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Unit Pricing of Residential Municipal Solid Waste: Lessons from Nine Case Study Communities

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1.0 OVERVIEW

United States' households generate a substantial amount of solid waste each year. The enormous volumes of waste generated provide challenges for municipalities in terms of collection and disposal of the waste. In communities across the country, policy-makers are considering methods to promote waste reduction and diversion. Unit pricing of residential solid waste, or pay-as-you-throw programs,[1] represents one innovative approach to encourage significant waste reduction and diversion. Instead of paying a monthly or annual flat fee, a household must pay per unit of waste generated under a unit pricing program. Today, more than 1,500 communities employ some variation of unit pricing.

This report provides an overview of case studies of nine municipalities that have implemented unit pricing for residential waste collection. This overview analyzes the various characteristics of the nine unit pricing programs, assesses program outcomes, and compares the results with findings from an in-depth literature review.[2] The nine communities are: Downers Grove, Illinois; Glendale, California; Grand Rapids, Michigan; Hoffman Estates, Illinois; Lansing, Michigan; Pasadena, California; San Jose, California; Santa Monica, California; and Woodstock, Illinois. The detailed case studies for the nine communities are appended to this report.

2.0 METHOD

To explore the performance of unit pricing, the authors compiled a list of unit pricing communities across the United States based on references in the literature or referred to in conversations with various solid waste officials and experts. The project staff then selected nine cities for in-depth case studies based on several criteria including: geographical diversity; size and characteristics of the communities; system design diversity; availability of data; and helpfulness of solid waste staff. Project staff selected three Illinois and two Michigan communities because EPA personnel sponsoring the project expressed a particular interest in the Midwest. EPA personnel also expressed interest in West Coast (but not Seattle) cities -- hence the four California case studies. These clusters of cities allow for both intra- and inter-regional comparisons of the

[1] Unit pricing, unit-based pricing, pay-as-you-throw and variable rate pricing are all used interchangeably in this document.

[2] Please refer to Miranda, Marie Lynn; Scott D. Bauer; and Joseph E. Aldy. Unit Pricing Programs for Residential Solid Waste: An Assessment of the Literature. School of the Environment, Duke University, 1995 for a review of the significant written material on unit pricing.

performance of unit pricing.

The project staff made site visits to each of the nine case study cities. During the visits, project staff met with officials in each city's solid waste department. These officials provided more in-depth information about materials collection and disposal in their cities, described the history of their collection programs, provided waste stream and cost revenue data, discussed their education and enforcement efforts, and explained any problems with their systems. Project staff also spoke with representatives of some of the private hauling firms operating in the nine cities to obtain similar information. To ascertain the degree of undesirable diversion, the staff spoke with street maintenance personnel, commercial haulers, charitable organizations, a few downtown property management companies, some randomly selected multi-unit complex managers, and some randomly selected small business owners in each city. Project staff followed up site visits with telephone conversations to obtain any additional necessary information.

3.0 THE CASE STUDY COMMUNITIES

The nine case study communities are located in the states of California, Illinois and Michigan. Of the four California communities, three lay in Los Angeles County in southern California and the fourth lays on San Francisco Bay. The three Illinois communities comprise part of the Chicago suburbs. The two Michigan communities lay in the lower peninsula and are major urban areas in the state. Table 3-1 provides a brief description of each community.

Table 3-1. Case Study Communities' Descriptions

Community	**Description**
Downers Grove, IL	Downers Grove is located southwest of Chicago and hosts the corporate headquarters of several large firms. A larger percentage of high school graduates live in the village than in any other case study community.
Glendale, CA	Glendale lays approximately eight miles northeast of Los Angeles in the foothills of the Verdugo Mountains.
Grand Rapids, MI	Grand Rapids is the seat of Kent County and is located on the Grand River 25 miles east of Lake Michigan. The city has the lowest per capita income of the nine case study communities.
Hoffman Estates, IL	Hoffman Estates is located about 30 miles northwest of Chicago in Cook County. The village's median household income is larger than the median incomes of the other eight case study communities.
Lansing, MI	Lansing, the capital of Michigan, is located at the junction of the Red Cedar, Sycamore, and Grand Rivers in Ingham County. The city has the lowest median household income of the nine case study communities.
Pasadena, CA	Pasadena sits in the foothills of the San Gabriel Mountains approximately ten miles from Los Angeles.
San Jose, CA	San Jose lies in the Santa Clara Valley seven miles south of San Francisco Bay. The city supports more than triple the population of the next largest community in the study.
Santa Monica, CA	Santa Monica rests on Santa Monica Bay approximately fifteen miles from the center of Los Angeles proper. The city's population density is nearly twice that of the next most densely populated community in this study. In addition, a higher percentage of Santa Monica residents hold bachelor degrees than in any other case study community.
Woodstock, IL	Woodstock is located 65 miles northwest of Chicago in McHenry County. The village's formerly rural character has changed in recent years in response to Chicago's suburban sprawl. The village supports the smallest population and the smallest population density of the nine case study communities.

The following table provides a summary of the communities' demographic characteristics.

Table 3-2. Case Study Communities' Characteristics[3]

Community	Adopted Unit Pricing Program	Population	Population Density (individuals per square mile)	Rural/ Urban/ Suburban	Median Household Income	Median Housing Value
Downers Grove, IL	1990	47,883	3,521	suburban	$48,266	$143,900
Glendale, CA	1992	177,671	5,806	suburban	$34,372	$341,700
Grand Rapids, MI	1972	189,126	4,317	urban	$26,809	$57,600
Hoffman Estates, IL	1992	47,266	2,528	suburban	$49,475	$133,800
Lansing, MI	1975	127,321	3,738	urban	$26,398	$48,100
Pasadena, CA	1992	132,605	5,765	suburban	$35,103	$281,500
San Jose, CA	1993	782,225	4,678	urban	$46,206	$257,500
Santa Monica, CA	1992	87,064	10,490	suburban	$35,997	$500,001
Woodstock, IL	1988	14,353	291	rural	$31,458	$99,777

4.0 PROGRAM FEATURES

4.1 ADOPTING THE SYSTEM

The nine case study communities implemented their unit pricing waste collection programs to encourage waste diversion and decrease the amount of waste landfilled and incinerated. The communities' rationales for adopting unit pricing are similar to reasons provided in the unit pricing literature (Miranda et. al. 1995, p. 6). The suburban Chicago communities of Downers Grove, Hoffman Estates, and Woodstock adopted unit pricing programs in reaction to the expected closing of two of the area's landfills. Officials in all three villages anticipate higher

[3] All demographic data are based on the 1990 Census, except for population density, which is derived from U.S. Bureau of the Census. County and City Data Book: 1994. Washington, DC: G.P.O., 1994.

tipping fees once these landfills close.

The Michigan cities of Grand Rapids and Lansing adopted unit pricing programs in the 1970's. Recently, these cities significantly increased their per unit fees and began providing curbside recycling and yard waste collection. Both cities adjusted their fees with the goals of reducing landfilled and incinerated waste and encouraging waste diversion.

The California cities of Glendale, Pasadena, San Jose, and Santa Monica implemented unit pricing programs in response to the California Integrated Waste Management Act of 1989 (Assembly Bill 939). This act set statewide waste diversion goals, and required all municipalities to divert 25% of their garbage from landfills by 1995, and 50% by 2000. The measure defined diversion as source reduction, recycling, and composting. According to Assembly Bill 939's authors, shifting from disposable to reusable products, decreased packaging, and increased efficiency in the use of materials in the manufacturing process all constitute source reduction. Some of the reasons listed in the bill for raising waste diversion levels include energy conservation, decreased collection and disposal costs, and increased public awareness of the cost of waste disposal. The bill recommended public education and financial incentives as means to achieve increased waste diversion. Assembly Bill 939 required every community to develop a Source Reduction and Recycling Element, a plan outlining how a community expects to decrease landfilled waste and increase waste diversion.

4.2 CONTAINERS

In these nine communities, the city or the contracted private hauler establishes the refuse container and the unit pricing fee. In five communities, residents purchase bags or stickers, where one bag or one sticker reflects the unit price for refuse collection. Of those five, three communities require residents to purchase special refuse bags available at municipal government offices and local convenience and grocery stores. Two communities require residents to affix refuse stickers to ordinary 30-gallon bags. The unit pricing literature indicates that special waste bags require low investment costs and ensure uniformity of refuse containers. Despite these advantages, residents may overstuff bags and dogs or rodents may tear through these bags. Refuse stickers also require low investment costs, but they may be affixed to bags of different sizes and they may fall off. The bag and sticker approaches alleviate the need for a household billing system, but require a distribution system (Miranda et. al. 1995, p. 6).

Alternatively, the four California communities require residents to subscribe to a specific volume cart. These communities employ a billing system for cart subscriptions. All four cities decided to implement automated collection systems prior to their decision to implement unit pricing systems. Officials in these communities indicate that automated collection saves their communities money through increased collection efficiency, decreased labor costs, and decreased worker liability. The existing cart subscription systems serve as the foundation for the unit pricing systems in these communities. In San Jose and Santa Monica, if a household generates waste in

excess of the volume of its cart, then it may purchase a special refuse sticker and affix it to an ordinary 32-gallon bag or purchase a special refuse bag. The unit pricing literature indicates that carts require a significant capital investment and a more complicated billing system than systems based on bags and stickers (Miranda et. al. 1995, p. 6).

The split between the containers used by the Midwestern case study communities and the containers used in the California case study communities illustrates the national tendencies in residential solid waste management. In the East and Midwest, most unit pricing communities employ bag-based or sticker-based systems. West Coast communities usually prefer to employ subscription can/cart systems. Since many of these Western communities have already implemented automated collection systems, a unit pricing program premised on subscription cans is a logical outcome.

4.3 FEE STRUCTURE

All nine case study communities employ pure variable fee structures. The literature indicates that pure variable systems send stronger price signals to households than do multi-tier systems (Miranda et. al. 1995, p. 7). The unit pricing fee per gallon of waste collected ranges from $0.02 in Glendale to $0.10 in San Jose. The five communities requiring residents to use special refuse bags or refuse stickers have established unit pricing fees between $0.85 per 30 gallons in Grand Rapids to $1.56 per 30 gallons in Woodstock in 1994. The four communities operating a subscription program have established a schedule of fees based on cart volume (refer to table 4-1.A and table 4-1.B).

Table 4-1.A. California Communities' Fee Structures

Community	**Minimum Cart Volume**	**Fee/ Month**	**Fee/ Gallon/ Week**	**Maximum Cart Volume**	**Fee/ Month**	**Fee/ Gallon/ Week**
Glendale, CA	65 gallons	$6.45	$0.02	100 gallons	$10.10	$0.02
Pasadena, CA	60 gallons	$10.41	$0.04	200 gallons	$28.62	$0.03
San Jose, CA	32 gallons	$13.95	$0.10	128 gallons	$55.80	$0.10
Santa Monica, CA	40 gallons	$14.85	$0.09	163 gallons	$37.28	$0.05

Table 4-1.B. Midwestern Communities' Fee Structures

Community	Container Volume	Fee/Container	Fee/Gallon
Downers Grove, IL	30 gallons	$1.50	$0.05
Grand Rapids, MI	30 gallons	$0.85	$0.03
Hoffman Estates, IL	30 gallons	$1.45	$0.05
Lansing, MI	30 gallons	$1.50	$0.05
Woodstock, IL	30 gallons	$1.56	$0.05

4.4 BASIS OF FEES

All nine communities operate unit pricing programs premised on solid waste volume, not weight. Since these communities operate volume-based programs, their variable fees reflect an average cost pricing approach.

4.5 PRIVATELY VERSUS PUBLICLY RUN

The communities varied with respect to the local government's direct involvement in the collection of residential solid waste. Four communities contract out waste collection to private haulers. Three communities operate under a closed system where the city government collects all residential solid waste. Two communities, Grand Rapids and Lansing, run an open system where residents may choose between the city and licensed private waste haulers for their collection service. Grand Rapids serves approximately two-thirds of its single-family dwellings and Lansing serves approximately one-half of its single-family dwellings. While Grand Rapids and Lansing compete with private haulers for residential collection services, the municipalities employ a closed system for recyclables and yard waste. Table 4-2 summarizes the hauler types for the communities' collection programs.

Table 4-2. Publicly Versus Privately Run Collection Programs

Community	Waste Collection	Recycling Collection	Yard Waste Collection
Downers Grove, IL	private	private	private
Glendale, CA	public	public	public
Grand Rapids, MI	open	private	private
Hoffman Estates, IL	private	private	private
Lansing, MI	open	public	public
Pasadena, CA	public	private	public
San Jose, CA	private	private	private
Santa Monica, CA	public	public	not applicable
Woodstock, IL	private	private	private

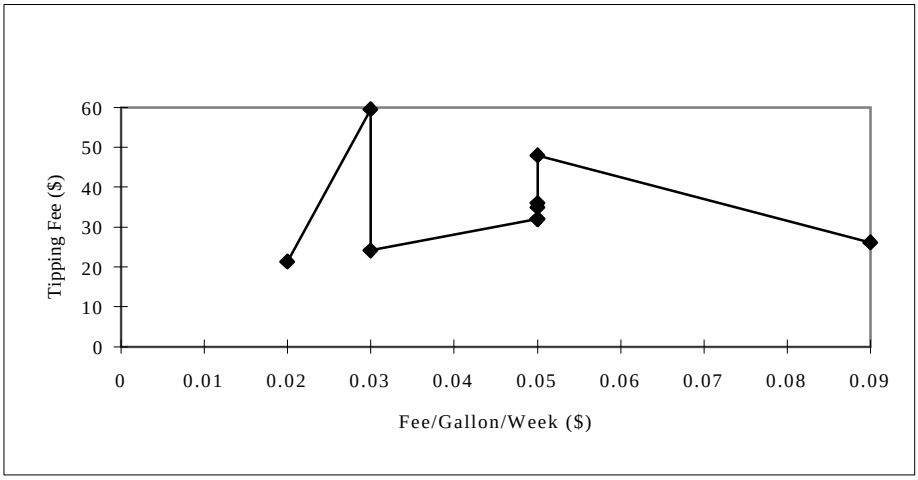
4.6 DISPOSAL

Eight of the nine communities dispose their waste in landfills, while Grand Rapids disposes its waste at a local incinerator (a post-RCRA waste-to-energy facility). These eight communities send their waste to eight landfills (Glendale and Pasadena use the same landfill, and Downers Grove and Hoffman Estates use a common landfill as well), four of which post-date the 1976 Resource Conservation and Recovery Act (RCRA). The tipping fees charged to the communities range from $21.35 to $59.51 (see table 4-3). As shown in figure 4-1, a higher tipping fee for a community does not indicate that the community charges a higher unit pricing fee. This may imply that diversion and source reduction goals and hauling and labor costs are more significant in setting unit prices than are tipping fees for these communities.

Table 4-3. Communities' Unit Pricing Fees and Disposal Tipping Fees

Community	Fee/Gallon/Week	Tipping Fee per Ton
Downers Grove, IL	$0.05	$32.00
Glendale, CA	$0.02	$21.35
Grand Rapids, MI	$0.03	$59.51
Hoffman Estates, IL	$0.05	$32.00
Lansing, MI	$0.05	$36.00
Pasadena, CA	$0.03 to $0.04	$24.11
San Jose, CA	$0.09 to $0.10	$26.11
Santa Monica, CA	$0.05 to $0.09	$48.00
Woodstock, IL	$0.05	$35.00

Figure 4-1. Comparison of Unit Pricing Fees and Disposal Tipping Fees



4.7 COMPLEMENTARY PROGRAMS

To encourage residents to set out less waste each week, the nine case study communities employ several complementary programs, which is common for communities using unit pricing (Miranda et. al. 1995, p. 10). Residents in these communities may divert their wastes through

curbside and drop-off recycling, curbside yard waste collection, and backyard composting programs. In addition, the case study communities run periodic special collection programs. The nine case study communities take widely varying approaches toward public education.

4.7.1 Recycling

All nine communities operate curbside recycling programs. One community mandates household participation, six automatically provide recycling containers but do not mandate participation, and the other two provide recycling containers and service upon request. While Lansing and Grand Rapids only collect refuse for approximately one-half and two-thirds of the single-family dwellings within their city limits, respectively, they do provide recycling to all single-family dwellings. Table 4-4 illustrates the materials each community collects for recycling. Table 4-6 indicates when the communities implemented their recycling programs.

Most of the case study communities recover their costs for recycling collection through the unit pricing fee for solid waste collection and through the sale of recyclable materials to regional vendors. Seven communities do not charge for recycling collection. To the extent that the unit pricing fee for solid waste collection must compensate for any shortfall in the recycling collection program, the unit pricing fee may be set at an inefficient level. In this situation, the community charges too much for solid waste collection (the unit fee is set too high) while charging too little for recycling collection (the unit fee is set at zero). This encourages households to divert waste from refuse collection to recycling, and could affect source reduction. Recycling collection free of charge could negatively impact household source reduction behavior.

Two cities assess special recycling fees. In Grand Rapids, households requesting recycling collection must pay $1.75 per month for the weekly service. In Lansing, every household is assessed a solid waste collection fee of $55 as a part of their property taxes. Of this fee, the city diverts $25 to the recycling program. In addition, households in Downers Grove and Hoffman Estates that generate recyclables in excess of the volume of their recycling bin, must purchase additional bins from their respective village governments.

