residents set out all types of yard trimmings plus scrap wood and lumber in the 60- or 105-gallon roll-out carts they previously used for trash set-out. One-person crews use the regular automated trash trucks to collect green waste. All green waste is taken to a local business — Tulare County Compost and Biomass. This company, eight miles away from the center of town, windrow composts about 1,600 tons of material per month and sells the finished product for $8 per ton. It employs nine full-time equivalent workers.

110-split containers are automatically emptied into hopper of split compactor trucks.

Education, Publicity, and Outreach

During the first pilot program in 1991, the city undertook an extensive outreach campaign to teach residents how to use the new system as well as the importance of recycling in general. Staff held neighborhood meetings to show off the new container and collection vehicle. Each resident received via mail full instructions for using the new system in advance of receiving their split container. Information was also attached to each container at delivery. Two months into the pilot program, the city surveyed residents to assess the program. Results indicated a 98% acceptance rate. The most frequent comment was how easy the system was to use.

The last phase of implementation outreach combined local radio and television advertising, meetings with local service clubs, seniors' groups, school recycling programs, and neighborhood meetings. Both before and after implementation, staff was always willing to meet with individual residents to resolve any issues. This personal contact with individuals was probably the most important element in creating a successful program.

Costs

A $3.5 million lease/purchase agreement was arranged to provide financing for the city's new dual-collection vehicles and split containers. Based on a seven-year life cycle for trucks and containers, staff calculated that residential collection rates would need to be increased $1.20 per month to fund the lease/purchase agreement. The city's source separated yard debris collection program cost approximately $4 per household per month. These increases were offset, however, by savings in tip fees. Landfill tip fees are $31 per ton, while tip fees for composting are $15 per ton and recycling processing fees are $28 per ton. The new program saved approximately $300,000 per year in tip fees, which

resulted in an actual rate increase to each household of only $3.20 per month.

The modified dual-collection vehicles cost approximately 20% more than the trash-only automated trucks. The split containers cost 32% more than the old 60- to 105-gallon carts. Maintenance and labor costs for the new fleet of dual-collection vehicles are comparable to the old fleet. In sum, the dual-collection/green waste vehicle system annual costs are approximately 16% above the costs to provide twice-per-week collection under the old collection system.[1]

The new system was designed to maintain the same route productivity collecting trash and recyclables as it achieved with collecting trash alone — the same time, number of stops, number of employees, and number of vehicles. It succeeded.

WASTE REDUCTION COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$950,512	8,324	$114.19	$36.56
Curbside Collection[1]	$505,285	8,324	$60.70	
Processing[2]	$242,131	8,324	$29.09	
Administration[3]	$185,595	8,324	$22.30	
Education/Publicity	$17,500	8,324	$2.10	
Composting Gross Costs	$1,478,739	16,952	$87.23	$56.87
Curbside Collection[1]	$876,237	14,435	$60.70	
Drop-off Collection	$21,080	2,517	$8.38	
Processing[4]	$275,186	16,952	$16.23	
Administration[3]	$288,736	16,952	$17.03	
Education/Publicity	$17,500	16,952	$1.03	
Waste Reduction Gross Costs	$2,429,251	25,276	$96.11	$93.43
Materials Revenues	($0)		($0)	($0)
Net Waste Reduction Costs	$2,429,251	25,276	$96.11	$93.43

Note: Figures may not total due to rounding. Recycling tonnage figure above is different than figure in table, page 152, as figure above includes MRF rejects and excludes deposit containers. Figures above include equipment depreciation and overhead and administration costs for the Solid Waste Division. Some overhead/administrative costs above the division level are included. (See Appendix B for further detail.) The city's FY97 extends from July 1st, 1996 through June 30th, 1997.

[1]Visalia does not track its costs for collection of materials for recycling, composting, and trash separately. Collection costs for all materials averaged $60.70 in FY97.

[2]Represents contract cost with Tulare County Recycling and is based on a tip fee of $28 per ton. The contract extends over five years (it expires February 2000) and includes five one-year renewal options. The city receives no revenues from the sale of materials.

[3]Within the DPW, administrative costs are allocated to services based on estimated percentage of total expenses on each service center.

[4]Represents contract cost with Tulare County Compost and Biomass. Contract is based on per ton tip fees: $15 per ton in FY97 and $17.50 per ton starting July 1997. The contract expires July 1998, although it's renewable every year.

TOTAL SOLID WASTE MANAGEMENT COSTS (FY97)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$2,827,896	24,174	$116.98	$108.77
Trash Collection[1]	$1,467,416	24,174	$60.70	
Landfill Tip Fees[2]	$801,810	24,174	$33.17	
Administration[3]	$552,170	24,174	$22.84	
Education/Publicity	$6,500	24,174	$0.27	
Waste Reduction Gross Costs	$2,429,251	25,276	$96.11	$93.43
SWM Gross Costs	$5,257,147	49,450	$106.31	$202.20
Materials Revenues	($0)		($0)	($0)
Total SWM Net Costs	$5,257,147	49,450	$106.31	$202.20

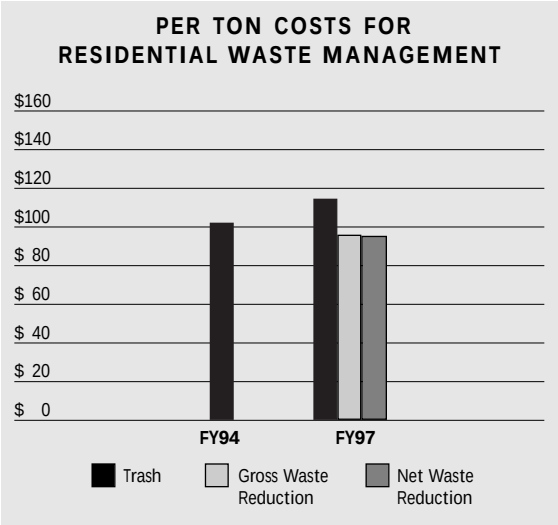
Note: Figures may not total due to rounding. Trash tonnage figure above is different than figure in table, page 152, as figure above excludes MRF rejects. Figures above include equipment depreciation and overhead and administration costs for the Solid Waste Division. Some overhead/administrative costs above the division level are included. (See Appendix B for further detail.) The city's FY97 extends from July 1st, 1996 through June 30th, 1997.

[1]Visalia does not track its costs for collection of materials for recycling, composting, and trash separately. Collection costs for all materials averaged $60.70 in FY97.

[2]Visalia disposes of its trash at the Tulare County landfill; the tip fee $31 per ton. This facility is five miles away.

[3]Within the DPW, administrative costs are allocated to services based on estimated percentage of total expenses on each service center.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

In 1996, the city spent about $5.26 million for trash, recycling, and green waste services — about $202 per household served. Of this, about 54% was spent on trash collection and disposal, 18% was spent on recycling, and 28% was spent on green waste collection and recovery. On a per-ton basis, trash cost $117 and waste reduction programs cost $96 — recycling $114 and green waste recovery, $87.[2] Overall, net solid waste management costs per household served have increased from $190 in FY94 to $202 in FY97. During this same time period, per ton trash tip fees increased 10%. If these fees had not risen, per household waste management costs in FY97 would have been within 5% of per household costs in FY94.