Table 4-4. Case Study Communities' Recycling Programs

Community	Service	Fee	Materials Collected
Downers Grove, IL	automatically provided	none	newspaper, mixed paper, plastic (coded 1, 2, 3, 4, 5, 6, 7), glass (brown, clear, green), metal cans (aluminum, steel, tin), aluminum foil, polystyrene foam products
Glendale, CA	upon request	none	newspaper, mixed paper, plastic (coded 1, 2), glass (brown, clear, green), metal cans (aluminum, tin), cardboard, telephone books
Grand Rapids, MI	upon request	$1.75 per month	newspaper, magazines, catalogs, plastic (coded 1, 2), glass (brown, clear, green), metal cans (aluminum, steel, tin), household batteries
Hoffman Estates, IL	automatically provided	none	newspaper, mixed paper, plastic (coded 1, 2, 3, 4), glass (brown, clear, green), metal cans (aluminum, steel, tin), cardboard
Lansing, MI	automatically provided	$25 per year	newspaper, magazines, catalogs, plastic (coded 2), glass (brown, clear, green), metal cans (aluminum, steel)
Pasadena, CA	automatically provided	none	newspaper, plastic (coded 1, 2), glass (brown, clear, green), metal cans (aluminum, steel, tin), motor oil
San Jose, CA	automatically provided	none	newspaper, mixed paper, plastic (coded 1), glass (brown, clear, green), metal cans (aluminum, tin), cardboard, motor oil
Santa Monica, CA	automatically provided	none	newspaper, mixed paper, plastic (coded 1, 2, 3, 4, 5), glass (brown, clear, green), metal cans (aluminum, steel, tin)
Woodstock, IL	mandatory	none	newspaper, paper goods, plastic (coded 1, 2, 3, 4), glass (brown, clear, green), metal cans (aluminum, steel, tin)

4.7.2 Yard Waste Collection

Eight of the nine communities provide yard waste collection to the households they serve. Santa Monica does not provide yard waste collection. City officials indicate that a yard waste

collection program would not be cost-effective given the significant amount of high density housing in Santa Monica (refer to table 3-2). Lansing and Grand Rapids provide yard waste collection to all city residents, although they only collect refuse from those who subscribe to their services. Refer to table 4-5 for a review of the case study communities' yard waste collection programs. Table 4-6 indicates when the communities implemented their yard waste collection programs.

Table 4-5. Yard Waste Programs

Community	**Collection Dates**	**Fee**	**Container**
Downers Grove, IL	seasonal	$1.50 per sticker	33-gallon container or a bundle weighing less than 60 pounds
Glendale, CA	year-round	none	any container or a bundle
Grand Rapids, MI	seasonal	$0.75 per bag	special yard waste bag or a bundle
Hoffman Estates, IL	seasonal	same as unit price fee for refuse	30-gallon Kraft biodegradable bag or a bundle
Lansing, MI	seasonal	$18 per year	30-gallon bag or a bundle
Pasadena, CA	year-round	$5 per month	100-gallon can
San Jose, CA	year-round	none	residents pile yard waste on curb
Santa Monica, CA	not applicable	not applicable	not applicable
Woodstock, IL	seasonal	$1.15 per sticker	Kraft paper bags, bundles or open 30-gallon cans

4.7.3 Backyard Composting

Four communities provide residents with the opportunity to purchase backyard compost bins from the municipal government. Another four provide technical information to residents about backyard composting. Grand Rapids does not provide information or composting bins for residents. Glendale provides a limited number of free compost bins to residents who attend a composting workshop. The Lansing city government provides compost bins at a $10 discount to city residents. Santa Monica residents may also purchase compost bins from the city government. Woodstock began a backyard composting pilot program with 100 households. Refer to table 4-6

for a review of the communities that provide compost bins and those that provide only composting information.

Table 4-6. Communities' Complementary Programs

Community	Adopted Curbside Recycling	Adopted Yard Waste Collection	Backyard Compost Program
Downers Grove, IL	1990	1990	information only
Glendale, CA	1988	1992	information and some discounted bins
Grand Rapids, MI	1994	1995	none
Hoffman Estates, IL	1990	1990	information only
Lansing, MI	1991	1992	information and discounted bins
Pasadena, CA	1990	1993	information only
San Jose, CA	1987	1989	information only
Santa Monica, CA	1981	not applicable	information and bins
Woodstock, IL	1987	1994	information and bins

4.7.4 Special Collections

In addition to refuse, recycling and yard waste collections, these communities offer an array of special collections (refer to table 4-7). Eight communities collect holiday greenery and Christmas trees free of charge. These collections usually occur over a two-week period in early January. Santa Monica provides residents with the opportunity to drop-off Christmas trees at one of four sites in the city. Each Santa Monica resident receives a tree seedling in return for dropping off a Christmas tree.

All nine communities collect white goods. In Downers Grove, residents may set out one appliance per week, with a city waste sticker attached. Residents must inform the hauler prior to the collection day that they will set out an appliance. In Grand Rapids, residents may set out small appliances with attached city refuse tags. The city will only collect major appliances if residents attach a $10 appliance sticker to each appliance they set out. In Hoffman Estates, residents must pay $25 for each collected appliance. In Lansing, residents must attach $20 bulk collection stickers to appliances and furniture set out for pick up. Pasadena collects white goods

free of charge during the Annual Neighborhood Clean-Up. In San Jose, residents may schedule a special collection for appliances and furniture. This service costs residents $18 for up to three items. In Woodstock, residents may arrange for the Salvation Army to collect appliances in working order free of charge.

Hoffman Estates and Woodstock integrate collection of reusable household goods by the Salvation Army into their waste management systems. In Hoffman Estates, residents may place reusable goods in specially marked bags for once a month collections. Large goods donated to the Salvation Army require a scheduled appointment. In Woodstock, residents may donate old clothes to several charitable organizations through the McHenry County Spring Clean-Up. Residents may participate in all of these programs free of charge.

Eight communities provide residents with opportunities to dispose of bulk waste. Downers Grove allows residents to arrange for special pick-ups of large quantities at a cost of $7.50 per cubic yard of material. Grand Rapids collects tires, furniture and bundled boards provided that residents attach a city waste sticker to each item. Pasadena provides residents with the option of renting a 3-cubic yard bin for a one time collection. As mentioned in the discussion of white goods, Lansing and San Jose offer collection of furniture for a fee.

Table 4-7. Communities' Special Collections Programs

Community	**Holiday Greenery**	**White Goods**	**Charitable Donations**	**Special Bulk Waste**
Downers Grove, IL	yes	yes	no	yes
Glendale, CA	yes	yes	no	yes
Grand Rapids, MI	yes	yes	no	yes
Hoffman Estates, IL	yes	yes	yes	yes
Lansing, MI	yes	yes	no	yes
Pasadena, CA	yes	yes	no	yes
San Jose, CA	yes	yes	no	yes
Santa Monica, CA	yes (drop-off)	yes	no	yes
Woodstock, IL	yes	yes (charity)	yes	no

4.7.5 Education

To encourage participation in their waste management systems, the nine case study

communities have developed a variety of educational programs (refer to table 4-8). Eight communities implemented special public education programs in coordination with the start-up of their unit pricing programs. In Downers Grove, the village purchased advertisements in the local newspaper and mailed informational brochures to all residents. Hoffman Estates mailed information to residents, and the recycling coordinator presented the new unit pricing program at public meetings. San Jose spent $1.5 million on its start-up education program. Through this program, the city mailed information to every residential household and ran television, radio, and newspaper public service announcements. City officials also attended neighborhood meetings to explain the new system to residents. Grand Rapids and Lansing conducted mass mailings prior to the implementation of their curbside recycling and yard waste collection programs. Woodstock advertised its new program through pamphlets provided to residents, press releases, and a newsletter.

In addition to the start-up programs, these municipalities continue to operate educational outreach programs. All nine communities provide informational brochures to residents upon request. These brochures cover such topics as: the unit pricing system, source reduction, curbside recycling, yard waste collection, backyard composting, grasscycling, leaf shredders and mulching mowers, Christmas tree collection, annual spring clean-ups, household hazardous waste, paint disposal, and xeriscaping. In seven communities, city officials attend neighborhood group meetings and schools or conduct public workshops. Municipal officials in Downers Grove, Lansing, and Woodstock attend neighborhood meetings and schools. Glendale, San Jose, and Santa Monica provide workshops on waste management, recycling, and backyard composting. In Hoffman Estates, the private hauler provides informational briefings on recycling to school and civic groups at its materials recovery facility.

These communities also provide an array of miscellaneous education programs. Downers Grove residents receive the Recycling Yellow Pages, published by DuPage County, twice a year. This recycling newsletter describes various waste diversion and waste reduction options for households. Pasadena provides residents with waste reduction checklists and uses product displays to encourage waste reduction. In San Jose, the San Jose University's Center for Development of Recycling acts as a clearinghouse of information on source reduction and recycling. The Center's activities include: public service announcements, hotlines for source reduction campaigns, displays at local conventions and fairs, and directories of recyclers and reuse opportunities. Santa Monica produced a video entitled "Untrashing Santa Monica" for Santa Monica City-TV. This video explains the city's solid waste management system and the concept of source reduction. Woodstock residents receive the quarterly newsletter, Solid Waste Matters, published by McHenry County. This newsletter informs residents of the county's Total Solid Waste Management Plan.

Table 4-8. Communities' Education Programs

Community	Start-Up Program	Radio/TV/ Newspaper	Informational Brochures	Information Programs
Downers Grove, IL	yes	yes	yes	yes
Glendale, CA	no	no	yes	yes
Grand Rapids, MI	yes	yes	yes	no
Hoffman Estates, IL	yes	no	yes	yes
Lansing, MI	yes	yes	yes	yes
Pasadena, CA	yes	no	yes	no
San Jose, CA	yes	yes	yes	yes
Santa Monica, CA	yes	yes	yes	yes
Woodstock, IL	yes	no	yes	yes

4.8 ADMINISTRATION

The extent of a community's administration varies with the type of container employed and the type of hauler used. All four California communities have implemented a cart-subscription waste management system. These communities must operate a billing system for residential cart service. In the other five case study communities, where residents purchase bags or stickers at local government offices, grocery stores and convenience stores, the nature of the container eliminates the need for a billing system but requires a distribution system. The unit pricing literature indicates that a distribution system is less expensive, especially for a sticker-based system (Miranda et. al. 1995, p. 6). The annual waste management budgets for two bag-based systems (Grand Rapids and Lansing) confirm that a distribution system is less expensive per capita than a billing system (such as in San Jose).

The three Illinois case study communities contract with private haulers. Through their contracts, the waste haulers maintain the responsibility for responding to residents' questions and complaints. The villages then do not need to operate customer service offices. A fourth case study community, San Jose, also contracts with private haulers. In contrast to the Illinois communities, San Jose maintains responsibility for providing a customer service office.

4.9 ENFORCEMENT

The case study communities have implemented and enforced various rules and ordinances to ensure residential compliance with their waste management systems. In these communities, waste collection personnel do not pick up overstuffed bags or carts with lids ajar. Personnel do not collect waste in improper bags or bags lacking the appropriate waste sticker. Further, some communities do not collect bags where refuse and yard waste are commingled. Communities do not collect contaminated recyclables.

In these communities, if collection personnel decide not to collect waste, yard waste, or recyclables for any of the above reasons, they leave behind a notice indicating the resident's violation. Repeated violations may result in fines for residents.

These communities also attempt to prevent dumping of household waste into commercial dumpsters and littering. The unit pricing literature indicates that strict enforcement of illegal dumping, littering and anti-burning ordinances may ensure greater success for a unit pricing system (Miranda et. al. 1995, p. 20). Some commercial haulers provide locks for their customers' dumpsters. One form of undesirable diversion, burning of waste, is illegal in most of the case study communities. In Woodstock, however, the city discourages burning through informational brochures, but it has not implemented an ordinance banning burning.

5.0 PROGRAM OUTCOMES

The nine communities experienced varying degrees of success with respect to the most important program outcomes.

5.1 WASTE LANDFILLED/INCINERATED

Lansing, Hoffman Estates, Glendale, Woodstock, Downers Grove, Grand Rapids, and San Jose experienced significant decreases in landfilled and incinerated waste (refer to table 5-1 below). These six communities decreased their landfilled and incinerated waste by at least 20% after implementing unit pricing. Grand Rapids' waste incinerated decreased 14% between 1990 and 1994; but its per household waste incinerated decreased 22% as the number of service subscribers increased from 35,000 in 1987 to 40,000 in 1994. Lansing and Hoffman Estates achieved quite substantial landfilled waste reductions of 50.0% and 37.6%, respectively. The decreases in landfilled waste are consistent with the findings of the unit pricing literature, especially for those case study communities with established recycling, yard waste collection, and education programs (Miranda et. al. 1995, p. 13). On the other hand, two of the southern California communities, Pasadena and Santa Monica experienced only minimal reductions in landfilled waste. Neither community achieved more than a 6% decrease in landfilled waste.

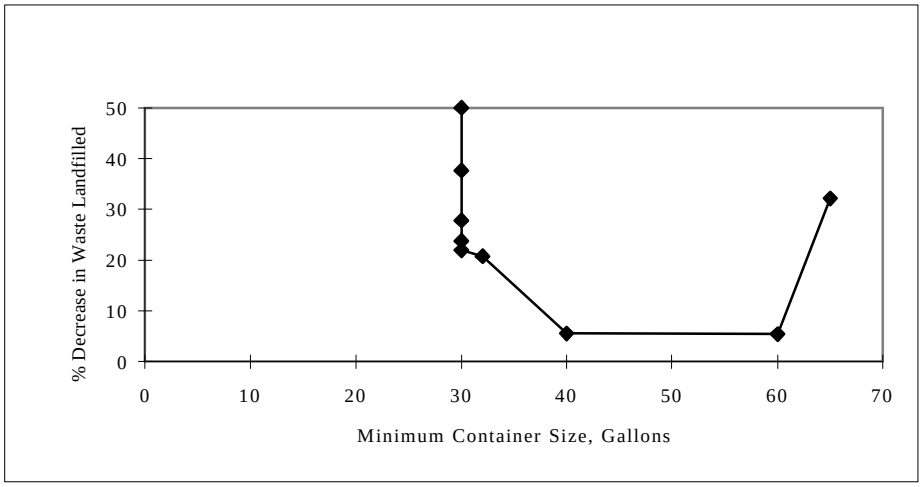
Table 5-1. Communities' Residential Landfilled Waste Since 1990 (tons per year)

Community	1990	1991	1992	1993	1994
Downers Grove, IL	not available	10,400	10,051	7,931	not available
Glendale, CA	54,190	not available	34,834	36,360	36,801
Grand Rapids, MI*	53,000	not available	not available	45,000	45,700
Hoffman Estates, IL	not available	15,101	10,924	9,418	not available
Lansing, MI	not available	16,000	10,000	7,600	8,000
Pasadena, CA	50,748	48,706	54,197	53,234	not available
San Jose, CA	not available	not available	not available	250,000	197,900
Santa Monica, CA	not available	66,960	64,368	63,240	not available
Woodstock, IL	12,604	10,874	9,886	10,710	not available

* FY 1993 data for Grand Rapids are based on an extrapolation of 6 months of data.

The case study communities achieving more significant landfilled waste reductions share several program characteristics. The communities employing relatively smaller minimum sized containers reduced their landfilled waste more effectively. The Illinois communities, the Michigan communities and San Jose employ smaller containers than the southern California case study communities. The southern California communities provide minimum cart volumes so large that residents may not experience any real incentive to reduce and divert waste. The smaller minimum size containers better reflect a continuous price signal for waste disposal than do the larger minimum size containers. Southern California residents may subscribe to the smallest container available and not need to modify their waste generation and disposal behavior. While San Jose provides an economic incentive by charging $13.95 per month for a 32-gallon container, Pasadena does not provide such an incentive by only charging $10.41 per month for a 60-gallon container. Figure 5-1 illustrates the relationship between minimum container size and landfilled waste reductions. With the exception of Glendale, the smaller the minimum container volume for a community's unit pricing program, the greater the decrease in landfilled and incinerated waste. Table 5-4 illustrates how the unit pricing case study communities compare with the national average for waste landfilled and incinerated.

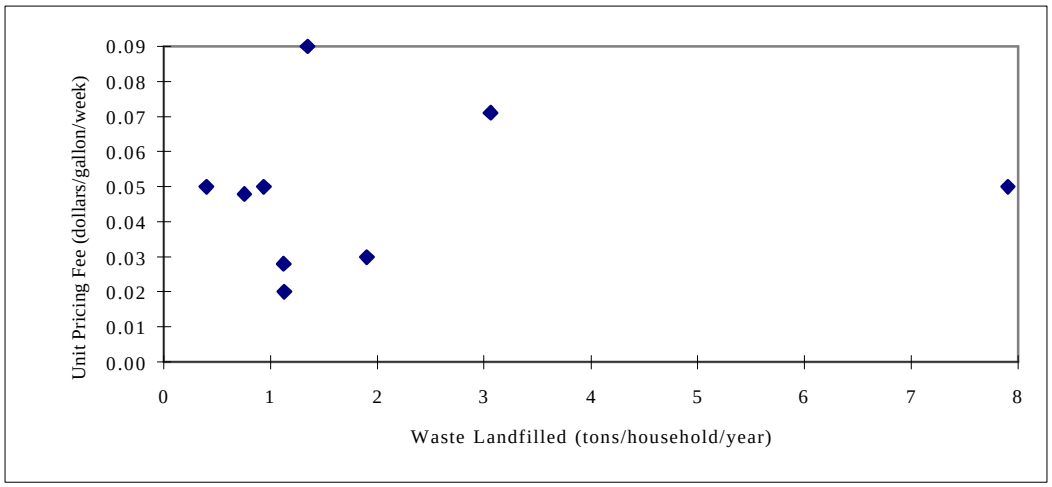
Figure 5-1. Comparison of Minimum Container Volume and Reduced Landfilled Waste



Glendale achieved significant reductions in its landfilled waste, attributable in large part to the high participation rate in its yard waste collection program. By providing yard waste collection free of charge, Glendale provides an incentive for waste diversion. In contrast to Glendale, Santa Monica does not offer a yard waste collection program and Pasadena offers yard waste collection for a fee.

Higher unit fees affect the reductions in landfilled waste, contingent on the minimum container size. Communities with higher unit fees experience lower annual per household waste landfilled and incinerated (refer to figure 5-2). Pasadena, with a low unit pricing fee, experienced small reductions in landfilled waste. A community with a much higher unit pricing fee, such as San Jose ($0.09 to $0.10 per gallon per week), experienced a significant reduction in its landfilled waste. While Santa Monica employs a relatively high unit pricing fee ($0.05 to $0.09 per gallon per week), the large minimum size container negates the effects of the economic incentives of the fee. Grand Rapids, however, charges a relatively low unit pricing fee ($0.03 per gallon per week) but still achieved a landfilled waste reduction of 22%. The small minimum size container in conjunction with the city's long history with unit pricing (since 1972) and residents' choice to participate in the program (in lieu of private service) explain how the city achieved such a reduction. Further, while the fee is small in comparison to other case study communities, the fee's substantial increases in the late 1980's and early 1990's have also influenced residential waste generation and disposal behavior.

Figure 5-2. Comparison of Unit Pricing Fee and Per Household Waste Landfilled/Incinerated, 1993



5.2 WASTE DIVERSION

All nine case study communities experienced increases in recycling and yard waste collection after implementing unit pricing programs.

5.2.1 Waste Recycled

The eight communities with available data experienced significant increases in recycling tonnages since 1990.[4] The increases in recycling confirm the findings of the unit pricing literature, which indicate that recycling participation and tonnages increase under a unit pricing system (Miranda et. al. 1995, p. 10). San Jose and Lansing experienced more than a doubling in recycling levels over a two-year period and a three-year period, respectively. The Illinois communities witnessed recycling rate increases between 41% and 64% over the past five years. Hoffman Estates, Downers Grove and Woodstock experienced the highest levels of recycling tonnages per household of the eight communities operating recycling programs in 1993 (refer to figure 5-3). Pasadena and Santa Monica experienced recycling rate increases of approximately 70% and 30% respectively. While Glendale's recycling rate increased 60% the year it implemented unit pricing, the city's recycling has fluctuated since then and was lower in 1994 than it was in 1992. All eight communities with recycling programs report strong recycling markets, which provide these communities with the necessary revenues to maintain, and in some cases, expand their recycling programs. Refer to table 5-2 for details on the communities' recycling rates. Refer to table 5-4 for a comparison of the unit pricing communities recycling rates with the

[4] Grand Rapids does not have recycling data due to the recent implementation of its recycling program.

national average.

Table 5-2. Communities' Residential Recycling Tonnages Since 1990 (tons per year)

Community	**1990**	**1991**	**1992**	**1993**	**1994**
Downers Grove, IL	0	4,147	4,726	5,941	not available
Glendale, CA	2,970	not available	4,824	5,221	4,742
Grand Rapids, MI	0	0	0	0	0
Hoffman Estates, IL	0	6,305	7,065	8,896	not available
Lansing, MI	0	0	1,600	3,500	3,400
Pasadena, CA	1,769	2,514	2,931	3,004	not available
San Jose, CA	0	0	0	30,800	75,700
Santa Monica, CA	not available	5,334	6,636	6,924	not available
Woodstock, IL	755	956	1,112	1,238	not available

Providing large minimum volume waste containers acts as a disincentive to recycle in the case study communities. In 1993, eight of the nine communities employed curbside recycling collection. As figure 5-4 illustrates, the Midwestern communities with smaller waste containers achieved higher per household recycling rates. Santa Monica is an exception, probably in large part due to long-term household experience with the curbside program (the city implemented its program in 1981).

Figure 5-3. Comparison of Unit Pricing Fee and Waste Recycled, 1993

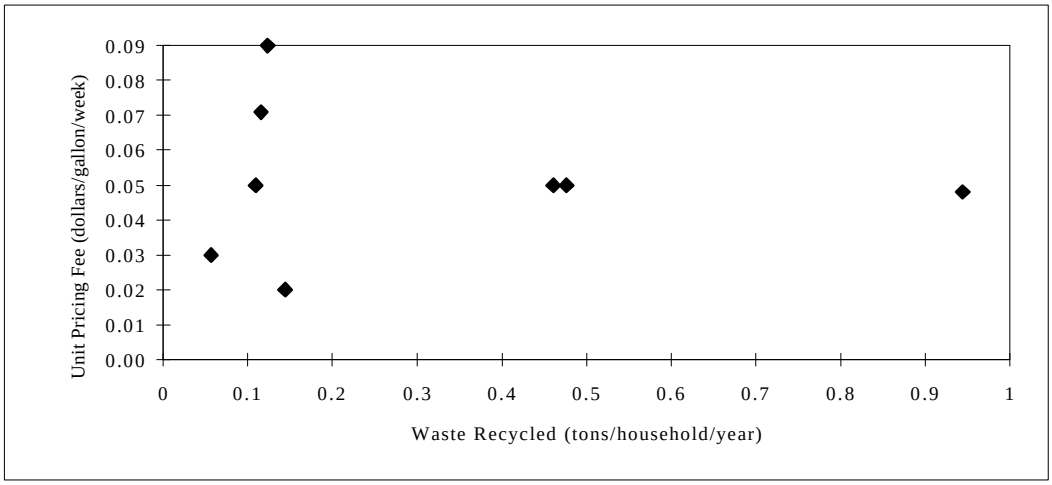
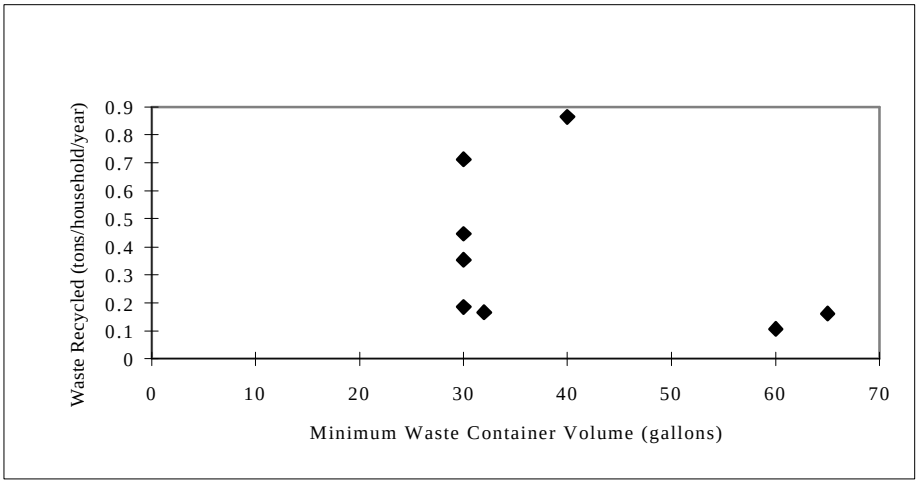


Figure 5-4. Relationship Between Per Household Recycling and Waste Minimum Container Volume, 1993



5.2.2 Yard Waste Collected

Of the six communities with yard waste collection data, the percentage increases vary considerably. From the first year of yard waste collection through the most recent year of available data, Lansing experienced a quadrupling in yard waste collected while Downers Grove experienced only a negligible increase. Both had virtually the same levels of yard waste tonnage per capita in 1993. Glendale and San Jose both have yard waste tonnage per household values

nearly double that of the community with the next highest rate. While more of the unit pricing literature focuses on the effects of unit pricing on recycling, the few studies which have addressed yard waste set-outs and composting have found a positive relationship between unit pricing and increased yard waste collections consistent with the results of some of the case study communities (Miranda et. al. 1995, p. 13). Refer to table 5-3 below for further details on the communities' yard waste collection program outcomes. See table 5-4 for a per household comparison of the communities.

It should be noted that the increases in yard waste set-outs and the absolute magnitude of annual collections can vary significantly between the California case study communities and the Midwestern case study communities because of the length of the collection period. The three California case study communities with yard waste collection programs pick up yard waste set-outs year-round. The five Midwestern case study communities operate yard waste collection programs from early Spring through mid to late Autumn.

Table 5-3. Communities' Residential Yard Waste Collection Tonnages Since 1990 (tons per year)

Community	**1990**	**1991**	**1992**	**1993**	**1994**
Downers Grove, IL	0	1,864	1,871	1,986	not available
Glendale, CA	0	0	14,634	14,914	13,695
Grand Rapids, MI	0	0	0	0	0
Hoffman Estates, IL	not available	not available	1,538	1,896	1,924
Lansing, MI	0	0	1,300	5,200	5,800
Pasadena, CA	0	0	0	6,030	not available
San Jose, CA	not available	not available	not available	66,500	96,800
Santa Monica, CA	0	0	0	0	0
Woodstock, IL	0	0	0	0	not available

Providing yard waste collection free of charge encourages higher yard waste set-outs per household than a for-fee yard waste collection program. As figure 5-5 illustrates, communities which do not charge for yard waste collection achieve higher annual per household yard waste collection. While the year-round collection in the California communities may explain some of the

additional per household set-outs, Lansing achieves greater per household collections than Downers Grove, Hoffman Estates, and Pasadena, the three case study communities charging yard waste collection fees.

By collecting yard waste free of charge, communities provide the same improper economic incentives that not charging a unit price for refuse provides. A community charging a variable fee for yard waste collection may encourage backyard composting as one diversion path from curbside collection. Households may respond to a for-fee yard waste collection program through yard waste source reduction. Opportunities for yard waste source reduction include the use of mulching lawn mowers, less frequent lawn mowing, and less frequent landscape work.

Figure 5-5. Comparison of Per Household Yard Waste Collection and Yard Waste Fee

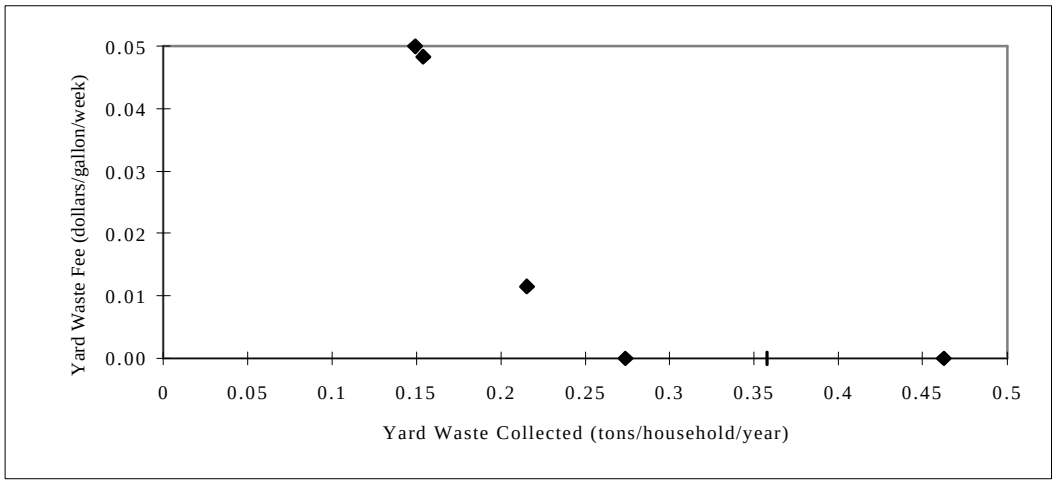


Table 5-4. Communities' Per Household Waste Generation

Community	**Per Household Landfilled/ Incinerated Waste (tons), 1993**	**Per Household Recycling (tons), 1993**	**Per Household Yard Waste Set-outs 1993, (tons)**	**Unit Price ($): Fee/ Gallon/ Week**
Downers Grove, IL	0.596	0.447	0.149	0.05
Glendale, CA	1.127	0.162	0.462	0.02
Grand Rapids, MI*	1.125	0	0	0.03
Hoffman Estates, IL	0.753	0.712	0.152	0.05
Lansing, MI	0.400	0.0921	0.274	0.05
Pasadena, CA	1.901	0.107	0.215	0.03 to 0.04
San Jose, CA	1.344	0.166	0.357	0.09 to 0.10
Santa Monica, CA	7.905	0.866	0	0.05 to 0.09
Woodstock, IL	3.060	0.35	0	0.05
National Average, 1992[5]	1.020	0.142	0.00006	not available

5.2.3 Undesirable Diversion

All of the case study communities acknowledge the existence of undesirable diversion activities. Undesirable diversion takes several forms in these communities including dumping in commercial and school dumpsters, burning of refuse, and leaving household garbage or junk at charitable organizations' drop-off locations. This array of undesirable diversion behaviors is consistent with observations of other communities in the unit pricing literature (Miranda et. al. 1995, p. 20).

The city of Grand Rapids collects 30 tons of illegally dumped waste annually, at a cost of approximately $15,000. Grand Rapids officials estimate a doubling of illegally dumped waste since 1990. Grand Rapids' significant undesirable diversion problem could be linked to its

[5] The national averages were calculated from data presented in Franklin Associates, Ltd. The Role of Recycling in Integrated Solid Waste Management to the Year 2000. Prepared for Keep America Beautiful, Inc., 1994. They represent all residential generation in the country divided by the U.S. Census estimate of the total number of households in 1992.

complementary programs. The unit pricing literature indicates that extensive complementary programs may minimize undesirable diversion (Miranda et. al. 1995, p. 21). In Grand Rapids, residents may choose to participate in the recycling program and must pay for the service monthly. Further, the city only began its yard waste program in March, 1995. The disincentive of a service charge for voluntary recycling, coupled with the relative newness of the yard waste program and limited education about the unit pricing waste collection program, provide possible explanations for the extent of undesirable diversion in Grand Rapids. The unit pricing literature confirms that the success of a unit pricing program, especially in large, urban areas, results in large part from education programs and available diversion alternatives (Miranda et. al. 1995, p. 10).

Lansing estimates that residents illegally dump approximately 300 tons annually, costing the city more than $52,000 per year. San Jose reports 170 tons of illegal dumping costing the city about $500,000 for cleanup annually. Of these 170 tons, 70% includes yard waste in quantities of one ton or greater, indicating that professional landscaping operations are responsible. The significant variance in per ton clean-up costs for illegally dumped waste in Grand Rapids, Lansing, and San Jose indicates that dollars spent on clean-up do not serve as a meaningful measure for the severity of the undesirable diversion problem.

In Grand Rapids, the Salvation Army must dispose of 25% of its donations and the Goodwill disposes of 50%. San Jose charitable organizations report significant illegal dumping. The Pasadena Salvation Army must dispose of some illegally dumped waste as well.

To minimize undesirable diversion, the case study communities employ a variety of management mechanisms. These communities enforce littering and illegal dumping ordinances by fining those residents committing violations. Several communities provide informational brochures to residents on desirable and undesirable forms of waste diversion. Commercial haulers in some communities provide locks for customers' dumpsters. Several communities provide annual or seasonal free bulk waste collections for residents to prevent the illegal dumping of furniture and appliances. The unit pricing literature identifies all of these as common measures to alleviate undesirable diversion (Miranda et. al. 1995, p. 20).

The Downers Grove Police Department reported only 23 illegal dumping and littering violations between May 1993 and May 1994, a decrease of 78% from the period of May 1990 to May 1991. In the first six months of its unit pricing program, Hoffman Estates issued 103 citations. For the period between January 1993 and November 1994, the city only issued 71 citations as residents became more accustomed to the program.

The Village of Woodstock distributed a brochure to residents on the negative effects of burning refuse in their backyards, which village officials note is the worst side-effect of the unit pricing program. Several communities provide brochures informing residents of appropriate waste disposal and diversion.

5.3 SOURCE REDUCTION

Consistent with the disagreement in the unit pricing literature, the results from the case study communities do not conclusively demonstrate source reduction behavior associated with unit pricing programs (Miranda et. al. 1995, p. 13). While every community experiences some decrease in waste landfilled, several communities experience an increase in total waste generated (refer to figure 5-6). Several other communities experience a decrease in total waste generated, and others require inferences from the data to assess the degree of source reduction.

In the case of Lansing, only one-half of those people receiving the city recyclables and yard waste collections dispose of their waste through the city unit pricing program. If those households subscribing to the city's service did not source reduce at all, then they would be responsible for at least 8,000 of the 8,700 tons of recyclable materials and yard waste set-outs in 1993. While those households subscribing to the Lansing public service likely divert more of their waste than comparable households subscribing to private haulers (due to the unit pricing incentive), it is unlikely that public service subscribers are responsible for at least 92% of the recycling and yard waste set-outs. One can reasonably infer that some source reduction occurs in Lansing, although the magnitude of the reduction can not be determined.

In Grand Rapids, increases in the unit pricing fee since 1990 have resulted in decreases in waste incinerated. Prior to 1995, the city did not offer recycling or yard waste collection. Reductions in the waste incinerated could result from source reduction, diversion activities (i.e., drop-off recycling), or undesirable diversion activities. If households had been source reducing prior to the implementation of the city's complementary collection programs, the recycling program dampened the incentive to continue to source reduce. In the first year of the recycling program, waste incinerated remained virtually unchanged, while households generated approximately 6,000 tons of recyclable materials. The total waste generated for this year jumped back up near the 1990 level. Alternatively, the increase in total waste generated associated with the recycling program could illustrate a decrease in undesirable diversion activity or a transition from residential use of drop-off centers to curbside recycling instead of changes in source reduction behavior.