The Solid Waste Division employs 23 full-time employees (eight recycling and trash collection workers, eight green waste collection workers, and seven administrative staff). Hourly wages average $17 (with benefits) for recycling and trash services.

Funding & Accounting Systems

The Solid Waste Division receives its funds each year directly from an enterprise fund. Enterprise fund revenues come from a per household flat fee of $16 per month for trash, recycling, and green waste services. Charges show up on residents' utility bills. (Prior to the new system, each household paid $12.80.)

The Division uses full-cost accounting techniques to track its expenditures.

Future Plans and Obstacles to Increasing Diversion

Visalia plans to continue education in areas of town where contamination of recyclables has been a problem. It also is rewriting its contract with the MRF to try and get the reject weight down to 10% at maximum from the current level of 19.6%. The city is looking at adding recycling service at some of its multi-family dwellings.

Tips for Replication

Investigate the dual-collection split-container system and automated collection, especially when faced with an aging trash fleet.

Focus on education to teach residents how to use the system.

Seek committed staff and administration to ensure program success.

Find processor willing to receive totally commingled recyclables.

Put together Citizen Advisory Group or find other way to seek resident input and buy-in.

Notes:

[1]See R.W. Beck, The SWANA Collection Efficiency Project, Nov. 14, 1995. Annual costs include truck and cart capital, driver labor, fuel, truck maintenance costs, and landfill and MRF tip fees.

[2]The differences in the per ton costs in these figures is largely a reflection of the per ton costs for recycling and composting processing and trash disposal. Visalia does not track curbside collection costs for recyclables, yard debris, and trash separately and reports per ton collection costs for all materials as the total system average curbside collection cost.

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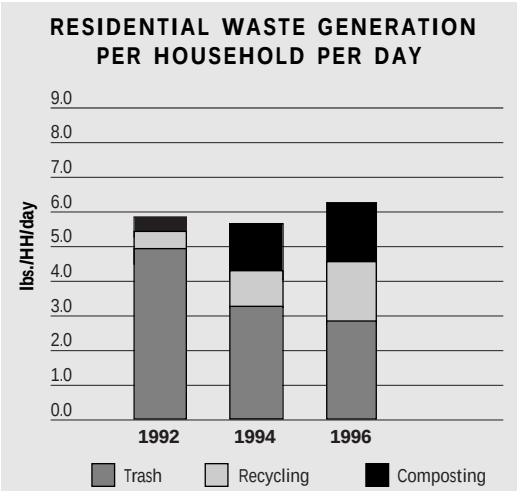
WORCESTER, MASSACHUSETTS

Residential Waste Reduction

54%

In the early 1990s, this urban city faced looming state landfill bans for recoverable materials and needed to transfer trash costs from its tax base to user fees. As a result, in November 1993, the city implemented recycling concurrently with a pay-as-you-throw trash system. Within a short time, Worcester's residential waste reduction rate had nearly tripled to 44% in 1994 from 15% in 1992. In 1996, during which recycling collection increased from biweekly to weekly, the residential recycling rate rose to 54% (27% through recycling and 27% through composting). Pay-as-you-throw trash fees, collection of many recyclables at curbside, the state bottle bill, and diversion of yard debris for composting all contribute to the city's high diversion rate.



Source: Institute for Local Self-Reliance, 1999.

Worcester provides all residents living in dwellings with six or fewer units with trash and recycling service.[1] They receive curbside collection of 20 types of recyclables (including mixed paper, all plastic containers, milk and juice cartons, and scrap metal). Fall leaves are collected once in conjunction with street sweeping. Per-bag trash fees are a financial incentive for residents to reduce trash disposal, recycle at curbside, and deliver their yard trimmings to one of the city's three yard debris drop-off sites, open April through November. The state bottle bill acts as a further financial incentive for material recovery. Residents receive 5¢ for each deposit container redeemed. A local ordinance and state bans prohibit disposal of yard debris with trash.

Per household costs of waste management were $75 in 1996; trash cost $48 per household and diversion cost $27 per household. High diversion levels have helped control costs. Waste reduction programs cost $47 per ton, compared to trash collection and disposal at $96 per ton. Recycling collection, processing, and marketing cost $54 per ton; yard debris collection and composting cost $40 per ton. Less trash has decreased the crew size on trash collection routes from three- to two-person crews. Since November 1993, overall employment for solid waste management has dropped by 12 full-time equivalents (slightly more than one person per daily trash route). A favorable recycling contract has also enhanced the program's cost-effectiveness.

PROGRAM SUMMARY

	1992	1996
Tons Per Year	53,087	57,573
Disposal	45,168	26,575
Diversion	7,919	30,998
Percent Diverted	15%	54%
Recycled	7%	27%
Composted	8%	27%
Average lbs./HH/day	5.84	6.20
Disposal	4.97	2.86
Diversion	0.87	3.34
Annual Disposal Fees		
Disposal	$1,578,806	$827,835
Net Program Costs/HH[1]	NA	$75.34
Disposal Services	NA	$48.15
Diversion Services	NA	$27.19

Notes: 49,824 households served in 1992, 50,868 in 1996. 1992 dollars adjusted to 1996 dollars using the GDP deflator. Numbers may not add to total due to rounding.

[1]Worcester did not provide 1992 cost data for collection. Tip fee paid was reported allowing the calculation of disposal fees only.

Source: Institute for Local Self-Reliance, 1999.

DEMOGRAPHICS

POPULATION: 171,226 (1995); 169,759 (1996)
HOUSEHOLDS: 63,588 (1996); 22,500 single-family households (one unit per building), 41,088 multi-family units
BUSINESSES: over 4,000
LAND AREA: 37.5 square miles
HOUSEHOLD DENSITY: 1,696 / sq. mi.
AVERAGE PER CAPITA INCOME: $15,657 (1989)
MEDIAN HOUSEHOLD INCOME: $35,977 (1989)
COMMUNITY CHARACTER: Urban/city, major industries include abrasives manufacturing, bio-tech firms, and health care services. Worcester is also home to nine colleges and universities.
COUNTY: Worcester

RESIDENTIAL WASTE REDUCTION

	Tons (1996)
Recycled	15,498
Mixed Paper	9,183
Commingled Containers	4,093
White Goods and Bulk Materials[1]	693
Scrap Metal	93
Deposit Containers[2]	2,498
MRF Rejects[3]	-1,062
Composted/Chipped[4]	15,500
Total Waste Reduction	30,998
MSW Disposed	26,575
Incinerated	24,142
Bulk Waste[5]	1,298
MRF Rejects	1,062
Tires	73
Total Generation	57,573
Percent Reduced	53.8%
Lbs. Waste/HH Served/Day	6.20

Notes: Figures above include material from 50,868 households and some schools and municipal office buildings. Excluded are trash and recycling from 12,720 households in buildings or complexes with seven or more units, which are not served by the city.

[1]Estimated using state conversion for volume to weight.

[2]ILSR calculated deposit container recycling for the residential portion of Worcester's waste stream using 60% of the statewide average per capita refillable bottle usage, and the statewide average per capita residential deposit container recovery multiplied by Worcester's total population. These figures were reduced by 20% to account for the households not included in the city's waste management programs.