In San Jose, evidence from the first two years of its unit pricing program illustrates a series of behavioral changes in household waste generation and disposal. Between fiscal year 1993 and fiscal year 1994, San Jose households significantly increased their waste diversion activities. San Jose's landfilled waste decreased by more than 20%, while residential recycling more than doubled, and yard waste set-outs increased more than 40%. The total waste generated (landfilled waste, collected recyclable materials, and yard waste collected) for San Jose actually increased during this period. It appears that the immediate response of San Jose households was to divert their waste, and not source reduce. Once gains were made in diversion, households may then have begun to source reduce, as illustrated by the projections for fiscal year 1995. Based on the first six months of fiscal year 1995, projections for the entire year indicate that recycling and yard waste set-out levels will remain virtually unchanged while landfilled waste will decrease

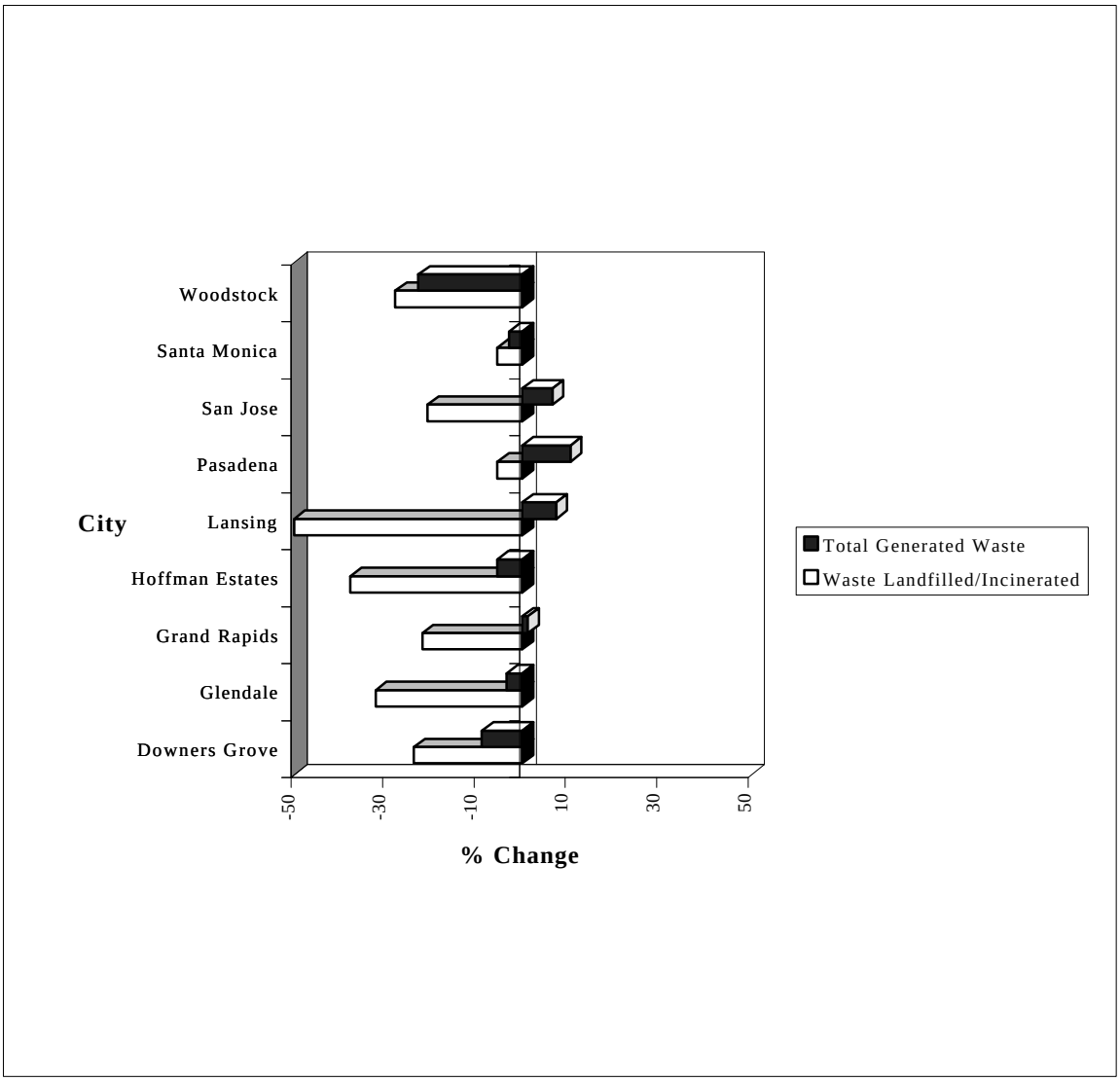
another 20%, indicating a predicted 10% decrease in total waste generated. San Jose residential waste disposal activity appears to follow a transition path which begins with waste diversion behavior and evolves into source reduction behavior after several years of the unit pricing program (Miranda et. al. 1994).

A similar pattern characterizes the waste disposal trend in Downers Grove. In the first two years of the unit pricing program, waste landfilled decreased as households diverted their waste through recycling and yard waste collections. The total generated waste remained unchanged until fiscal year 1993, the third year of the unit pricing program. In 1993, waste landfilled decreased by another 3,300 tons from the previous year while recycling and yard waste collections increased by less than half of that amount. Total generated waste decreased by approximately 10% between fiscal years 1992 and 1993.

Woodstock's reduction in waste landfilled accompanied by small increases in recycling illustrate household source reduction behavior. Between 1989 and 1993, waste landfilled fell by almost a third and total waste generated decreased by more than 20%. The waste burning problem could complicate the findings for Woodstock, since the extent of this undesirable diversion activity has not been estimated. The recent implementation of a yard waste collection program may affect household behavior by encouraging more diversionary activities in lieu of source reduction.

The unit pricing programs in Hoffman Estates, Glendale, Pasadena and Santa Monica do not appear to encourage source reduction. While Hoffman Estates experienced significant decreases in its landfilled waste, waste diversion behavior has been more evident than source reduction. Total generated waste levels in Glendale and Pasadena have only fluctuated slightly since they implemented unit pricing programs. The absence of source reduction behavior by households in these cities may result from the disincentive of a large minimum cart volume in these cities' subscription programs. In Glendale, the free yard waste collection may provide too strong of a diversion incentive for residents to bear a source reduction incentive from the unit pricing program. Total waste generation in Santa Monica decreased by about 1% in the first year after the city implemented unit pricing. Santa Monica experienced decreases in waste landfilled and increases in recycling collection in the first two years of unit pricing. The small decreases could illustrate some source reduction behavior, however, such a small change could also be attributed to measurement error or increased undesirable diversion activities. Santa Monica may follow the trends set by the San Jose and Downers Grove, where residents first diverted waste, and then after several years, began to minimize their waste generation.

Figure 5-6. Communities' Percentage Changes in Waste Landfilled/Incinerated and in Total Generated Waste



6.0 FUTURE RESEARCH

Further research in unit pricing of residential solid waste collection is necessary to better understand the effects of the economic incentives, waste diversion options, and education and enforcement efforts on household waste management decisions. The nine communities researched for this report employ widely varying residential solid waste management programs. On several important waste management issues, it is difficult to ascertain the effects of unit pricing given that many other factors varied at the same time. A better understanding of the effects of the unit fee, the minimum container size, container type, curbside recycling, yard waste collection, education, deterrence of undesirable diversion, special collections, and other components of a residential waste management program, requires researchers employing multi-variate statistical analyses of a large sample of unit pricing communities. To conduct such analyses, research must address several other issues to frame the analyses appropriately.

First, better data collection is necessary for accurate analysis of unit pricing programs. Some communities provide some waste stream measures by volume (e.g., yard waste in cubic yards or waste in bags per household) and others by weight (e.g., recyclables by pounds or tons). These various measures provide challenges for analysts attempting to compare communities' programs. More importantly, communities need to obtain a better sense of undesirable diversion in order to understand the fate of the whole waste stream, not just the legally disposed and diverted components. Further, the literature indicates that in several communities unit pricing has increased backyard composting (Miranda et. al. 1995, p. 13). If backyard composting does increase, then research methods need to be employed to incorporate this information into waste management analyses.

Organizing more complete waste stream data will facilitate the construction of typical "baseline" waste generation figures. Once analysts estimate the baseline for a community, the effects of changes in the waste management program (e.g., new complementary programs, education initiatives, changes in the unit fee, etc.) can be ascertained. Further, analysts may more easily derive estimates of source reduction from such a baseline. Sound analyses of unit pricing programs will require better and more complete data collection.

Second, the results from some of the case study communities indicate that households modify their waste behavior in two stages in response to unit pricing. In the first stage, households divert their waste through recycling and yard waste collection. Once households attain some maximum level of waste diversion, they enter the second stage, where they begin to source reduce. Research on this process on a large sample of unit pricing communities would test this hypothesis. Further research on methods to accelerate the process would also provide beneficial information for solid waste managers. For example, if more intensive education programs accelerate the transition from stage one to stage two, solid waste managers designing unit pricing programs may find it more cost-effective to fund larger start-up education campaigns and achieve source reduction sooner. The process may also be affected by the frequency and charges for recycling and yard waste collection. Charging for these programs may decrease waste

diversion (e.g., free yard waste collection in Glendale resulted in a much higher diversion rate than the for-fee yard waste collection program in Pasadena), but accelerate the transition to source reduction behavior.

Third, several case studies imply that household behavior under a unit pricing program changes when the community implements new complementary programs. Continued research on new complementary programs on a larger sample of communities may validate the perceived effects of these programs. For example, if a community adds recycling after implementing unit pricing, and total waste generation appears to increase (as in the case of Grand Rapids), does this imply that households are actually generating more, or are households shifting their recycling from drop-off centers to curbside collection? This further substantiates the need for accurate and complete data collection discussed above.

There are many unresolved questions regarding the effects and incentives of unit pricing and the various complementary residential solid waste management programs. Most of the unit pricing literature addresses these questions through anecdotal evidence, theory and case studies. The case studies presented in this report have illustrated some of these questions, and provide limited insight into some of the answers. More importantly, the case studies serve as a guide for continued research in the unit pricing arena. The next step in assessing these questions is to study a larger sample of unit pricing communities and conduct statistical analyses.

7.0 REFERENCES

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APPENDIX 1: CONVERSIONS

The case study communities provided waste stream information using several different measures. To compare the results of the nine communities, the provided data were converted to a single measure, tons. When necessary to convert cubic yards to tons, the following conversion factors were employed:

Waste/Refuse: 3.3 cubic yards per ton

Yard Waste: 3 cubic yards per ton

Recycling: 4.7 cubic yards per ton

The village of Woodstock could not provide landfilled waste data. However, the village did provide the number of bags collected per household per week since 1989. The following equation was used to convert this measure into tons of waste landfilled annually.

waste landfilled in one year = (# bags/household/week)*(3,500 households)*
(52 weeks/year)*(30 gallons/bag)*(1 cubic yard/201.97 gallons)*(1 ton/3.3 cubic yards)

APPENDIX 2: CASE STUDIES

Downers Grove, Illinois
Glendale, California
Grand Rapids, Michigan
Hoffman Estates, Illinois
Lansing, Michigan
Pasadena, California
San Jose, California
Santa Monica, California
Woodstock, Illinois

DOWNERS GROVE, ILLINOIS

DEMOGRAPHICS[1]

Jurisdiction:	Village of Downers Grove
Population:	
Population:	47,883
Population Density (individuals per square mile) :	3,521
Number of Households:	17,660
Education (percent):	
Earned High School Diploma:	90.30
Earned Bachelor's Degree:	33.50
Ethnic Breakdown (percent):	
African-American:	1.69
Asian:	4.12
Hispanic:	2.38
Native American:	0.09
Economic Characteristics:	
Mean Per Capita Income:	$20,891
Median Household Income:	$48,266
Median Housing Value:	$143,900

Brief Description:

Downers Grove is located in Dupage County in the southwest suburbs of Chicago. Spiegel, Inc., Service MASTER Industries, Magnetrol International, and Swift-Eckrich maintain their corporate headquarters in Downers Grove. Pepperidge Farm and Arrow Gear operate manufacturing facilities in the area. The Park District manages over 500 acres of park land operated by the Park District in the municipality.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

In response to increases in waste generation and speculation concerning the impending closure of local landfills, Downers Grove decided to adopt a unit pricing program to decrease the amount of waste landfilled. The municipality requires households to place refuse stickers on bags left out for collection. Stickers may be purchased at local grocery stores, hardware stores, through the hauler, or at the Village Hall. Residents pay $1.50 per sticker. Households must attach a sticker to each standard, 30-gallon waste bag set out for collection. Only single family dwellings participate in the program. The municipality awards hauler contracts through a bidding process. Downers Grove presently contracts with Browning-Ferris Industries (BFI). The city considers fluctuations in sticker sales, the costs of waste collection, and the costs of the curbside recycling program in formulating the unit price. Households may also purchase or lease 60- and 90-gallon toters. Monthly flat fees apply to households who use toters.

Large household items, such as appliances and furniture, require one refuse sticker. A household may only dispose one large household item per weekly pick-up. The household must notify the hauler in advance regarding appliances collection. BFI will arrange to recycle appliances. Automotive parts and construction waste require a refuse sticker for every part or for every bundle of construction material. Households may also arrange for special pick-ups of large quantities of waste from the hauler at a cost of $7.50 per cubic yard of material. New residents may also arrange for a one-time collection of corrugated cardboard boxes used during a move.

Unit Pricing Program Adopted: 1990

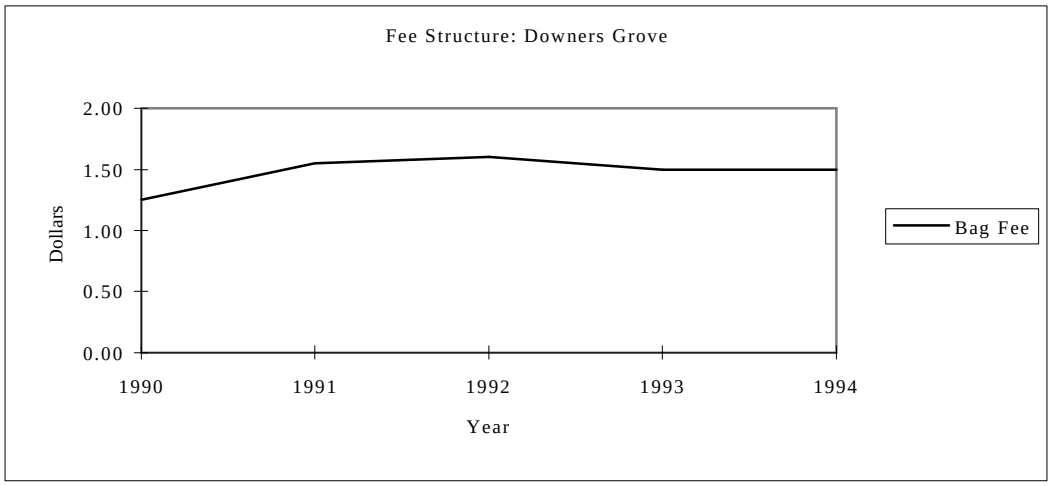
Container Type: sticker

Collection Frequency: weekly

Households Served: 13,300

Fee Structure:

Year	Fee
1990	$1.25
1991	$1.55
1992	$1.60
1993	$1.50
1994	$1.50



Disposal

Downers Grove disposes of its waste at Mallard Lake and Green Valley landfills. The tipping fees at the two landfills amount to $9.70 per cubic yard (about $32 per ton). These landfills opened in 1974 and will close in 1998, leaving Downers Grove with limited possibilities for waste disposal. In 1994, Browning-Ferris Industries hauled the waste for single-family homes in Downers Grove. The average haul distance for refuse is approximately 20 miles.

Landfill:	Mallard Lake Landfill, Green Valley Landfill, pre-RCRA
Tipping Fee:	$32 per ton
Hauler Type:	private

Recycling

Curbside recycling is included in the unit price for waste collection and therefore does not require a sticker. BFI collects recyclables weekly on the same day as refuse collection. Each single-family household receives an 18-gallon recycling bin free of charge, and may purchase up to two more bins at $4.25 each. For $6.50, a household may purchase a recycling bin with wheels and a pull cord. The bins are considered property of the Village, and residents must replace lost, stolen or damaged bins. Residents must simply place recyclables commingled in their bins for collection. If a household generates recyclables in excess of their bin capacity, they may place additional recyclables in paper or plastic grocery bags. BFI sells its processed recyclables to various vendors in the region. The Chicago area markets for recyclable materials are strong.

Curbside Program Adopted:	1991
Collection Frequency:	weekly
Hauler Type:	private
Recycled Materials:	glass (brown, clear, green) plastic (coded 1, 2, 3, 4, 5, 6, 7) metal cans (aluminum, steel, tin) aluminum foil newspaper mixed paper polystyrene foam products
Recycling Destination:	private processing facility
Drop-off Centers:	yes

Yard Waste Collection

BFI collects yard waste on the same day as refuse if residents attach the appropriate sticker. Yard waste stickers cost $1.50 and may be purchased at the same places as the refuse stickers. Despite the fact that they cost the same amount, yard waste and refuse stickers are not interchangeable. Residents may attach yard waste stickers to any 33-gallon container (biodegradable paper bag or can) that weighs less than 60 pounds when full or to a bundle of yard waste weighing less than 60 pounds. The hauler collects yard waste between April 1 and December 15 with two "no-charge" pickup days for Christmas tree collection after the holidays. The village pays $9.00 per cubic yard (about $27 per ton) to the compost facility which accepts its yard wastes. The average haul distance for yard waste is approximately 8 miles. While the city encourages backyard composting in its educational materials, residents may only compost certain organic wastes. City ordinance prohibits the composting of kitchen wastes and pet waste for fly, roach, and rodent control. Households with large quantities of yard waste should schedule a special pick-up through the hauler. Downers Grove residents may pick up wood chips free of charge at the Village's transfer station. The village and the county provide information on backyard composting.

Curbside Collection Program Adopted:	1991
Container:	sticker
Fee:	$1.50 per sticker
Collection Frequency:	weekly
Yard Waste Destination:	private compost facility
Backyard Program:	information only

Education

Prior to the implementation of the unit pricing program, the municipality advertised in the local newspaper and mailed information to residents describing the program. The Recycling Coordinator visits community meetings to keep citizens updated, as well as to educate new residents about the program. DuPage County publishes a recycling newsletter, the Recycling Yellow Pages, twice a year. This newsletter describes various waste diversion and source reduction options for households, as well as tips for better household waste management.

Administration and Enforcement

From 1991 to the present, Downers Grove budget for the waste management program runs about $80,000 per year. The first year of the program cost the village approximately $100,000 because of education efforts such as a mailing of information and local newspaper advertisements. The remainder of the budget covers the Recycling Coordinator's salary, one-half of a secretary's salary, and replacement of recycling bins. The private hauler, BFI manages the collection and disposal of the waste stream and the distribution of refuse and yard waste stickers.

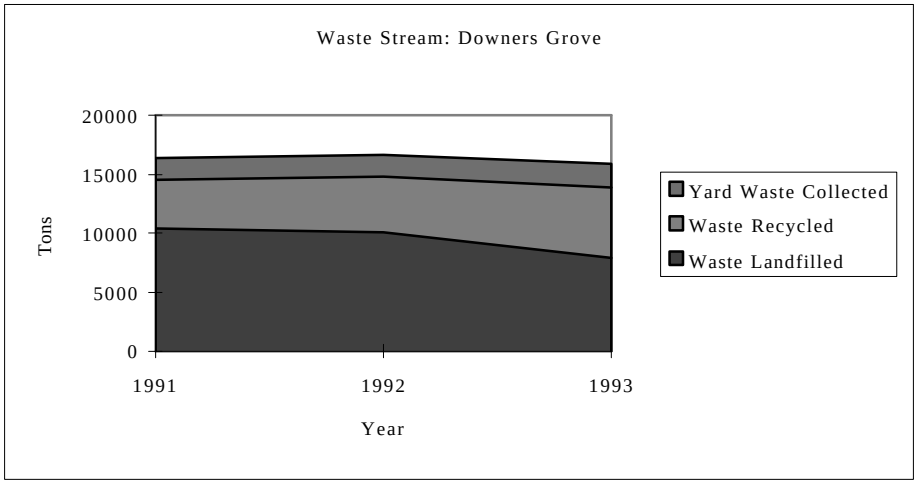
BFI does not collect any bags of refuse or yard waste without the appropriate sticker. Further, BFI does not collect any refuse and yard waste commingled bags. The hauler does not collect yard waste or refuse bags weighing in excess of 60 pounds. Further, BFI does not collect earth, rocks, concrete, construction debris, car parts and hazardous wastes except through a special pick up. The hauler does not collect contaminated recyclables as well. If the hauler does not collect refuse, yard waste or recyclables on the specified collection day, the hauler leaves a notice indicating the rationale for not collecting the waste.

The Village established a minimum fine of $100 for stealing recyclables, theft of stickers, and theft of recycling bins. The police department and the village and county health departments all respond to complaints involving illegal dumping. The first offense carries a fine of $75 and the second offense carries a fine of $200.

OUTCOMES

Waste Stream (tons)

Fiscal Year	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1991	10,400.3	4,147.2	1,864.0	16,411.5
1992	10,051.2	4,725.5	1,871.0	16,647.7
1993	7,930.9	5,940.6	1,986.3	15,857.8



Undesirable Diversion

While not significant, dumping in commercial dumpsters does exist. The Downers Grove Police Department reported 105 illegal dumping and littering violations between May 1990 and May 1991. The number of violations fell to 23 for the period between May 1993 and May 1994. Since the surrounding municipalities and villages employ unit pricing programs, Downers Grove residents probably do not carry their waste to friends and relatives outside of the village for disposal.

Total Waste Generated

Since 1991, Downers Grove has generated less landfilled waste while increasing the amount of recyclables and yard waste collected. While landfilled waste dropped more than 23% between 1991 and 1993, recycling and yard waste jumped 43% and 6%, respectively. The total tonnage of waste generated over this period decreased, indicating that Downers Grove residents actively source reduce or participate in undesirable diversion activities. The undesirable diversion evidence supports the assessment that the unit pricing program in Downers Grove encourages source reduction.

GLENDALE, CALIFORNIA

DEMOGRAPHICS[1]

Jurisdiction:	City of Glendale
Population:	
Population:	177,671
Population Density (individuals per square mile) :	5,806
Number of Households:	68,604
Education (percent):	
Earned High School Diploma:	77.20
Earned Bachelor's Degree:	28.60
Ethnic Breakdown (percent):	
African-American:	1.31
Asian:	14.33
Hispanic:	21.24
Native American:	0.35
Economic Characteristics:	
Mean Per Capita Income:	$17,966
Median Household Income:	$34,372
Median Housing Value:	$341,700

Brief Description:

The City of Glendale lays approximately eight miles northeast of Los Angeles in the foothills of the Verdugo Mountains. Predominantly a residential community, Glendale covers 30.6 square miles. Most residents of Glendale commute to either Los Angeles or to manufacturing facilities in the San Fernando Valley. The city does provide for some light manufacturing industries.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

The city collects refuse from all single family residences. The city contracts service for multi-family residential, commercial and industrial customers to licensed private haulers. Between 1990 and 1992, Glendale implemented an automated collection system and variable rate pricing for its residents. Single family residences may subscribe to either one 65-gallon cart or one 100-gallon cart. Households may request additional carts, but must pay a one-time, non-refundable fee of $66 and applicable monthly collection fees.

Glendale offers Christmas tree collection through its yard waste collection program in January. Residents may rent one to three cubic yard bins for special collection of bulk waste. The city also provides residents with collection of white goods for a minimum fee of $25.

Unit Pricing Program Adopted: 1992

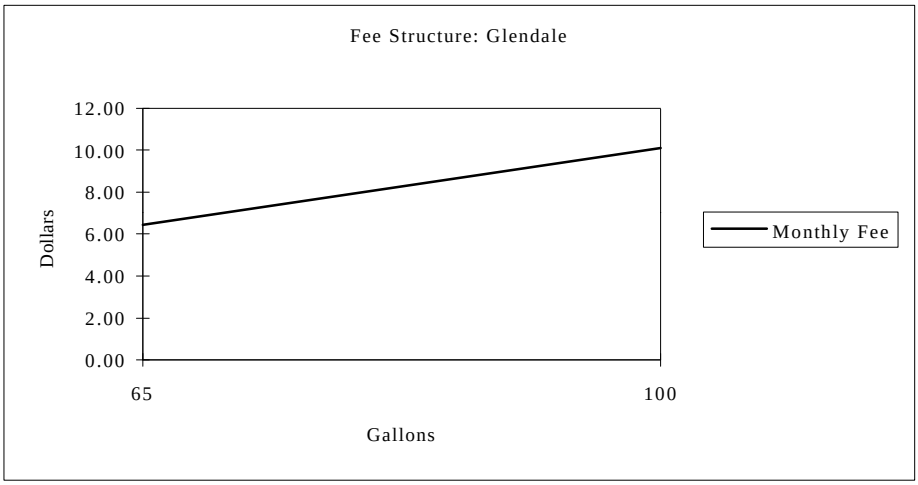
Container Type: cart

Collection Frequency: weekly

Households Served: 32,251

Fee Structure:

Cart Volume	Fee (per month)
65-gallon container	$6.45
100-gallon container	$10.10



Disposal

Glendale disposes of its solid waste at the Scholl Canyon Landfill located in the southeastern section of the city. The City of Glendale and Los Angeles County jointly own the facility, and the Sanitation Districts of Los Angeles County jointly operate it. Prior to 1987, the landfill permitted unlimited access to cities in the area to dispose of their garbage there. In 1987, citing its desire to prolong the service life of Scholl Canyon Landfill, Glendale restricted access to six cities: Glendale, La Canada Flintridge, Pasadena, San Marino, Sierra Madre and South Pasadena.

Landfill: Scholl Canyon Landfill, pre-RCRA

Tipping Fee: $21.35 per ton

Hauler Type: public

Recycling

Glendale began operating a voluntary curbside collection program for recyclables in December of 1988. The program originally served 27,000 single-family households and 8,200 duplex/fourplex units. In 1990, the city phased in multi-family unit curbside collection, adding 36,000 residential units to the program. While Glendale owns the collection vehicles, the city contracts out laborers from the private sector. Residents must separate their recyclables by placing glass in a green bucket, metals in a white bucket and all paper-based recyclables in a paper bag or bound by twine. Households may pick up recycling buckets free of charge from the Glendale Recycling Center. The regional markets for recyclable materials are strong.

Curbside Program Adopted:	1988
Collection Frequency:	bi-weekly
Hauler Type:	public
Recycled Materials:	glass (brown, clear, green) plastics (coded 1, 2) metal cans (aluminum, tin) newspaper telephone books mixed paper cardboard
Recycling Destination:	public processing facility
Drop-off Centers:	yes

Yard Waste Collection

Glendale collects yard waste trimmings on a weekly basis on the same day as refuse collection. The yard trimmings are shredded and used as cover material and mulch at the landfill. An educational brochure encourages residents to separate yard waste from regular waste. Households must place their yard waste in old refuse containers or they must bundle the trimmings and place the yard waste on the curb.

Glendale provides a limited number of free compost bins to residents who attend a composting workshop. In addition, on Saturdays, the city offers free brush and tree limb chipping and shredding for residents.

Curbside Collection Program Adopted:	1992
Container:	can or bundle
Fee:	none
Collection Frequency:	weekly
Yard Waste Destination:	public processing facility
Backyard Program:	yes

Education

Glendale spends approximately $200,000 per year to educate its citizens about solid waste management. At the Educational Resource Lab of the Glendale Recycling Center, individuals can access information and attend workshops on waste management and recycling. Glendale offers workshops to individuals interested in using a backyard composting bin. The city also provides brochures on grasscycling and xeriscaping.

Administration and Enforcement

Glendale bills households for waste collection bi-monthly through the city utility bill. This utility bill includes the households' water, electricity and solid waste bills. By consolidating the city billing system, Glendale more efficiently serves its residents. The city provides a customer service office to respond to residents' complaints, questions, and requests for information.

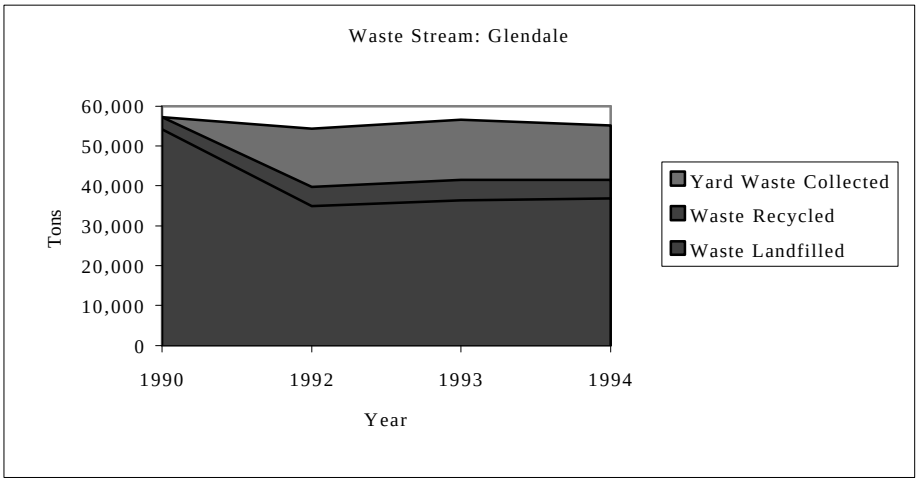
Waste collectors refuse to accept waste carts with waste stacked on top of the cart lids. They collect carts with ajar lids so long as the automated collection system does not spill trash when depositing the waste into the truck. Glendale often collects contaminated recyclables. The city would rather address the contamination at the processing facility than to leave behind a bin full of recyclables. It is illegal for any unauthorized individual to collect recyclables from curb set-outs. City collectors leave behind contaminated yard waste. If the collectors leave behind waste or yard waste, they place a non-collection notice indicating the violation on the cart, can or bundle. Glendale rarely assesses fines for littering and illegal dumping. Instead, the city attempts to make the responsible party dispose of the waste properly.

OUTCOMES

Waste Stream (tons)

Fiscal Year*	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1990	54,190	2,970	0	57,160
1992	34,834	4,824	14,634	54,292
1993	36,360	5,221	14,914	56,495
1994	36,801	4,742	13,695	55,238

* Glendale could not provide data for 1991.



Undesirable Diversion

City officials do not consider undesirable diversion behavior a serious problem. Residents do not burn waste, and dumping of waste at commercial dumpsters is rare. Glendale does report that dumping of bulky waste, such as old furniture and broken appliances, does occur. In 1994, Glendale reported that city employees collected 134.5 tons of dumped waste, litter and bulky waste.

Total Waste Generated

The annual amount of total waste generated (landfilled waste, recycling, and yard waste) by Glendale has not changed significantly over the past five years. Since 1990, residents have paid $10.10 per month for a 100-gallon cart, which is equivalent to Glendale's flat-fee rate prior to the implementation of the unit-pricing program. The low unit prices do not convey the necessary economic incentives to households to source reduce. However, the provision of recycling and yard waste collection have allowed for residents to divert some waste.

GRAND RAPIDS, MICHIGAN

DEMOGRAPHICS[1]

Jurisdiction:	City of Grand Rapids
Population:	
Population:	189,126
Population Density (individuals per square mile) :	4,317
Number of Households:	69,452
Education (percent):	
Earned High School Diploma:	76.45
Earned Bachelor's Degree:	20.85
Ethnic Breakdown (percent):	
African-American:	18.58
Asian:	1.04
Hispanic:	4.47
Native American:	0.79
Economic Characteristics:	
Mean Per Capita Income:	$12,070
Median Household Income:	$26,809
Median Housing Value:	$57,600

Brief Description:

Grand Rapids is the seat of Kent County and is located on the Grand River 25 miles east of Lake Michigan in the southwestern part of the lower peninsula. The city produces furniture, automobile parts, seating for religious and educational institutions and wallboard. In addition, gypsum mining is a significant component of Grand Rapids' economy. The city is also a wholesale distribution center for much of Michigan's agricultural production.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

The city of Grand Rapids adopted its fee-per-bag/tag pricing system in 1972. The price of the city bags/tags started off very low, and remained low throughout most of the 1980's. In the late 1980's, in response to increases in the costs of waste collection and disposal, the city began to increase the price steadily up to its present rate of $0.85 per bag/tag. Grand Rapids operates an open garbage collection system. Residents may select their collection service from among the city government and 23 licensed private hauling firms. The city serves approximately two-thirds of all single-family dwellings. The city does not offer collection service to the 11,000 households in multi-unit complexes.

The city offers three options to its residential waste customers. Residents may purchase special 30-gallon city bags at fire stations, the City Treasurer's office, supermarkets, and convenience stores. A package of ten costs $8.50. Residents may also purchase $0.85 city refuse tags at the same locations and attach these tags to regular 30-gallon garbage bags, a 30-gallon cardboard box or bundled waste not exceeding 30 pounds. In addition, residents may purchase 30-gallon refuse containers from the city for $10 and $44.20 annual refuse license sticker for the container (which equates to $0.85 per week).

The city collects bulk items, such as bundled branches and boards, tires, small appliances, furniture and Christmas trees, provided that residents attach the $0.85 city refuse tags. The city only collects major appliances, such as refrigerators, stoves, dishwashers, washer/dryers, and water heaters, if residents attach a $10 appliance sticker to each item.

Unit Pricing Program Adopted: 1972

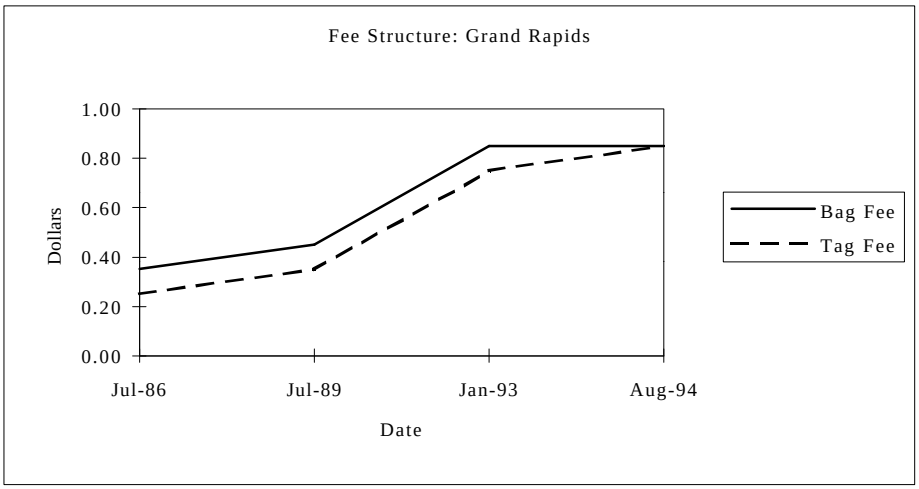
Container Type: bag

Collection Frequency: weekly

Households Served: 40,000

Fee Structure:

Dates	Fee (city bag/tag)
7/86-6/87	$0.35/$0.25
7/89-6/90	$0.45/$0.35
1/93-6/94	$0.85/$0.75
8/94-1/95	$0.85/$0.85



Disposal

The city sends all of the garbage it collects to the Kent County Mass Burn Incinerator, a waste-to-energy facility. The county owns and operates the incinerator.

Incinerator:	Kent County Mass Burn Incinerator, post-RCRA
Tipping Fee:	$59.51 per ton
Hauler Type:	public

Recycling

Kent County operated a number of recycling drop-off centers within Grand Rapids for many years. Curbside recycling is now available to any city resident upon request. The city provides an 18-gallon bin to all participating residents. Residents place newspapers, magazines and catalogs as well as household batteries in a separate paper bag. Recycling collection occurs on the same day as refuse collection.

The city contracts with Waste Management of Michigan to collect and process recyclables, and to bill participating households every four months. According to company officials, the revenue it collects from residents, the city, and the sale of recyclables just covers the operating expenses of the collection program. The city currently subsidizes part of the monthly recycling charge, but that subsidy will be phased out by fiscal year 1998. In fiscal year 1995, households pay $1.75 per month for recycling service, and the city pays $1.63 per month for each household receiving recycling service.

Waste Management processes the recyclables it collects at its own facility on the southern edge of the city, and sells the material to regional buyers. The regional markets are, for the most part, stable, and prices are good. They sell almost all of their material within a 500-mile radius of Grand Rapids.

Curbside Program Adopted:	1994
Collection Frequency:	weekly
Hauler Type:	private
Recycled Materials:	glass (brown, clear, green) plastic (coded 1, 2) metal cans (aluminum, steel, tin) newspaper magazines catalogs household batteries
Recycling Destination:	private processing facility
Drop-off Centers:	yes

Yard Waste Collection

In March of 1995, Grand Rapids began a curbside yard waste collection program through a contract with Waste Management. Residents may place leaves, grass clippings, brush, small twigs and garden plants in clear city yard waste bags. They may also bundle together larger branches and brush and mark them with a city yard waste tag. Bags cost $7.50 for a package of ten, and tags are $0.75 each. Both are available at city fire stations, the Treasurer's office, supermarkets, and convenience stores. Yard waste collection occurs on the same day as refuse and recycling pick-up. Waste Management delivers the yard waste it collects to a facility owned by Compost Soil Technology, an independent firm. This facility charges a tipping fee of $2 per cubic yard, or approximately $6 per ton. The city does not sponsor a backyard composting program.