[3]BFI staff report 8% by weight of mixed paper and commingled containers are rejected as residuals at their Auburn facility.

[4]Estimated by weighing representative loads and extrapolating. This figure represents all yard debris recovered in the city's programs. Since any city resident, driving a non-commercial vehicle, is allowed to deliver yard debris to city drop-off sites, some of this material may have originated from MFDs not served by the city's trash and recycling programs. The DPW Assistant Commissioner, though, believes most households in buildings or complexes with seven or more units are served by commercial landscapers and the amount of yard debris originating in these households that enters the city management program is negligible.

[5]Neither Worcester nor BFI track the tons of bulk waste disposed. According to the U.S. EPA *Characterization of Municipal Solid Waste in the United States: 1996 Update*, disposed durable goods consist of approximately 35% metals and 65% other materials. Worcester recovers only metals from its bulk waste stream. ILSR estimated disposal tonnage of Worcester's bulk waste by assuming the 693 tons of material recovered from this waste stream were metals, leaving 65% or approximately 1,298 tons of bulk materials for disposal.

Source: Institute for Local Self-Reliance, 1999.

State and Local Policies

The Massachusetts Department of Environmental Protection has set statewide municipal solid waste recycling goals of 23% by 1992, 34% by 1996, and 46% by 2000. Massachusetts bans lead-acid batteries, leaves and other yard debris, white goods, all metal and glass containers, #1 and #2 single polymer plastics, and recyclable paper from disposal in all state landfills and incinerators. The bans were phased in from 1990 to 1994.

Waste disposal facilities must demonstrate that waste equivalent to 25% of their permitted capacity will be recycled either by themselves, the generators, or an intermediate handler.

Massachusetts' beverage container deposit law, effective January 17, 1983, requires consumers to pay a 5¢ deposit on containers for "soda water or similar carbonated soft drinks, mineral water, and beer and other malt beverages." Consumers can redeem containers at retailers that sell these products. A single corporation created by beverage distributors recycles about 75% of redeemed containers. Unclaimed deposits become state property; a portion of this money goes into the state's Clean Environment Fund. Massachusetts makes funds and equipment for source reduction, composting, recycling, and market development available to communities, schools, and businesses through this fund and other grant and loan programs.

Worcester's local ordinance states "[n]o person shall dispose of leaves or yard waste with the solid waste collection..." and "[n]o person shall place recyclable items in any solid waste bag placed out for collection." The DPW commissioner is empowered to define recyclable items. The ordinance enables enforcement starting with a warning and allowing for fines up to $100 for violations. Four staff in Public Health and Code Enforcement enforce solid waste regulations.

Residents must place trash in special yellow bags or city trash crews will not collect it. A 30-gallon bag costs 50¢ and a 15-gallon bag, 25¢. Bags are readily available at local stores.

Source Reduction Initiatives

Worcester's source reduction initiatives consist of promoting home composting. Worcester has worked with the state to encourage backyard composting by sponsoring home composting bin sales and a state composting class. Classes are usually offered twice a year. Composting bins are available for purchase at the DPW. As of September 1997, the city had sold 177 bins to residents.

Recycling Program

Residents can recycle 20 categories of materials in the curbside recycling program. In 1996, 27% of residential waste was recycled through curbside recycling and deposit container recovery. The city contracts with Browning-Ferris Industries (BFI) to

CURBSIDE COLLECTION OF RECYCLABLES

Service Provider: Browning-Ferris Industries

Start-up Date: November 1993

Mandatory: Yes. Residents are not allowed to set out designated recyclables in their trash.

Households Served: 50,868: 22,500 residents in SFDs and 28,368 in MFDs with two to six units

Materials Accepted: Newspaper, corrugated cardboard, paperboard, magazines, office paper, mail, phone books, paper bags, other mixed paper, milk and juice cartons and boxes, scrap metal, glass containers, aluminum cans, steel food and beverage containers, aluminum trays and tins, all plastic containers (except motor oil and anti-freeze containers and pails or buckets), white goods

Collection Frequency: Weekly same day as trash, metal items (including white goods) by appointment

Set-out Method: Corrugated cardboard must be flattened and less than 3'x3'. Other paper products in paper bag placed beside recycling bin. All glass, metal, and plastics commingled in 14-gallon blue or green recycling bin. White goods are set out at curb on day of appointment.

Collection Method: One-person crews use split compactor trucks with one compartment for mixed recyclables, the other for paper. Separate crew collects white goods by appointment from the curb on scheduled bulky material collection days.

Participation Rate: NA

Participation Incentives: Reduced trash fees through increased recycling

Enforcement: Collection crews sticker bins containing inappropriate materials and leave the non-recyclable items in the bins.

CURBSIDE COLLECTION OF YARD TRIMMINGS

Start-up Date: Leaf collection began in the early 1980s, composting began approximately 1988

Service Provider: City of Worcester Department of Public Works

Households Served: All

Mandatory: Yes. Residents are not allowed to set out leaves and other yard debris in their trash.

Materials Collected: Leaves

Collection Frequency: Material from each street collected once, program lasts five weeks and usually begins mid-November depending on time of leaf drop and weather conditions

Set-out Method: Leaves can be raked into the street or bagged in paper bags

Collection Method: Crews use front-end loaders and claws to transfer leaves into dump trucks, street sweepers follow. Crew sizes vary depending on needs.

Participation Rate: NA

Participation Incentives: Reduced trash fees through increased diversion

Enforcement: Same as recycling

DROP-OFF COLLECTION

Number of sites: Three yard debris drop-off sites open April through November on Wednesday, Saturday, and Sunday

Staffing: Two or more staff present at each site at all times

Service Provider: City of Worcester Department of Public Works

Materials Accepted: Leaves, grass clippings, garden debris, brush (less than three feet in length), Christmas trees

Participation Incentives: Finished compost given to residents free of charge, reduced trash disposal charges through increased diversion, mandatory separation of yard debris from trash

Sectors Served: All residents, no commercial vehicles permitted to enter drop-off sites

EQUIPMENT COSTS

Item	Costs	Use	Year Incurred
~55,500 Recycling Bins[1]	$4 each	Recycling	1993
Dump Trucks[2]	NA	Leaf Collection	NA
Front-end Loaders/Claws[3]	NA	Leaf Collection	NA
3 Pickup Trucks[4]	NA	Trash	NA
20 Trash Trucks[5]	NA	Trash	NA
Wildcat Windrow Turner	$187,000	Composting	NA
Willibald Grinder[6]	$182,000	Composting	NA

Note: Most equipment is purchased outright using city bond funds with a five-year pay-off term. Repayment of bonds is out of city's general fund. The DPW does not incur financing costs for equipment purchases.
[1]An initial purchase of 53,000 bins was financed from grant money. The city provided each residence with a bin at the start of the curbside program. The 2,500 bins purchased later were paid for with 50% state grant monies and 50% city funds.
[2]A five-ton dump truck cost $90,000 in 1997.
[3]Each vehicle equipped with claws costs $150,000 in 1997.
[4]One vehicle costs about $20,000 in 1997.
[5]The most recently purchased truck cost $90,000. The trucks are various makes and sizes with compactor volumes in the 20- to-25-cubic-yard range.
[6]Purchased for city as part of state grant program.

Source: Institute for Local Self-Reliance, 1999.

collect, process, and market residential recyclables. Nine recycling routes each day cover the city. Residents set out their recyclables on the same day as their trash.

Until June 1997, recyclables were processed at a MRF in Springfield, Massachusetts. BFI now processes the materials at its new Transcyclery™ facility located in the town of Auburn, seven miles from Worcester. The Transcyclery™ is a transfer station and a MRF. Recyclables are delivered to the facility sorted into separate fiber and container streams. Each stream is processed on a separate side of the facility. On the fiber side, cardboard is mechanically separated and the rest of the materials are hand-sorted. The container processing method is more automated. A magnetic separator removes ferrous material; air blowers and trommel screens further sort recyclables. Workers manually process remaining materials.

As of December 1997, Worcester had received no revenue from the sale of its recyclables. The city, in contract negotiations, has traded the opportunity to receive a guaranteed share of revenue in return for increased service levels. According to the city's current contract, if paper prices climb above an index price based on New England markets ($90 per ton in mid-1997), the city would receive a 50% share of the revenue in excess.

Composting Program

Worcester provides fall leaf collection and operates drop-off sites for other compostable materials. In 1996, these city programs composted 27% of residential waste. Department of Public Works crews collect leaves from the street and in paper bags each fall. Residents can deliver their yard debris, free of charge, to one of three city-run drop-off sites. The city has two sites where staff windrow compost material. The city gives compost to residents and also uses the material in city parks and gardens.

Education, Publicity, and Outreach

When curbside recycling and the pay-as-you-throw trash system were implemented, Worcester staged a media blitz. The city used 22 billboards, television, newspapers, and radio to publicize the upcoming changes. The city also distributed bumper stickers with the slogan "Pay a little. Save a lot."

The city relies on an annual mailing outlining program details, a Web site, and an automated message system to keep residents informed. In addition, the city advertises any up-coming program changes in print.

Worcester invites state staff to conduct educational programs on waste management in the local schools. The city has distributed more than 50,000 book covers printed with information on solid waste to local school children.

Costs

In 1996, the city spent about $3.8 million for trash, recycling, and yard debris services — about $75 per household served. Of this, about 64% was spent on trash collection and disposal, 20% was spent on recycling, and 16% was spent on yard debris

collection and recovery. On a per-ton basis, trash cost $96, while waste reduction costs $47 ($54 for recycling and $40 for yard debris recovery).

Worcester executed its recycling contract during a period of exceptionally high material revenue. The city opted to renew the contract for two additional years, trading revenues for an increase of service (collection frequency increased from bi-weekly to weekly and materials were added to the curbside program). At the time Worcester exercised this option, BFI was charging more for new contracts as a result of the decline in revenues.

WASTE REDUCTION COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Recycling Gross Costs	$760,169	14,062	$54.06	$14.94
Recycling Collection and Processing[1]	$641,124	13,369	$47.96	
Bulky Materials Recycling[2]	$45,945	693	$66.30	
Administration/Overhead/Depreciation[3]	$65,100	14,062	$4.63	
Education/Publicity[4]	$8,000	14,062	$0.57	
Composting Gross Costs	$623,014	15,500	$40.19	$12.25
Collection	$483,963	15,500	$31.22	
Composting[5]	$32,522	15,500	$2.10	
Administration/Overhead/Depreciation[6]	$104,529	15,500	$6.74	
Education/Publicity[7]	$2,000	15,500	$0.13	
Waste Reduction Gross Costs	$1,383,182	29,562	$46.79	$27.19
Materials Revenues	($0.00)	29,562	($0.00)	($0.00)
Net Waste Reduction Costs	$1,383,182	29,562	$46.79	$27.19

Notes: Figures may not total due to rounding. Recycling tonnage figure differs from figure in table on page 158 as figure above includes MRF rejects. All costs reflect contract payments or salaries for city employees. Fringe benefits and overhead not included for city expenditures.

[1]Contract costs with BFI.

[2]BFI charges Worcester for bulky waste based on a menu of disposal fees for different classes of materials. BFI made over 17,000 collections in 1996. City records show 693 tons of this material was recycled (all of which was metal) but do not contain disposal tonnages. ILSR estimated disposal tons assuming the 693 tons of materials recovered account for 35% of this waste stream, therefore 65% of the BFI collected items would have been disposed. Costs for the collection and disposal were then pro-rated on a per ton basis for recycling and disposal.

[3]80% of one administrator's salary estimated at $40,000 and depreciation costs for recycling bins.

[4]80% of total recycling/composting education budget of $10,000.

[5]27% FTE with average Sanitation Division salary of $28,653.

[6]20% of one administrator's salary estimated at $40,000 and depreciation costs for equipment used in the yard trimmings management program.

[7]20% of total recycling/composting education budget of $10,000.

TOTAL SOLID WASTE MANAGEMENT COSTS (1996)

	Cost	Tons	Cost/Ton	Cost/HH/YR
Disposal Gross Costs	$2,449,221	25,513	$96.00	$48.15
Trash Collection[1]	$793,122	24,142	$32.85	
Trash Bag Purchase	$382,166	24,142	$15.83	
Large Item Collection and Disposal[2]	$86,055	1,298	$66.30	
Incinerator Tip Fees[3]	$740,244	24,142	$30.66	
Tire Disposal	$11,004	73	$150.74	
Ash Disposal	$76,587	NA	NA	
Administration/Overhead/Depreciation[4]	$360,043	25,513	$14.11	
Education/Publicity	$0.00	25,513	$0.00	
Waste Reduction Gross Costs	$1,383,182	29,562	$46.79	$27.19
SWM Gross Costs	$3,832,403	55,075	$69.59	$75.34
Materials Revenues	($0.00)	29,562	($0.00)	($0.00)
Total SWM Net Costs	$3,832,403	55,075	$69.59	$75.34

Note: Figures may not total due to rounding. All costs reflect contract payments or salaries for city employees. Fringe benefits and overhead not included for city expenditures.

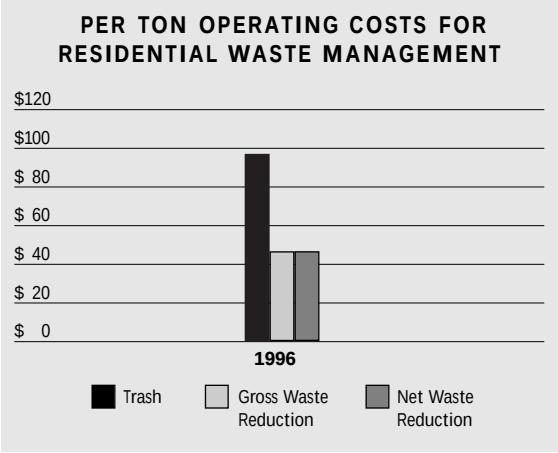
[1]Eleven two-person city crews collect trash five days of the week. Each household is served once a week. Costs reflect collector salaries, vehicle fuel, and vehicle repair costs only.

[2]See note 2 in above table for explanation of tonnage and cost estimate.

[3]The city delivers trash to the Wheelabrator incinerator in Millbury, approximately two miles from Worcester.