Curbside Collection Program Adopted:	1995
Container:	bag
Fee:	$0.75 per bag
Collection Frequency:	weekly
Yard Waste Destination:	private composting facility
Backyard Program:	no

Education

Grand Rapids only engages in significant citizen education efforts when it implements a change in the city's waste collection service, such as the start of curbside recycling or yard waste collection. Before each of these programs, the city sent mass mailings to every resident explaining the system and encouraging them to participate. The city also ran television, radio, and newspaper public service announcements. Grand Rapids' regular educational expenses, however, are minimal. The city provides informational brochures available upon request.

Administration and Enforcement

The Grand Rapids City Manager, who reports to the Mayor and the City Commission, oversees the seven city offices, of which Public Works is one. Public Works contains six departments and maintains responsibility for snow removal, city water, street maintenance, sanitation, traffic safety, the city motor pool and refuse collection. The administrative staff of Public Works employs about a dozen individuals. Since the city uses refuse bags and tags, it does not need a billing department. The Purchasing Office, which is in another service area, handles the purchase and distribution of the bags and tags to retail outlets.

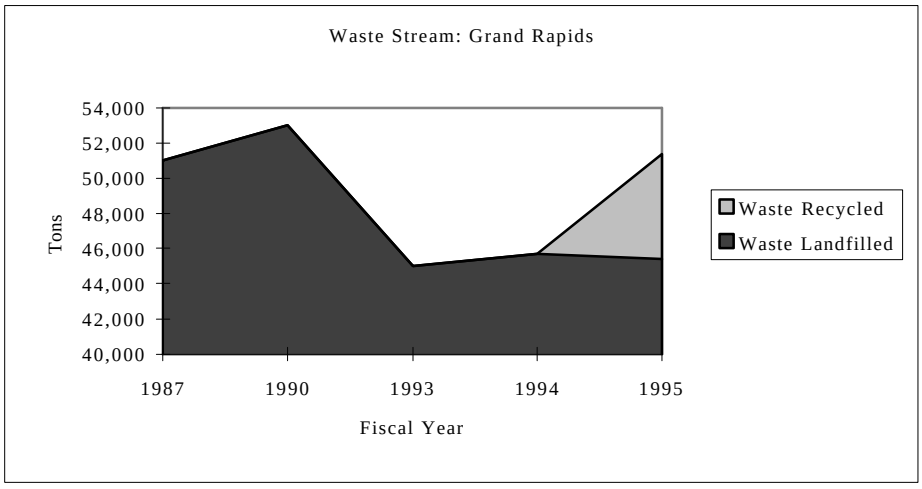
The city only collects garbage in a city refuse bag or can, or marked with a city refuse tag. City refuse bags and cans, or tagged refuse containers, may not exceed 30 pounds or the city does not collect them. Collection personnel are lenient on the weight limits, but if the receptacle is clearly over 30 pounds, they leave it behind. Residents must tag bulky items or attach a city appliance sticker. Solid waste personnel sort recyclables at the curb and leave behind any contaminants. Yard waste bags and bundled brush may not exceed 30 pounds. Clear bags enable drivers to visually inspect for contaminants. Contaminated yard waste bags are left behind. Officials tag any receptacles in violation of the above restrictions with a city refuse violation. The violation indicates the exact nature of the offense and instructs the resident to correct the problem within seven days. The city distributed more than 4,100 of these notices annually in 1993 and 1994. According to city officials, residents properly dispose of most tagged waste within seven days. If the resident does not take care of the tagged refuse by the following collection day, the city removes the refuse and bills the property owner for the cost of removal. The bill amounts to $40 for administrative costs, and $20 for collection and disposal, plus $10 for each appliance. Only about 390 violations in 1993 and 1994 resulted in subsequent action.

OUTCOMES

Waste Stream (tons)

Fiscal Year	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1987	51,000	0	0	51,000
1990	53,000	0	0	53,000
1993*	45,000	0	0	45,000
1994	45,700	0	0	45,700
1995*	45,400	6,000	0	51,400

* Data for FY 1993 and FY 1995 are based on 6 months of data, and are extrapolated for a full fiscal year.



Undesirable Diversion

City officials report a noticeable amount of illegally dumped waste and litter in Grand Rapids, particularly in the poorer sections of the city. Despite this, the total amount of litter collected by the city is fairly low. Grand Rapids collects 30 tons of illegally dumped waste annually, at a cost of $15,000. Much of the refuse it collects includes large items, such as furniture and appliances. The city also collects about 60 tons of garbage per year in neighborhood cleanups. Some of this waste is probably dumped refuse. Officials estimate that the amount of dumped waste has doubled since 1990.

Grand Rapids' commercial haulers report that some of their customers complain about people dumping garbage in their dumpsters. Several haulers offer dumpster locks to their customers. Charitable organizations also report some problems with people leaving junk or actual household garbage at their drop-off locations. The Salvation Army disposes 25% of its donations and Goodwill disposes 50%.

Total Waste Generated

The steep and steady bag and tag price increases during the late 1980's and early 1990's illustrate waste generation behavior of households receiving city collection service. The price increases have affected the level of household waste generation. In its first six months, the curbside recycling program has not significantly affected total household waste generation. The city estimates that it will collect about 8,000 tons of yard waste per year, or 22 pounds per household per month.

HOFFMAN ESTATES, ILLINOIS

DEMOGRAPHICS[1]

Jurisdiction:	Village of Hoffman Estates
Population:	
Population:	47,266
Population Density (individuals per square mile) :	2,528
Number of Households:	15,924
Education (percent):	
Earned High School Diploma:	89.70
Earned Bachelor's Degree:	40.00
Ethnic Breakdown (percent):	
African-American:	2.82
Asian:	7.89
Hispanic:	5.38
Native American:	0.18
Economic Characteristics:	
Mean Per Capita Income:	$19,072
Median Household Income:	$49,475
Median Housing Value:	$133,800

Brief Description:

Hoffman Estates is located about 30 miles northwest of Chicago in Cook County. Sears, Roebuck and Company, one of the largest employers in the area, employs approximately 4,000 people, followed by Ameritech, which employs about 2,500, and Siemens Gammasonics, which employs 950 people. The community manages 4,000 acres of forest preserves, parks and golf courses.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

Hoffman Estates adopted a variable rate program in May of 1992 in response to anticipated increases in tipping fees and waste production. Residents may purchase stickers at the Village Hall or order them through the hauler. Residents must attach the stickers to bags for weekly collection. Residents pay only for the amount of waste they set out: there is no additional flat fee. Only single-family dwellings participate in the program.

In addition to waste collection, white goods may be collected and disposed for a charge of $25 per item. The Salvation Army provides a reusable household goods collection program at no charge. Residents place goods for the Salvation Army in specially marked bags and leave the bags on the curb for pickup during a specified collection day once a month. Large goods donated to the Salvation Army require a scheduled appointment. The village also provides for special bulk waste collection, for a fee which varies with the amount of waste collected.

Unit Pricing Program Adopted: 1992

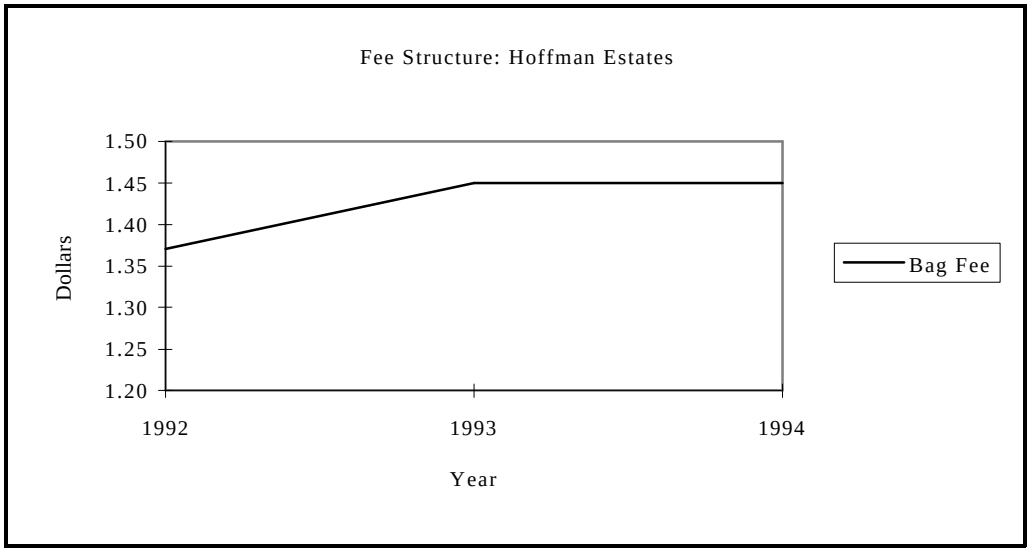
Container Type: sticker

Collection Frequency: weekly

Households Served: 12,500

Fee Structure:

Year	Fee
1992	$1.37
1993	$1.45
1994	$1.45



Disposal

The municipal government contracts with a hauler through a bidding process. The municipality is serviced by Laidlaw Waste Systems. The hauler accounts for fluctuations in sticker sales when formulating its unit price. Laidlaw Waste Systems currently uses a pre-RCRA landfill, Mallard Lake. A federal court mandated the closure of this facility by 1998 due to its location on a forest preserve. The municipality joined the Solid Waste Agency of Northern Cook County (SWANCC) which seeks solutions for the landfill crisis. SWANCC plans to operate three transfer stations by the beginning of 1996 to handle the waste generated by its members. Hoffman Estates anticipates a dramatic increase in tipping fees once Mallard Lake landfill closes. Laidlaw Waste Systems expects to use either Woodland Landfill or Settlers Hill Landfill when Mallard Lake closes. Both of these latter landfills have a long life-expectancy.

Landfill: Mallard Lake Landfill, pre-RCRA

Tipping Fee: $32 per ton

Hauler Type: private

Recycling

Hoffman Estates residents receive curbside recycling free of charge. The private hauler collects recyclables once a week on the same day as refuse collection. The city requests residents place clean and dry recyclables in a city-provided recycling bin. Residents place all recyclable paper goods in a separate paper bag and leave them beside the recycling bin on the appropriate collection day. Residents may purchase additional recycling bins from the Village Hall at a cost of $5.00 each. All recyclables are processed at the Laidlaw Material Recovery Facility. The recycled materials are then sold to vendors, and the markets have been strong for these materials over the past two years.

The village provides several recycling drop-off centers. These centers accept newspaper, aluminum, glass (brown, clear, and green), used motor oil, used antifreeze, household batteries, office paper, and cardboard. The private hauler responsible for curbside recyclables pick-up is also responsible for all recyclables in the drop-off center except for the oil and antifreeze.

Curbside Program Adopted:	1990
Collection Frequency:	weekly
Hauler Type:	private
Recycled Materials:	glass (brown, clear, green) plastic (coded 1, 2, 3, 4) metal cans (aluminum, steel, tin) newspaper mixed paper cardboard
Recycling Destination:	private processing facility
Drop-off Centers:	yes

Yard Waste Collection

Residents attach the same unit price stickers to yard waste for collection. Yard waste, however, must be placed in 30-gallon biodegradable kraft paper bags or bundled. The contracted hauler collects yard waste on a weekly basis between April 1 and November 30 of each year. The village also schedules a two-week collection period for Christmas trees and other holiday greenery. Residents with unusually large amounts of yard waste may schedule a special pick-up with the private hauler. Laidlaw takes collected yard waste to one of three private composting facilities, although the company is in the process of constructing its own facility.

The village also provides information on mulching mowers, leaf shredders and backyard compost piles.

Curbside Collection Program Adopted:	1990
Container:	30-gallon kraft bag
Fee:	same as refuse collection fee
Collection Frequency:	weekly
Yard Waste Destination:	3 private composting facilities
Backyard Program:	information only

Education

Preceding the implementation of the unit pricing program, all residents received a mailing describing the program. This mailing cost the village $7,080, or $0.14 per capita. In addition, the recycling coordinator informed residents about the program at public meetings six months before the program began. The hauler maintains responsibility for educating residents about any additional changes in the program's design. Residents may receive information about backyard composting, leaf shredders and mulching mowers from the Village's Recycling Coordinator. A public education brochure was developed and mailed to all residents upon the extension of the Village's contract with Laidlaw Waste Systems in 1995.

Laidlaw Waste Systems provides informational briefings on recycling to school and civic groups at its materials recovery facility. The Village of Hoffman Estates newsletter is another avenue for education and information provision to the general public.

Administration and Enforcement

During the first year of the program, the Village budgeted $60,080 for the program. The first-year costs included the Recycling Coordinator's salary as well as expenditures on education efforts. Each year thereafter, the municipality budgeted approximately $55,000 to cover salary costs. The program is basically administered by the private hauler through a contract with the city. The hauler maintains responsibility for providing a customer service center, collecting all refuse, yard waste and recyclables, distributing refuse stickers to retailers, collecting and managing revenues and providing some education and information to residents.

Illegal dumping carries a minimum fine of $50. Theft of stickers, recyclables and recycling bins are illegal by village ordinance. The Hoffman Estates Police Department investigates illegal dumping complaints and the Division of Code Enforcement prosecutes such cases. An individual issued a citation for illegal dumping must pay a $50 fine or contest the citation in court. Illegal dumping in commercial dumpsters carries a fine of up to $500 and may be prosecuted on the basis of mail found in the refuse.

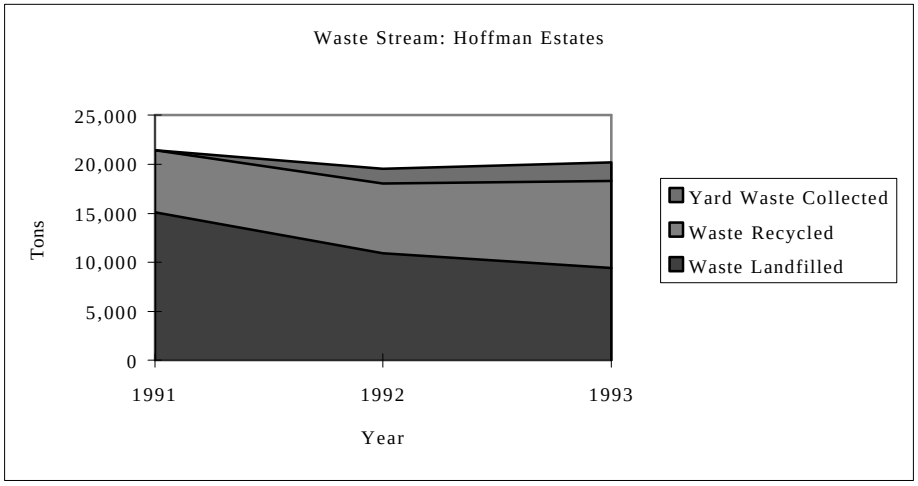
The private hauler only collects refuse in a tagged bag. The hauler does not collect refuse in cans or other containers except for those cans set-out for back-door collection service. Recycling collectors do not pick-up unacceptable or contaminated recyclables. Plastic containers coded 5, 6, 7 or do not have a code cannot be recycled and the collectors do not pick these up. The village does not accept the following in its yard waste collection: garden vegetables and fruits; tree trunks, stumps and large limbs; fence posts, railroad ties and fire wood; or sod and rocks. Yard waste collectors do not pick up yard waste in plastic bags or unbundled branches. Every bag and bundle must have a refuse sticker affixed to it.

OUTCOMES

Waste Stream

Fiscal Year	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1991	15,101	6,305	not available	21,406*
1992	10,924	7,065	1,538	19,527
1993	9,418	8,896	1,896	20,210

* The total waste generated for Hoffman Estates for 1991 does not include collected yard waste.



Undesirable Diversion

During the first six months of the pay-per-bag program, Hoffman Estates issued 103 citations to residents for illegal dumping and refuse sticker theft. Of these 103, the Circuit Court Judge dismissed 30 and fined 73 residents. The fines ranged from $25 to $500. After the first six months, illegal dumping and refuse sticker theft declined. For the period between January 1993 and November 1994, the village issued 71 citations. Several interviewed businesses believe that illegal dumping remains a problem for the village.

Total Waste Generated

From the year preceding the program to the first year of the program, there was a 27% decrease in waste landfilled. Recyclables increased by 12% during this period. This leaves an unexplained decrease of 6.9% reduction accounted for by source reduction, composting or undesirable diversion. Landfilled waste dropped

another 10% from its 1991 value in the second year of the program, while recycling increased another 28% in that year.

LANSING, MICHIGAN

DEMOGRAPHICS[1]

Jurisdiction:	City of Lansing
Population:	
Population:	127,321
Population Density (individuals per square mile) :	3,738
Number of Households:	50,835
Education (percent):	
Earned High School Diploma:	78.31
Earned Bachelor's Degree:	18.32
Ethnic Breakdown (percent):	
African-American:	18.57
Asian:	1.69
Hispanic:	7.98
Native American:	1.25
Economic Characteristics:	
Mean Per Capita Income:	$12,232
Median Household Income:	$26,398
Median Housing Value:	$48,100

Brief Description:

Lansing, the capital of the state of Michigan, is located at the junction of the Red Cedar, Sycamore, and Grand Rivers in Ingham County. The city is approximately 80 miles northwest of Detroit. Lansing's economy is dominated by the automobile industry and state government operations. Manufacturing facilities associated with the automobile industry, such as fabricated metal plants, are also found in Lansing.

[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

Lansing began a voluntary fee-per-bag residential waste collection system in 1975. At that time, a household could subscribe to the city's unit pricing program, or subscribe to private service. The city continued this program virtually unchanged until 1991, when it increased the fee-per-bag from $1 to $1.50 and implemented city-wide curbside recycling and yard waste collection.

Households that subscribe to the city service must purchase 30-gallon refuse bags. The bags cost $7.50 for a package of five, and are available at several supermarket chains, Quality Dairy stores and local convenience stores. The city currently collects garbage from approximately 50% of the city's single-family dwellings (approximately 19,000 households). Waste Management of Midwest Michigan and Granger Container Service serve most of the other single-family households.