[4]Salaries for two FTE administrators at $40,000 each and depreciation costs for trash trucks.

Source: Institute for Local Self-Reliance, 1999.



Source: Institute for Local Self-Reliance, 1999.

Trash collection crew size has changed from three-person to two-person crews. The number of trash routes per day decreased from 11 to nine, effective November 1997. Since recycling began, trash crews service the same number of houses but do so with one-third less labor costs. SWM employees dropped from 58 in 1993 to 46 in 1996. City composting and trash program employees earn average hourly wages of $13.

Funding & Accounting Systems

Worcester's general fund and trash bag sales support solid waste management activities. The general fund fully funds the solid waste management program at the beginning of each fiscal year. Bag revenues are returned to the general fund. The price of trash bags has been set so sales cover approximately half of the total SWM budget.[2] If sales revenues drop below this level, the city plans to adjust the price accordingly.

Expenses within the DPW are tracked using modified accrual accounting.

Future Plans and Obstacles to Increasing Diversion

Worcester is home to many colleges and has a large transient student population. Many students are not familiar with the city's waste management program. Getting students to actively and properly recycle has proved a challenge for the city. The city distributes brochures about the waste management programs to each college in mid-August.

Worcester is considering the addition of more materials to its recycling program, particularly textiles, and added recycling drop-off sites in October 1997.

Tips for Replication

Implement a pay-as-you-throw trash system.

Collect as wide a variety of materials as possible.

Make program participation as convenient as possible.

Never add a material to the recycling program and then take it away, especially if the trash system is pay-as-you-throw. Residents don't like being told they have to pay for the disposal of something that had been free.

Notes:

[1]Some schools and municipal buildings are also in the program. These facilities must pay for and use the city trash bags the same as residential customers.

[2]The DPW had planned for the sale of trash bags to cover the total SWM budget but the City Council, due to local political conditions, lowered the price so that the bag fees only cover half of SWM costs.

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APPENDIX A: DENSITY FACTORS

Not all communities track actual scale weight data for materials collected in their waste management programs. Below is a list of conversion factors used by ILSR or the communities to estimate material weights from other available information.

Trash

1 cubic yard = 500 pounds (Ann Arbor, until September 1995, after which actual weight data available)

1 cubic yard = 1000 pounds (Crockett, ILSR used this figure from the U.S. EPA document *Measuring Recycling: A Guide for State and Local Governments*. Crockett uses its own conversion factor of 1 cubic yard = 640 pounds. ILSR used the EPA figure because it was more conservative.)

1 cubic yard = 750 pounds (Loveland, based on truck compaction rate)

Mixed yard debris

1 cubic yard = 500 pounds (Ann Arbor, until September 1995, after which actual weight data available)

Loveland and Worcester both weigh representative loads of yard debris and calculate weight by multiplying by the number of loads. ILSR did not obtain the source data used in making these calculations.

Grass clippings

1 cubic yard = 1111 pounds (Chatham)

1 cubic yard = 600 pounds (Fitchburg)

Brush

1 cubic yard = 250 pounds (Chatham)

Leaves

1 cubic yard = 700 pounds (Chatham)

1 cubic yard = 400 pounds (Clifton, loose leaves)

1 cubic yard = 700 pounds (Clifton, vacuumed leaves)

1 cubic yard = 1,000 pounds (Clifton, compacted leaves)

1 cubic yard = 200 pounds (Crockett)

1 truck load = 626 pounds (Falls Church)

1 cubic yard = 300 pounds (Fitchburg)

1 cubic yard = 300 pounds (Portland, EPA figure)

Mulch or wood chips

1 cubic yard = 625 pounds (Fitchburg)

1 hour of grinder throughput = 65 tons (Loveland)

Lead-acid batteries

1 battery = 39.4 pounds (Loveland, EPA figure)

White goods

Worcester: White goods estimated using state conversion for volume to weight.

APPENDIX B: COST DETAIL

Details on cost categories included in the cost calculations for each community are presented below. Bergen County and Ramsey County costs were not calculated therefore those counties are not included here. Recycling program costs for Saint Paul, located in Ramsey County, are included.

Ann Arbor, MI

Recycling: Contractor performs collection. City incurs costs for administration, education, and contract oversight only. Total administration and education costs for the Solid Waste Department were allocated to each function based on percentage of budget share. These costs include staff costs for the relevant staff and ancillary staff including salaries and wages, leave, insurance, and retirement benefits, and taxes. Office supplies costs are included but not utility, building insurance, or building costs for the office space occupied by city staff. Furthermore, city personnel, legal, payroll, and billing department functions relating to the Solid Waste Department are carried by other departments and not included here. Costs for city administration staff, such as the mayor and city council, are also not included.

Ann Arbor owns a MRF and recycling trucks which are leased to contractors. We assume the lease payments cover the capital costs of these investments and include neither these capital costs nor the lease payment revenues in our cost calculations.

Composting: City crews perform collection and processing. The city incurs costs for staff collecting and processing yard debris, vehicles and equipment used in these processes, administration, education, and overhead. Total administration and education costs for the Solid Waste Department were allocated to each function based on percentage of budget share. Staff costs include costs for salaries and wages, leave, insurance, and retirement benefits, and taxes for composting collection and processing crews, administrative and educational staff, and ancillary staff, such as dispatchers, clerical support, and customer service staff. Vehicle and equipment costs include vehicle maintenance labor and materials, vehicle fuel, insurance, and annualized capital costs (calculated by the city). Office supplies costs are included but not utility, building insurance, or building costs for the office space occupied by city staff. Furthermore, city personnel, legal, payroll, and billing department functions relating to the Solid Waste Department are carried by other departments and not included here. Costs for city administration staff, such as the mayor and city council, are also not included.

Trash: City crews perform collection. The city incurs costs for staff collecting and processing trash, vehicles and equipment used in these processes, administration, education, and overhead. Total administration and education costs for the Solid Waste Department were allocated to each function based on percentage of budget share. Staff costs include costs for salaries and wages, leave, insurance, and retirement benefits, and taxes for collection crews, administrative and educational staff, and ancillary staff, such as dispatchers, clerical support, and customer service staff. Vehicle and equipment costs include vehicle maintenance labor and materials, vehicle fuel, insurance, and annualized capital costs (calculated by the city). Office supplies costs are included but not utility, building insurance, or building costs for the office space occupied by city staff. Furthermore, city personnel, legal, payroll, and billing department functions relating to the Solid Waste Department are carried by other departments and not included here. Costs for city administration staff, such as the mayor and city council, are also not included.

Bellevue, WA

Recycling: Contractor performs collection. City incurs costs for administration, education, and contract oversight only. City staff costs were apportioned based on the amount of time staff spent on each job function. Staff costs include salaries and wages, leave, insurance, and retirement benefits, and taxes for program personnel and clerical support. Vehicles used by recycling program staff are rented. Office expenses included in the presented figures are utilities and rent for office space and office

supplies. The city is self-insured; therefore, the Solid Waste Administration does not incur insurance costs. The Solid Waste Administration is charged based on usage for services provided by the motor pool, information systems management, graphics, copy center, and word processing departments but does not pay directly for services provided by the legal, personnel, or finance departments or for services of the city administration such as the mayor or council.