For bulk waste, such as furniture and white goods, the city sells $20 bulk collection stickers. Lansing also collects Christmas trees during the first two weeks of January.

Unit Pricing Program Adopted: 1975

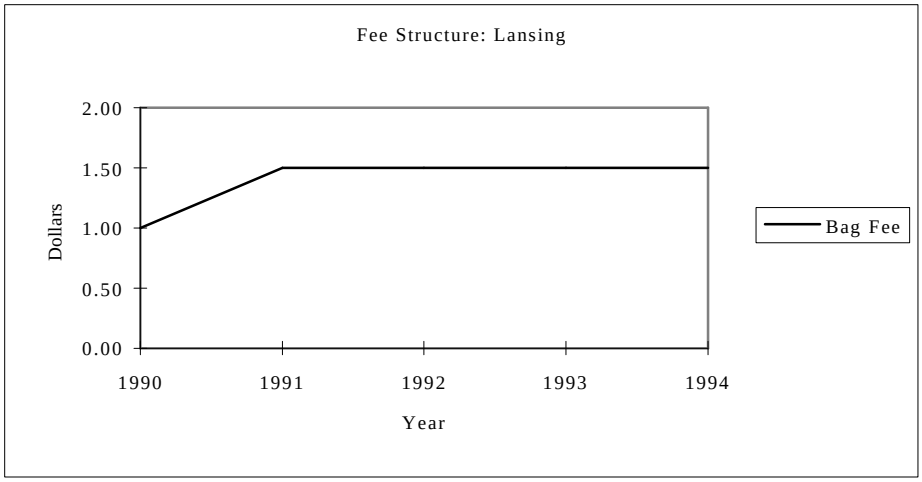
Container Type: bag

Collection Frequency: weekly

Households Served: 19,000

Fee Structure:

Year	Fee
1990	$1.00
1991	$1.50
1992	$1.50
1993	$1.50
1994	$1.50



Disposal

All refuse collected by the city is taken to the Wood Street Landfill and the Grand River Avenue Landfill. Both landfills conform to the Subtitle D requirements of RCRA. Granger owns both facilities and currently charges a tipping fee of $10.86 per cubic yard, or approximately $36 per ton, at each.

Landfill:	Wood Street Landfill, Grand River Avenue Landfill, post-RCRA
Tipping Fee:	$36 per ton
Hauler Type:	public

Recycling

Lansing implemented its recycling program in November, 1991. The city collects recyclables on the same day as refuse collection. Unlike the open waste collection system, the city is the exclusive provider of recycling service. All 38,000 single-family households automatically receive an 18-gallon recycling bin in which they place their recyclables. Residents may commingle all materials in the bin, except newspapers, which they package separately in a brown paper grocery bag, and magazines, which they bundle together with twine or string. Collection personnel separate the materials at the curb. The city processes recyclables at its own transfer station, and then sells to buyers within the state. The regional markets for all of the materials the city collects are good.

The city finances recycling and yard waste collection programs through a special $55 annual fee assessed to residents along with their regular city taxes: $25 of the fee goes towards recycling; $18 goes towards yard waste collection; and the remaining $12 goes towards education and promotion for the two programs. The recycling and yard waste collection programs also received $2.3 million in start-up funds from Michigan's Department of Natural Resources. The city also receives some revenue from the sale of recyclables.

Curbside Program Adopted:	1991
Collection Frequency:	weekly
Hauler Type:	public
Recycled Materials:	glass (brown, clear, green) plastic (coded 2) metal cans (aluminum, steel) newspaper magazines catalogs
Recycling Destination:	municipal transfer station
Drop-off Centers:	yes

Yard Waste Collection

Lansing runs a weekly yard waste collection program available to all single-family households. From late March through November, the city collects leaves, grass, garden clippings, weeds and bundled brush. Residents may place yard waste at the curb in an ordinary 30-gallon bag. The collection occurs on the same day as recycling and refuse pick-up. Lansing provides this service to all single-family households. The city delivers yard waste to the Great Lakes Compost facility, located just outside the city. Granger owns the Great Lakes compost facility. The city pays a tipping fee scaled to the volume of yard waste it brings in. On any day the city drops off yard waste, it pays $6.15 per cubic yard for the first 5,000 cubic yards, $5.40 per cubic yard for the next 5,000 cubic yards and about $4.00 per cubic yard for all yard waste in excess of 10,000 cubic yards. Great Lakes composts the yard waste it receives and distributes it to local buyers. The city also has a contract with Urban Options Consultants, a non-profit organization, to provide citywide education on backyard yard waste composting and grasscycling. City residents may purchase compost bins at a reduced price ($20 instead of $30) from Lansing.

Curbside Collection Program Adopted:	1992
Container:	bag
Fee:	$18 per year
Collection Frequency:	weekly
Yard Waste Destination:	private composting facility
Backyard Program:	yes

Education

Each package of bags contains a brochure explaining the different materials that the city collects and how residents should prepare their garbage, recycling, and yard waste for collection. The city distributes additional information upon request and operates a hotline that residents may call for answers to their questions. The city conducted a mass mailing to every household explaining the curbside recycling and yard waste collection programs when they began. Lansing also uses billboards, television, radio and local newspapers to inform residents about the city's waste collection services. Solid waste officials make presentations in local public schools, and the city hired a consultant to help with the public outreach. Overall, the city spends approximately $370,000 on promotion and education annually. The city directs efforts primarily at recycling and yard waste rather than source reduction education. Residents may also receive education on backyard yard waste composting and grasscycling. The city does very little to explain the fee-per-bag system to residents because that system has been in place so long. Also, the City Council is very wary of allowing the city garbage service to promote itself. Urban Options informs residents about backyard composting and grasscycling.

Administration and Enforcement

The Operations Maintenance Division of the Public Service Department of Lansing administers the refuse, recycling, and yard waste collection programs. Operations and Maintenance employs 142 people and operates under an annual budget of $19 million. In addition to refuse collection, the division maintains responsibilities for street, curb and sidewalk maintenance, street cleaning, debris and litter removal, sewer and storm drain maintenance, flood control, city building maintenance, and one of the three city vehicle garages. Lansing's garbage collection program is financially self-sufficient. The city covers the $1.4 million it costs to operate the program each year with city refuse bag and bulk sticker sales.

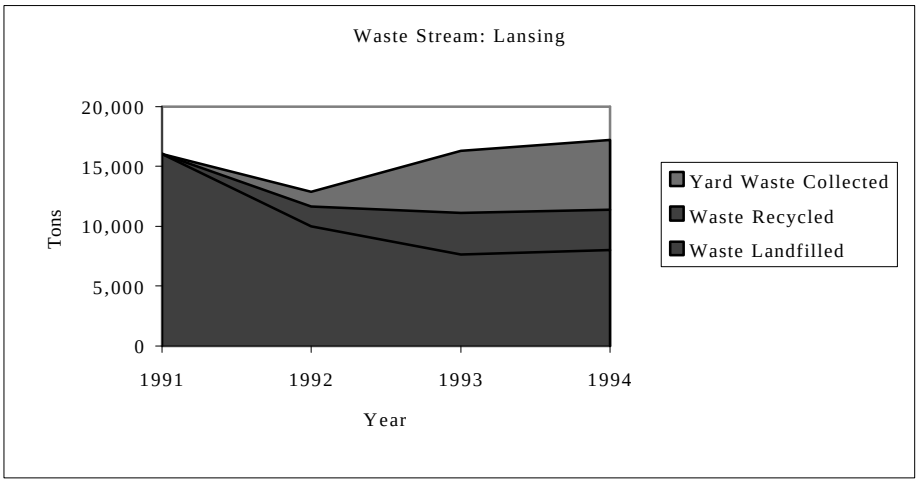
The city only collects authorized green city refuse bags. Waste not placed in a green city bag receives red solid waste violation stickers. The city tags ripped bags or overstuffed bags (greater than 30 pounds) with these same violation stickers. The city does not collect human or animal waste, dirt, stones, rocks, dead animals, or hazardous wastes, including gasoline and other explosive materials, wet paint, herbicides, pesticides, and hot ashes or coals. Residents must properly dispose of any refuse tagged with a red solid waste violation sticker. According to solid waste officials, the city tags a couple of bags each day. A city refuse collection inspector visits residents who do not take care of tagged waste or who repeatedly violate collection rules. If the city collects any tagged garbage, it bills the resident a minimum of $225 for all of the costs incurred in the process: administration, inspector’s time and the cost of collection and disposal.

The city leaves behind any nonrecyclable materials placed in the city’s recycling bins. The city leaves an “Oops” flyer explaining the eligible materials for the city’s recycling program. The city also leaves these “Oops” flyers on overstuffed yard waste bags.

OUTCOMES

Waste Stream (tons)

Fiscal Year	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1991	16,000	0	0	16,000
1992	10,000	1,600	1,300	12,900
1993	7,600	3,500	5,200	16,300
1994	8,000	3,400	5,800	17,200



Undesirable Diversion

The Solid Waste Section of the Operations and Maintenance Division receives approximately 500 telephone calls annually regarding illegally dumped garbage. The city estimates that residents illegally dump 300 tons of solid waste annually, which costs the city $52,500 for cleanup and disposal. Much of the dumped material includes bulk waste, such as furniture and large appliances. Officials from Allied, one of the three major commercial hauling firms in Lansing, report that about 10% of their customers have complained about people disposing refuse in their dumpsters.

The city does not have a problem with recycling contamination, since collectors sort recyclables at the curb and leave behind nonrecyclables. The city does not consider yard waste contamination a serious problem. The city collects approximately two to three bags of yard waste containing some garbage each day. This translates to about seven to ten tons of contaminated material annually.

Total Waste Generated

The large increase in the price of refuse bags in 1991, coupled with the implementation of the recycling and yard waste collection programs in 1991 and 1992, illustrate the effectiveness of unit pricing and complementary programs in managing the residential solid waste stream. The city halved its landfilled waste over a four year period while experiencing significant growth in recycling and yard waste collection. In addition to the significant waste diversion Lansing achieved, the city likely encouraged source reduction. The total waste generated (landfilled waste, recycled waste and yard waste collected) increased over the past four years, but some of this is attributable to the 19,000 city residents who participate in the recycling and yard waste programs but do not participate in the city refuse collection program.

PASADENA, CALIFORNIA

DEMOGRAPHICS[1]

Jurisdiction:	City of Pasadena
Population:	
Population:	132,605
Population Density (individuals per square mile) :	5,765
Number of Households:	50,199
Education (percent):	
Earned High School Diploma:	77.50
Earned Bachelor's Degree:	36.30
Ethnic Breakdown (percent):	
African-American:	18.82
Asian:	8.05
Hispanic:	27.08
Native American:	0.45
Economic Characteristics:	
Mean Per Capita Income:	$19,588
Median Household Income:	$35,103
Median Housing Value:	$281,500

Brief Description:

Pasadena sits in the foothills of the San Gabriel Mountains in Los Angeles County approximately ten miles from Los Angeles and thirty miles from the Pacific Ocean. The city's economy depends primarily on research and development in aerospace, electronics, and military industries. Pasadena hosts the California Institute of Technology and the Jet Propulsion Laboratory. The Rose Bowl, site of a New Year's Day collegiate bowl game, is located in Pasadena as well.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

Pasadena provides collection services for single-family homes and multi-family residences with four or fewer units. For multi-unit properties with greater than four units, the municipality competes with 38 licensed private haulers for contracts to service these residences. The city phased in the unit pricing program over the five-year period between 1987 and 1992. Unlike most southern California cities, Pasadena continues to offer backyard collection of solid waste, although at a higher rate. Since the implementation of the unit pricing program most residents have requested curbside automated trash collection. Estate property owners may contract services with private haulers, and many do.

Pasadena provides an Annual Neighborhood Clean-up once per year to collect white goods and scrap metal free of charge. In addition, residents may request special collection of large and bulky items for a fee. Residents who occasionally produce a large amount of waste may rent a 3-cubic yard bin for a one time collection fee. The city collects Christmas trees during the first couple of weeks of January.

Unit Pricing Program Adopted: 1992

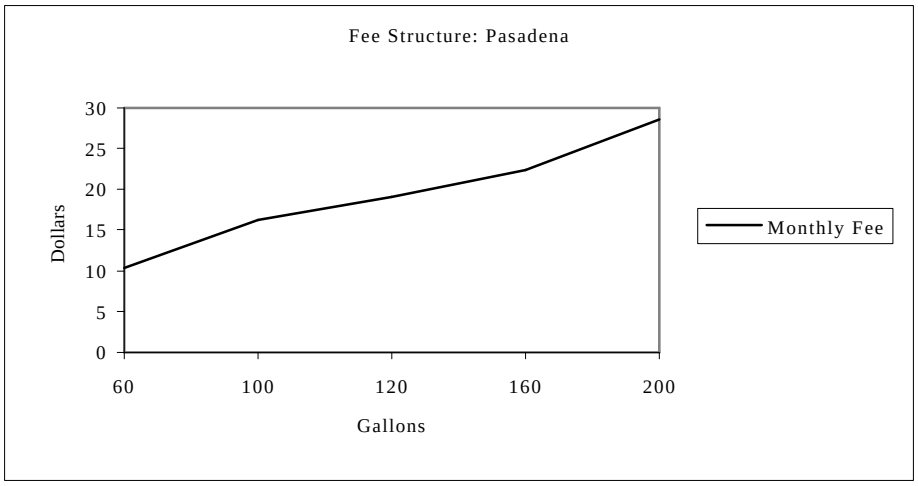
Container Type: cart

Collection Frequency: weekly

Households Served: 28,000

Fee Structure:

Cart Volume	Fee (per month)
60-gallon	$10.41
100-gallon	$16.23
two 60-gallon	$19.01
one 60-gallon, one 100-gallon	$22.40
two 100-gallon	$28.62



Disposal

Pasadena delivers its waste to the Scholl Canyon Landfill. The city pays a higher tipping fee than does Glendale because Glendale is co-owner of the Scholl Canyon landfill.

Landfill:	Scholl Canyon Landfill, pre-RCRA
Tipping Fee:	$24.11
Hauler Type:	public

Recycling

Pasadena implemented curbside recycling in March of 1990. For single-family residential recycling, the city contracts service to private recycling companies. These private firms bid for a specific day of the week. Currently one recycling firm is responsible for Monday through Thursday and another is responsible for Friday collection. These recycling firms pick up recyclables on a weekly basis on the same day as refuse collection. For recycling collection, all residents must place their recyclables into a 14-gallon box. The regional markets for all of the recyclable materials the city collects are strong.

Curbside Program Adopted:	1990
Collection Frequency:	weekly
Hauler Type:	private
Recycled Materials:	glass (brown, clear and green) plastic (coded 1, 2) metal cans newspaper used motor oil
Recycling Destination:	private processing facility
Drop-off Centers:	yes

Yard Waste Collection

Pasadena implemented a pilot yard waste collection program in 1991, and began city-wide service in 1993. The city offers residents the option to select a 100-gallon "yard waste only" container to be used on a weekly basis. The residents pay a $5 fee for this yard waste only container. The city takes the yard waste it collects to the grinder/landfill operation at the Scholl Canyon Landfill where the yard waste is used in mulching and composting activities. Since 1987, Pasadena has encouraged backyard composting by providing a "How to Compost" brochure along with additional technical assistance for residents upon request. The city has updated the original brochure and operates a composting demonstration site in a local park.

Curbside Collection Program Adopted:	1993
Container:	100-gallon can
Fee:	$5.00
Collection Frequency:	weekly
Yard Waste Destination:	public processing facility
Backyard Program:	information only

Education

When Pasadena implemented its unit pricing program, it provided residents information and education through a variety of outreach methods. Every household received a brochure describing the new system with a follow-up postcard. City officials attended public meetings to explain the system and answer residents' questions. The city also publicized the unit pricing system in newspaper articles.

After the start-up program, Pasadena now employs two programs to encourage source reduction. The City provides residents with a waste reduction checklist which contains helpful hints on measures to be taken to reduce waste at the source. The City also developed a "Do Buy" and "Don't Buy" product display which uses name brands in different forms of packaging. This display provides consumers with information regarding the volume of packaging and its recyclability in order to affect their purchasing decisions. The city provides brochures to residents regarding Christmas tree collection, backyard composting, curbside recycling, and the annual neighborhood clean-up. The city also undertakes outreach activities with the public libraries and schools.

Administration and Enforcement

The Pasadena Solid Waste Division administers the residential solid waste management program. The Division maintains responsibility for all single-family households and all dwellings with four or fewer households. For commercial businesses and multi-family dwellings with five or more households, the Division competes with 38 licensed private haulers for the right to serve them. The Solid Waste Division must recover all of its operating costs through collection rates, surcharges, grants and awards. It does not receive any subsidy from Pasadena's general fund. The city received seven grants totaling in excess of $200,000 between 1990 and 1994 for such programs as a multi-family recycling pilot program, a used motor oil recycling program, household hazardous waste education, and bar/restaurant recycling promotions.

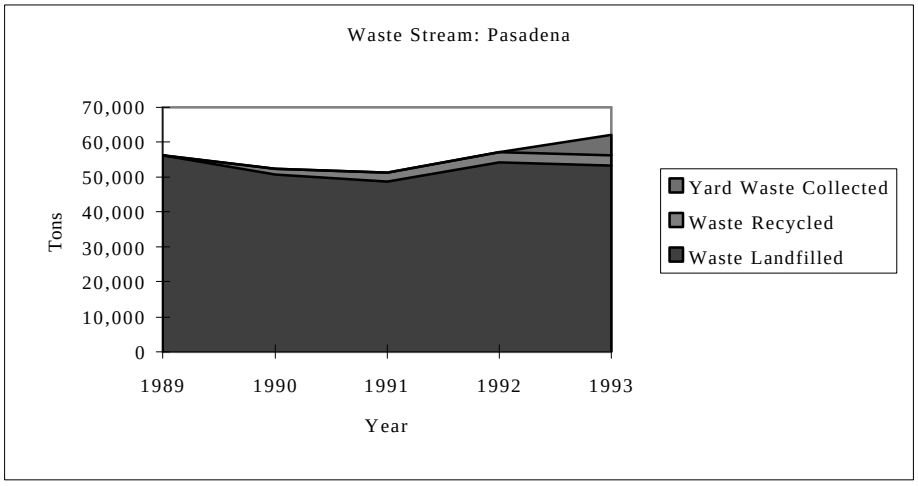
The city bills households once every two months for refuse collection. The households receive their refuse collection bill as a part of their utility bill (which includes water and electricity). By integrating all three utilities under one billing office, the city is able to more efficiently administer these services. Pasadena provides a customer service office to respond to residents' complaints, questions and requests for information.