Collection and processing costs reported in the tables on page 57 reflect costs of providing services as reported by the city's contractor.

Composting: Same as recycling.

Trash: Same as recycling.

Chatham, NJ

Recycling: Contractor provides collection services. Borough staff incur costs for administration, education, and overhead only. Borough staff estimated costs for administering the program and a limited education program at $500 for 1996 although the borough does not directly track these costs. This figure includes staff salaries only for time spent by the Town Administrator and his secretary. Benefits, overhead, and time spent by other borough personnel are not included in this figure. ILSR estimated depreciation costs of borough-owned equipment used in the drop-off program.

Composting: Department of Public Works staff collected fall leaves at a cost of $95,000 in 1996. This cost includes labor only. Truck and equipment insurance and operating and maintenance costs are paid out of the general fund. Furthermore, the trucks and equipment are used for other functions during the remainder of the year. The borough does not track these expenditures by function. Costs for the borough drop-off facility for yard debris represents staff labor only. The borough pays contractors to turn its leaf windrows and to process its brush. Borough staff estimated costs for administering the program and its education program at $3,000 for 1996 although the borough does not directly track these costs. This figure includes staff salaries only for time spent by the Town Administrator and his secretary and for production of educational materials. Benefits, overhead, and time spent by other borough personnel are not included in this figure. ILSR calculated annualized costs for capital equipment used in the curbside leaf collection program and equipment used at the borough drop-off facility.

Trash: Contractor provides collection services. Borough staff incur costs for administration, education, and overhead only. Borough staff estimated costs for administering the program at $1,500 for 1996 although the borough does not directly track these costs. This figure includes staff salaries only for time spent by the Town Administrator and his secretary. Benefits, overhead, and time spent by other borough personnel are not included in this figure. Borough staff estimated education costs for the trash program at $2,500 in 1996. This figure included costs of educational materials and staff salaries only for time spent by the Town Administrator and his secretary. Benefits, overhead, and time spent by other borough personnel are not included in this figure.

Clifton, NJ

Recycling: Department of Public Works crews perform collection. Collection costs include salaries for curbside collection crews and staff at the drop-off facility (including payroll taxes and overtime), expenses for vehicle parts and repairs, and office and other supplies. Costs related to the recycling program for staff benefits; ancillary staff; vehicle fuel and other fluids; vehicle insurance; facility utilities, insurance, and capital costs; and other city departments such as personnel, legal, payroll, and the mayor and council are not included. ILSR estimated annualized costs for capital equipment used in the collection program. The recycling coordinator estimated the annual cost of producing and distributing educational materials to be $45,000. This cost was divided among the recycling and composting programs according to budget share of each program. Administration costs represent one-third of the recycling coordinator's and a clerical staff member's annual salaries (including payroll taxes) only.

Composting: Private contractors collect some materials; city crews collect other materials. Collection costs presented include contract costs and labor for the city brush and leaf collection crews. Grass clippings processing costs represent

payments to Nature's Choice for transport and processing of collected materials. Processing costs for leaves and brush represent labor costs for city crews. ILSR estimated annualized costs for capital equipment used in the program. The recycling coordinator estimated the annual cost of producing and distributing educational materials to be $45,000. This cost was divided among the recycling and composting programs according to budget share of each program. Administration costs represent one-third of the recycling coordinator's and a clerical staff member's annual salaries (including payroll taxes) only. Costs related to the program for staff benefits; office supplies, ancillary staff; vehicle and other equipment maintenance, fuel and other fluids, and insurance; facility utilities, insurance, and capital costs; and other city departments such as personnel, legal, payroll, and the mayor and council are not included.

Trash: A contractor collects trash. Collection costs represent payment to the contractor. Administration costs represent one-third of the recycling coordinator's and a clerical staff member's annual salaries (including payroll taxes) only. Costs related to the program for staff benefits; office supplies, ancillary staff; facility utilities, insurance, and capital costs; and other city departments such as personnel, legal, payroll, and the mayor and council are not included.

Crockett TX

Recycling: City crews collect and process materials at a city-operated MRF. Reported costs include regular and overtime salaries (including payroll taxes) for crews and ancillary staff; employee life insurance and retirement benefits; uniforms; workers' compensation insurance; vehicle and equipment insurance, repairs and maintenance, and inputs such as gas, grease, and oil; office supplies; facility rental payments for the recycling center; building maintenance and repair and utilities; legal department services; and payment for city building space used by the recycling program staff. Costs for other city departments are not included. The annualized cost of capital for trucks is represented in truck lease/purchase payments. ILSR calculated annualized cost of capital for other equipment used in the program.

Composting: City crews collect and process materials at a city-operated facility. Reported costs include regular and overtime salaries (including payroll taxes) for crews and ancillary staff; employee life insurance and retirement benefits; uniforms; workers' compensation insurance; vehicle and equipment insurance, repairs and maintenance, and inputs such as gas, grease, and oil; office supplies; facility rental payments for the recycling center (where compost is processed); building maintenance and repair and utilities; legal department services; and payment for city building space used by the program staff. Costs for other city departments are not included. The annualized cost of capital for trucks is represented in truck lease/purchase payments. ILSR calculated annualized cost of capital for other equipment used in the program.

Trash: City crews collect and transport trash to the landfill for disposal. Reported costs include regular and overtime salaries (including payroll taxes) for crews and ancillary staff; employee life insurance and retirement benefits; uniforms; workers' compensation insurance; vehicle insurance, repairs and maintenance, and inputs such as gas, grease, and oil; office supplies; building maintenance and repair and utilities; legal department services; and payment for city building space used by the program staff. Costs for other city departments are not included. The annualized cost of capital for trucks is represented in truck lease/purchase payments.

Dover, NH

Recycling: A contractor collects and processes recyclables. Reported costs include contract fees, equipment rental costs, and city expenditures for administration and publicity. Administrative costs include staff salaries and benefits, including insurance benefits, retirement, uniforms, and payroll taxes for program staff and clerical support. Also included are office supplies, educational materials design and production, permit fees, vehicle and equipment maintenance and insurance (the recycling program staff use vehicles from the city motor pool and pay for the usage and a share of insurance and city garage costs), public liability insurance, and office telephone charges. ILSR calculated depreciation costs for recycling bins purchased by the city and distributed to residents.

Reported costs do not include office space rental or purchase costs, utilities other than telephone, overhead costs above the Recycling and Waste Management Division including payroll, personnel, legal, or billing departments, or costs for the city mayor and council.

Composting: A contractor services the drop-off facility and collects and processes yard debris. Reported costs include contract fees, leaf bag costs, and city expenditures for administration and publicity. Administrative costs include staff salaries and benefits, including insurance benefits, retirement, uniforms, and payroll taxes for program staff and clerical support. Also included are office supplies, educational materials design and production, permit fees, vehicle and equipment maintenance and insurance (the program staff use vehicles from the city motor pool and pay for the usage and a share of insurance and city garage costs), public liability insurance, and office telephone charges. ILSR calculated depreciation costs for roll-off containers purchased by the city and used for the collection of yard debris. Reported costs do not include office space rental or purchase costs, utilities other than telephone, overhead costs above the Recycling and Waste Management Division (which administers the yard debris management program) including payroll, personnel, legal, or billing departments, or costs for the city mayor and council.

Trash: A contractor collects and disposes residential trash. Reported costs include contract fees, trash bag costs, and city expenditures for administration and publicity. Administrative costs include staff salaries and benefits, including insurance benefits, retirement, uniforms, and payroll taxes for program staff and clerical support. Also included are office supplies, educational materials design and production, public liability insurance, and office telephone charges. Reported costs do not include office space rental or purchase costs, utilities other than telephone, overhead costs above the Recycling and Waste Management Division (which administers the trash management program) including payroll, personnel, legal, or billing departments, or costs for the city mayor and council.

Falls Church, VA

Recycling: One contractor collects curbside recyclables and another services the recycling drop-off facility. Presented costs reflect contract fees, salary and fringe benefits for the time the recycling coordinator spent on the program, educational materials production, outreach efforts, office supplies, and telephone charges. Other utilities and office rental or capital expenditures and insurance costs are not included. Costs borne by other city departments such as the personnel. legal, payroll, and billing departments and the city mayor and council are not included. ILSR calculated depreciation costs for recycling bins purchased by the city and distributed to residents.

Composting: City crews collect yard debris, delivering all materials except leaves to processors. A tub-grinding service processes leaves for the city and then city crews deliver material to residents free of charge. Reported costs include salaries, benefits, and uniforms for city crews; the salary and benefits for the portion of the recycling coordinator's time spent on administrative and educational tasks for the composting program; tip fees; contract fees; vehicle charges paid to the city motor pool (which include fluids, repair and maintenance, insurance, and depreciation costs), and office supplies. Utilities, office rental or capital expenditures, and insurance costs are not included. Costs borne by other city departments such as the personnel. legal, payroll, and billing departments and the city mayor and council are not included.

Trash: City crews collect and transport trash to a transfer station. A contractor hauls material from the transfer station to the disposal facility. Reported costs include salaries, benefits, and uniforms for city crews; tip fees; contract fees; vehicle charges paid to the city motor pool (which include fluids, repair and maintenance, insurance, and depreciation costs), and office supplies. Utilities and office rental or capital expenditures and insurance costs are not included. Costs borne by other city departments such as the personnel. legal, payroll, and billing departments and the city mayor and council are not included.

Fitchburg, WI

Recycling: A contractor collects materials at curbside and delivers them to a processor. ILSR calculated depreciation costs for recycling bins purchased by the city and distributed to residents for free at the beginning of the curbside program. City costs represent costs for operating the recycling drop-off facility and for program planning, administration, and education. These costs include staff salaries and benefits (retirement; health, life, dental, and disability insurances; and payroll taxes), hourly charges for vehicle use (these charges include depreciation costs, insurance, maintenance and repair materials and labor, fuel, oil, and other fluids), office supplies, and production of educational materials. Utilities, insurance, and building costs for use of city offices and land are not included in the presented figures. Overhead above the department level, such as costs for the city personnel, legal, payroll, and billing departments and for the mayor and city council are not included.

Composting: A contractor collects soft yard debris materials at curbside and delivers them to a processor. City costs represent costs for operating the drop-off facility, collecting and processing brush at curbside, and for program planning, administration, and education. These costs include staff salaries and benefits (retirement; health, life, dental, and disability insurances; and payroll taxes), hourly charges for equipment and vehicle use (these charges include depreciation costs, insurance, maintenance and repair materials and labor, fuel, oil, and other fluids), office supplies, and production of educational materials. Utilities, insurance, and building costs for use of city offices and land are not included in the presented figures. Overhead above the department level, such as costs for the city personnel, legal, payroll, and billing departments and for the mayor and city council are not included.

Trash: Trash costs presented are payments to contractors only. Administration, education, and planning costs are included in the recycling and composting costs.

Leverett, MA

Recycling: City costs reflect wages paid to the recycling coordinator and a transfer station attendant. The transfer station attendant's wages were divided based on percentage of time spent on recycling. Both positions do not include benefits but costs do include payroll taxes. Hauling costs reflect contract payments. Large item recycling costs include wages for transfer station staff based on percentage of time spent on this task, contract payments for hauling, and costs to the Highway Department for assistance. The Highway Department costs include hourly charges for use of a bucket loader and staff wages. The hourly rate for the bucket loader is an average based on equipment depreciation, fuel and other inputs, and repair and maintenance costs. Administration/Overhead/Depreciation costs include ILSR-estimated depreciation costs for Recycle/Transfer Station equipment, a portion of the recycling coordinator's wages, and overhead costs of $4.40 per ton. The overhead costs include site utilities, site maintenance costs (for snow plowing, etc.), and costs for clerical support of Recycle/Transfer Station staff (estimated at $600 per year for both recycling and trash).

Composting: NA

Trash: City costs reflect wages paid to two transfer station attendants based on the percent of time they spend on trash program related functions. These positions do not include benefits but costs do include payroll taxes. Trash hauling costs reflect contract payments. Tip fees and tire disposal fees reflect payments to the disposal facilities. Administration/Overhead/Depreciation costs include ILSR-estimated depreciation costs for Recycle/Transfer Station equipment, cost of trash stickers sold to residents, and overhead costs of $4.40 per ton. The overhead costs include site utilities, site maintenance costs (for snow plowing, etc.), and costs for clerical support of Recycle/Transfer Station staff (estimated at $600 per year for both recycling and trash).

Loveland, CO

Recycling: City costs include recyclables collection and transfer and program oversight, education, and planning. Presented costs include staff costs (leave, insurance, and retirement benefits; payroll taxes; uniform allowances; and replacement and ancillary staff costs); vehicle and equipment debt service; vehicle and equipment insurance,

maintenance labor and materials, and fuel, oil, and other fluids. Also included are payments made by the Solid Waste Utility to other city departments for services rendered for information systems management, telephone, insurance, the budget department, finance and accounting, billing, legal services, human resources, and facilities maintenance. The Solid Waste Utility also pays a share of city expenses for collection agency fees and bad debt. The Solid Waste Utility does not make any payment to the city for rent of office space but it does transfer 3% of revenue (~$50,000 in 1996) to the city's general fund as a payment in lieu of taxes. The Solid Waste Utility makes no payment for the city mayor and council expenses.

Composting: City costs include yard trimmings collection and transfer and program oversight, education, and planning. Presented costs include the same categories as listed for the recycling program.

Trash: City costs include trash collection, transfer, and disposal, and program oversight, education, and planning. Presented costs include the same categories as listed for the recycling program.

Madison WI

Recycling: City Department of Public Works employees collect materials at curbside. Reported costs include costs for labor and benefits, workers' compensation insurance, office supplies, education and advertising programs, uniforms, facility repair and maintenance, and use of vehicles and equipment. Labor costs include costs for line workers, administrative staff, and ancillary staff. The use of vehicles and equipment is paid through a charge levied by the city's motor Equipment Division and includes vehicle depreciation, labor and materials for maintenance, and fuel, oil, and other fluids. Costs for office space, utilities, and services provided to the DPW by other city departments are not included.

Composting: City Department of Public Works employees collect materials at curbside, service a drop-off facility, and haul some materials to processors. Reported costs include the same information as for recycling.

Trash: City Department of Public Works employees collect trash at curbside, operate a transfer station, and haul materials to disposal sites. Reported costs include the same information as for recycling, with the exceptions that trash costs include no education or publicity costs and transfer station debt is included.

Portland, OR

Recycling: Reported costs represent fees paid by customers. City expenditures are represented by franchise fees paid to the city by its franchisees, not by actual expenditures.

Composting: Reported costs represent fees paid by customers. City expenditures are represented by franchise fees paid to the city by its franchisees, not by actual expenditures

Trash: Reported costs represent fees paid by customers. City expenditures are represented by franchise fees paid to the city by its franchisees, not by actual expenditures

Saint Paul, MN:

Recycling: Reported costs reflect data from the Saint Paul Neighborhood Energy Consortium and are for the provision of recycling services to most residents of the city of Saint Paul. The Saint Paul Neighborhood Energy Consortium is a private, nonprofit enterprise and costs are assumed to represent its full cost of providing services. City costs for administration, education, and depreciation of recycling bins are not included.

Composting: Not applicable.

Trash: Not applicable.

San Jose, CA:

Recycling: Contractors collect and process recyclables. The city's Integrated Waste Management (IWM) program division incurs two main types of costs: program and general fund. Program costs include contract payments, administration costs, and utility billing services costs. Administration costs include staff salaries and benefits (including payroll taxes, leave, and insurance). General fund payments included payments made to the General Fund to pay directly for services of other city departments and a lump sum payment for indirect overhead. Direct general fund payments are made for services provided by the General Services Department (for purchasing services and office rent and utilities), the Streets and Traffic Division for debris hauling, the Information Technology Department, and the City

Manager's Office. The lump sum payment represents the IWM program's share of costs for other city departments, such as the legal, human resources, and payroll departments. Total administrative costs for the IWM Program were allocated among the residential, commercial, and city buildings programs according to the number of staff working in each program. The costs were further divided for the residential waste management program according to the tonnage of materials handled by recycling, composting, and trash programs.

Composting: Same as recycling.

Trash: Same as recycling.

Seattle, WA:

Recycling: Seattle Public Utilities maintains an enterprise fund for solid waste management expenses. Contractors perform most waste management tasks. Recycling costs represent payments to contractors for collection and processing of residential recyclables and education, publicity, and administrative costs. Seattle Public Utilities staff calculated per ton costs for customer service, education, planning, inspectors, and contract administration staff (including benefits) to be $2.90 in a 1995 study. General and administrative costs, depreciation, and taxes were allocated to the recycling program based on a percentage of the total Solid Waste Utility budget spent on these services. The general and administrative costs include rent, utilities, supplies, departmental overhead, information technology, and overhead for other city government departments including the mayor and council.

Composting: Composting costs represent payments to contractors for collection and processing of yard debris, city costs for transfer of yard debris at the city-owned transfer stations, the costs for hauling yard debris to processing facilities, administration and overhead costs, and the cost of education and outreach programs. Cost calculations for handling material at the transfer stations represent O&M costs only (including staff salaries and benefits and equipment costs for operation and maintenance). City staff calculated these costs to be $6.19 per ton. Hauling costs include labor costs (for staff, benefits, and supervisory and administrative staff), and fuel and maintenance costs for equipment. City staff estimate these costs to be $11.42 per ton. In a 1995 study, Seattle Public Utilities staff calculated per ton costs for the composting program customer service, education, planning, inspectors, and contract administration staff (including benefits) to be $7.00. General and administrative costs, depreciation, and taxes were allocated to the composting program based on a percentage of the total Solid Waste Utility budget spent on these services. The general and administrative costs include rent, utilities, supplies, departmental overhead, information technology, and overhead for other city government departments including the mayor and council.

Trash: Trash costs represent payments to contractors for collection of trash, city costs for transfer of trash at the city-owned transfer stations, costs for hauling trash to the railhead, tip fees paid at the railhead for hauling to and disposal at the landfill, and administration and overhead costs, and costs for education and outreach programs. Collection costs and rail hauling and disposal costs represent actual payments to contractors for these services. Cost calculations for handling material at the transfer stations represent O&M costs only (including staff salaries and benefits and equipment costs for operation and maintenance). City staff calculated these costs to be $6.93 per ton. Hauling costs include labor costs (for staff, benefits, and supervisory and administrative staff), and fuel and maintenance costs for equipment. City staff estimate these costs to be $3.29 per ton. In a 1995 study, Seattle Public Utilities staff calculated per ton costs for the trash program customer service, education, planning, inspectors, and contract administration staff (including benefits) to be $4.40. General and administrative costs, depreciation, and taxes were allocated to the trash program based on a percentage of the total Solid Waste Utility budget spent on these services. The general and administrative costs include rent, utilities, supplies, departmental overhead, information technology, and overhead for other city government departments including the mayor and council.

Visalia, CA:

Recycling: City crews collect recyclables, yard debris, and trash. The city does not track collection and program administration costs for each material separately. The Solid Waste Division incurs three main types of costs: collection costs, payments for services, and administration costs. Collection costs include salaries, benefits, uniforms, professional memberships, licenses, and training for collection crew staff. Also included are Division expenses for office supplies and postage. Visalia divided total collection costs by tons of total materials collected to obtain an average per ton collection cost for all materials. Payments for services represent tip fees paid by the city for processing of recyclables and yard debris and landfill disposal of trash. Administration costs include vehicle and equipment costs including depreciation, fuel, oil and other fluids, insurance, and repair; labor and benefits for Solid Waste Division administrative and clerical staff; Division telephone service charges; legal services; payments to other city departments for services provided to the Solid Waste Division; a building occupancy charge; and an in-lieu payment to the city's general fund. The Solid Waste Division transfers funds to the Purchasing, Utility Billing, Personnel, Public Works, and Street Departments for services provided to the Solid Waste Division. The building occupancy charge covers costs for rent, electricity, and taxes on city facilities occupied by the Solid Waste Division. The Solid Waste Division makes an in-lieu payment to the city general fund to cover costs for vehicle license fees and fuel taxes. Visalia allocated total administration costs among the recycling, composting, and trash programs based on the proportion of the budget spent on each waste stream.

Composting: Same as recycling.

Trash: Same as recycling.

Worcester, WA:

Recycling: The city pays a contractor to collect recyclables. The city also incurs costs for administration and oversight and education. These costs are represented by salaries of city staff based on the portion of time the staff spend on recycling and a portion (80%) of the education budget for all solid waste management programs. ILSR estimated and included costs for depreciation of recycling bins purchased by the city and distributed to residents. No other costs are included.

Composting: City Department of Public Works employees collect and process yard trimmings. Collection and processing costs represent collectors' salaries, vehicle fuel, and vehicle repair costs only. Administration costs are represented by salaries of city staff based on the portion of time the staff spend on composting. Education costs are 20% of the total city education budget for solid waste programs. ILSR estimated and included depreciation costs for equipment used for collecting and processing yard debris. No other costs are included.

Trash: City Department of Public Works employees collect and haul trash. Costs represent workers' salaries, vehicle fuel, and vehicle repair costs only. Administration costs are represented by salaries of city staff based on the portion of time the staff spend on composting. ILSR estimated and included depreciation costs for equipment used for collecting and hauling trash. No other costs are included.