Pasadena collects waste from overstuffed carts so long as the waste fits in the truck. The city places the following restrictions on the recyclable goods it collects: cardboard must be flattened, glass cannot be broken, newspaper must be flattened, and only two gallons of used motor oil allowed per week. Recycling collectors leave behind any non-recyclable materials in the recycling bins. Pasadena employed a yard waste inspection program when it implemented yard waste collection. An inspector would randomly check yard waste set-outs for contamination and tag carts for non-collection if the inspector found contaminants. The city abandoned the program when the rate of contamination fell to a low level, but recent increases in the contamination rate have forced Pasadena to reinstate the inspection program.

OUTCOMES

Waste Stream (tons)

Fiscal Year	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1989	56,275	0	0	56,275
1990	50,748	1,796	0	52,517
1991	48,706	2,514	0	51,220
1992	54,197	2,931	0	57,228
1993	53,234	3,004	6,030	62,268



Undesirable Diversion

Pasadena does not consider undesirable diversion activity a serious problem in Pasadena. City officials do not believe that illegal dumping, dumping in commercial dumpsters or burning of waste are problems. The Salvation Army does have to make several trips to the landfill weekly, and some of this results from illegally dumped waste at night.

Total Waste Generated

The amount of waste landfilled by Pasadena decreased soon after implementing its unit pricing program. At the same time, the amount of waste recycled increased. In recent years, however, the amount of waste landfilled has increased again, while recycling has begun to level off.

SAN JOSE, CALIFORNIA

DEMOGRAPHICS[1]

Jurisdiction:	City of San Jose
Population:	
Population:	782,225
Population Density (individuals per square mile) :	4,678
Number of Households:	251,050
Education (percent):	
Earned High School Diploma:	77.16
Earned Bachelor's Degree:	25.33
Ethnic Breakdown (percent):	
African-American:	4.65
Asian:	19.55
Hispanic:	26.08
Native American:	0.68
Economic Characteristics:	
Mean Per Capita Income:	$16,905
Median Household Income:	$46,206
Median Housing Value:	$257,500

Brief Description:

San Jose is the seat of Santa Clara County. The city lies in the Santa Clara Valley seven miles to the south of San Francisco Bay and 50 miles from San Francisco. San Jose is a major processing and distribution center for the region's agricultural production as well as a major producer of computers, electronic components and motor vehicles. The city's population has grown significantly since 1940, when 68,457 people resided within the city limits.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

San Jose named its waste collection system RECYCLE PLUS! The program consists of weekly curbside pick-up of garbage, recycling, and yard waste from every single-family household. Residents subscribe to a specific cart size and pay a monthly fee based on the volume of that cart. The rates have not changed since the implementation of the program in 1993. Residents may purchase additional waste stickers whenever they have more garbage than their carts will hold. The stickers cost $3.50 each, and may be attached to standard 32-gallon plastic garbage bags. The stickers are sold at city libraries, supermarkets and convenience stores. The city also provides waste collection to all multi-family dwellings, but these dwellings pay a flat fee for refuse collection. San Jose contracts with private waste hauling firms to provide its RECYCLING PLUS! services. Two firms collect refuse and recyclables. One serves approximately 80,000 single-family households in the northern half of the city as well as all of the multi-family complexes, and the other serves about 105,000 single-family households in the southern half of the city. Two different firms are responsible for yard waste collection along the same north-south boundary.

Residents may call the Customer Service section of the Environmental Services Department to arrange for special collection of bulky items, such as furniture and appliances. This service costs $18 for up to three items. The city collects Christmas trees and holiday greenery through its year-round yard waste collection program.

Unit Pricing Program Adopted: 1993

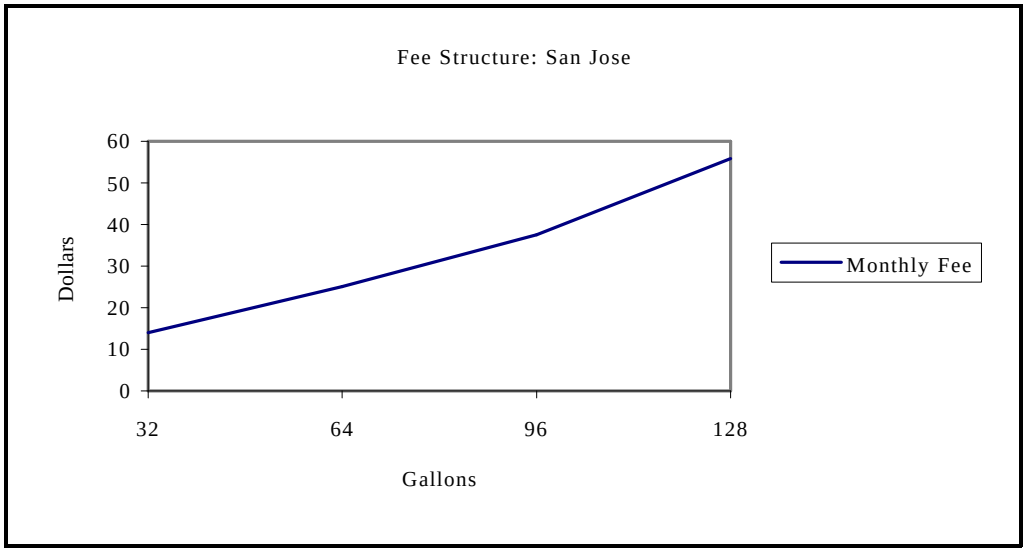
Container Type: cart/sticker

Collection Frequency: weekly

Households Served: 186,000

Fee Structure:

Cart Size	Fee
32-gallon	$13.95
64-gallon	$24.95
96-gallon	$37.50
128-gallon	$55.80



Disposal

San Jose sends all of its garbage to the Newby Island landfill facility, located about 15 minutes north of the city center on the southeastern edge of San Francisco Bay. Browning-Ferris Industries owns this post-RCRA landfill. The city has a 30-year contract with BFI and substantial capacity remains at the Newby Island landfill.

Landfill:	Newby Island, post-RCRA
Tipping Fee:	$26.11
Hauler Type:	private

Recycling

Residents receive three 18-gallon recycling bins: one for glass; one for junk mail, magazines and mixed paper; and one for newspaper. Each bin sports a written notice on its side in English, Spanish, and Vietnamese, indicating acceptable materials for recycling pick-up. Residents use a fourth container, typically their old garbage cans, for commingled aluminum, tin and metal cans, juice boxes and milk cartons, plastic bags, bottles and jugs, scrap metals, and textiles. Residents flatten and stack corrugated cardboard alongside the four containers and the city provides special jugs for used motor oil upon request. The private haulers responsible for recyclable pick-up operate their own recycled materials processing facilities where they sort and bundle the material they collect and sell it to buyers. City officials report that regional markets for recyclable materials are good.

Curbside Program Adopted:	1987
Collection Frequency:	weekly
Hauler Type:	private
Recycled Materials:	glass (brown, clear, green) plastic (coded 1) metal cans (aluminum, tin) newspaper mixed paper cardboard motor oil
Recycling Destination:	private processing facilities
Drop-off Centers:	yes

Yard Waste Collection

San Jose provides weekly yard waste collection. Residents pile their grass clippings, leaves, and small branches in the street, one foot from the curb. If residents live on narrow or busy streets, streets with posted "No Parking" signs, or streets with bike lanes contiguous to the curb, then they place their waste on city-issued tarps on the edge of their lawns. The collected yard waste goes to three composting facilities: Newby Island (35%); Zanker Road landfill, a local, privately-owned facility (15%); and Guadalupe landfill, also a local, privately-owned facility (50%). The city pays $22 per ton for these three facilities to accept, process and compost the material. Each facility produces a variety of products, tailored to a strong market among the region's farmers.

The city does not have a formal backyard composting program, but Santa Clara County does have a Master Composter program. The program makes composting kits available to any county resident wishing to purchase them, and provides information and training.

Curbside Collection Program Adopted:	1989
Container:	none
Fee:	none
Collection Frequency:	weekly
Yard Waste Destination:	three private composting facilities
Backyard Program:	Santa Clara County provides a voluntary program

Education

The city of San Jose runs an extensive public education program. The Environmental Services Department maintains an array of literature that can be picked up or mailed to residents upon request. The city prints all of its literature in English, Spanish, and Vietnamese. The Department also includes informational notices in residential bills throughout the year. The city operates a multi-media advertising campaign, consisting of local television, radio, and newspaper announcements. Current community relations efforts cost the city about $1 million per year.

The city spent $1.5 million in start-up education during 1993. The Environmental Services Department sent out letters to every residential household informing them of the new pricing system. City officials also attended numerous neighborhood meetings to explain the new system to residents and to answer questions. In addition, the city ran public service announcements in local newspapers and on radio and television.

San Jose University's Center for Development of Recycling plays an important role in city-wide citizen education efforts. The Center acts as a clearinghouse of information on recycling in San Jose and Santa Clara County. The Center's activities include: radio and television announcements; hotlines for source reduction campaigns, phone book recycling, and other special events; education material for city and county libraries; displays at local conventions and fairs; workshops and topics such as the disposal of construction and demolition debris; and a series of ongoing projects, including directories of San Jose recyclers, reuse opportunities in the area and used-appliance collectors.

Administration and Enforcement

The Integrated Waste Management Division of the city's Environmental Services Department administers the waste collection and recycling programs. The Customer Service division employs 20 customer service representatives who respond to inquiries from city residents. The division receives approximately 1,500 calls daily, most of which concern service and billing issues. Customer Service also oversees the Utility Billing Service, which bills residents for their collection service. The Billing Service coordinates with the contracted haulers and charges each household according to its level of service. At present, the Billing Service only covers waste collection, but it will eventually bill for all city services, including water and sewer.

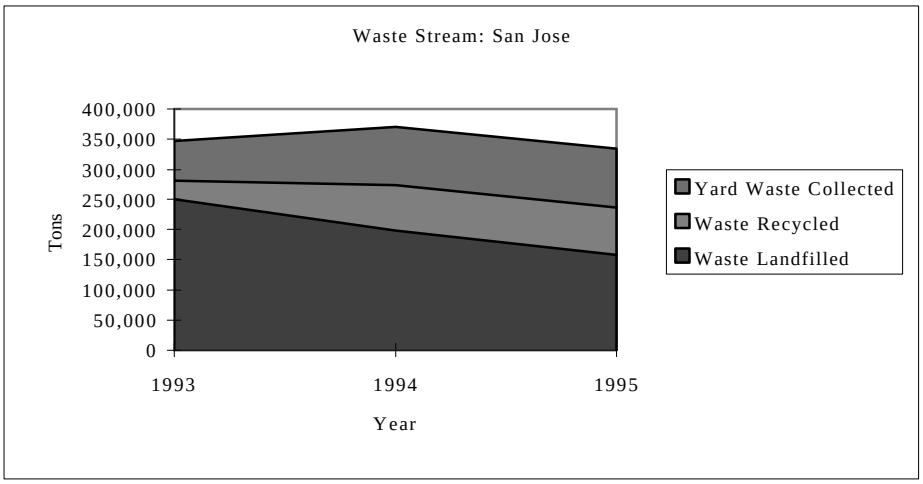
The contracted haulers only collect garbage located within a city cart or in a bag with a city extra waste tag. The top of the cart must close completely. If it is ajar, or if garbage is piled on top of the cart, the haulers do not collect it. They only collect bulky waste for which residents have made special arrangements with the city's Utility Billing Service. The haulers visually inspect recycling and yard waste set-outs, and do not collect material containing contaminants. Since a hydraulic arm lifts the carts onto the collection trucks, no enforceable weight limit on the carts exists. However, if drivers feel that a cart is too heavy (e.g., it is filled with dirt or concrete), they may choose not to collect it. Extra waste bags must not exceed 40 pounds, a loosely enforced restriction. The weight limit for yard waste is 60 pounds, and the piles may be no greater than five feet wide and five feet high. The haulers must be able to pick up the recycling containers easily. In the event of a violation of any of the above restrictions, the hauler leaves a non-collection notice indicating the specific nature of the offense. Any resident receiving such a notice must take care of the problem before the next collection date. Repeated violations result in an on-site visit from a representative of the city's Environmental Services Department. These measures usually resolve the problem. In the event of extreme abuse of the system, the city may levy fines.

OUTCOMES

Waste Stream (tons)

Fiscal Year	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1993	250,000	30,800	66,500	347,300
1994	197,900	75,700	96,800	370,400
1995*	158,400	78,400	96,400	333,200

* Data for FY 1995 are based on 6 months of data, and are extrapolated for a full fiscal year.



Undesirable Diversion

San Jose reports 170 tons of illegal dumping costing the city $500,000 for clean-up annually. Of this amount, 70% includes yard waste in quantities of one ton or greater, indicating that professional landscaping operations dump illegally. Construction debris or bulk items compose much of the rest of the collected waste, suggesting that households dump very little residential waste.

Anecdotal evidence indicates that dumping increased after the city adopted variable collection rates in 1993. Officials speculate that much of the attention illegal dumping receives results from an increased sensitivity to the issue rather than an actual increase in dumping. Further, higher levels of reported dumping may result from better reporting methods rather than actual increases. The three largest commercial haulers report that only a small fraction of their customers complain about people throwing waste in their dumpsters (between 0.1% and 1.0%). Two charitable organizations indicate that illegal dumping is a serious problem for them.

Total Waste Generated

The introduction of variable rates in July of 1993 made a significant impact on single-family residential waste diversion. Between fiscal year 1993 and fiscal year 1994, landfilled waste decreased by more than 20%, recycling increased 150% and yard waste set-outs jumped 45%. The overall diversion rate, from both recycling and yard waste collection, increased from 27% to nearly 50%. Overall waste generation, garbage, recycling and yard waste, increased by 7% in fiscal year 1994, but it is on pace to fall 10% in fiscal year 1995.

SANTA MONICA, CALIFORNIA

DEMOGRAPHICS[1]

Jurisdiction:	City of Santa Monica
Population:	
Population:	87,064
Population Density (individuals per square mile) :	10,490
Number of Households:	44,860
Education (percent):	
Earned High School Diploma:	87.50
Earned Bachelor's Degree:	43.40
Ethnic Breakdown (percent):	
African-American:	4.50
Asian:	6.37
Hispanic:	14.02
Native American:	0.44
Economic Characteristics:	
Mean Per Capita Income:	$29,134
Median Household Income:	$35,997
Median Housing Value:	$500,001

Brief Description:

Santa Monica resides in Los Angeles County on Santa Monica Bay, approximately fifteen miles from the center of Los Angeles proper. The city's economy depends primarily on the aircraft and aerospace industries, plastic components, and laser devices and systems. Electronics research and development also occurs in Santa Monica. The city's beaches attract tourists and local residents as well.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

Santa Monica implemented a unit pricing program in conjunction with the implementation of an automated collection system for its single-family dwellings. Through this program, residents subscribe to a specific cart volume for weekly collection. The city charges residents based on the type and number of containers set out for collection. If residents occasionally have extra trash that will not fit into their cart, they may purchase special collection bags from the city. Each bag holds up to 40 pounds of refuse and can be set out on any regular collection day. Residents may purchase bags in sets of five for $14.50. The city will only collect city-provided carts or bags.

Residents may drop off Christmas trees at one of four parks each year. Residents receive a tree seedling in exchange for bringing in a tree. The program began in 1988. Santa Monica collects white goods for a minimum fee of $25. In addition, residents may rent a 2-cubic yard bin for a special collection of bulk waste.

Unit Pricing Program Adopted: 1992

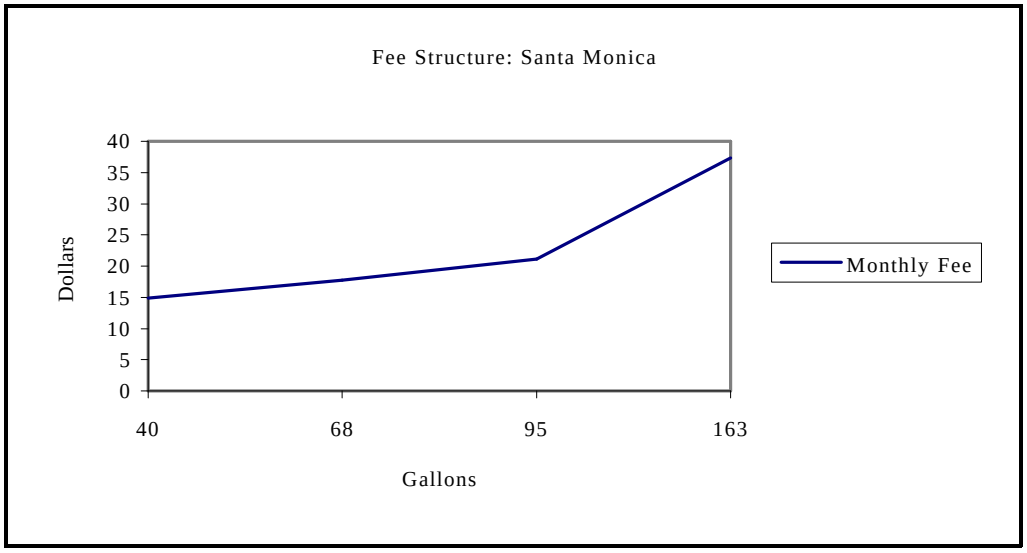
Container Type: cart/bag

Collection Frequency: weekly

Households Served: 8,000

Fee Structure:

Cart Volume	Fee (per month)
40-gallon	$14.84
68-gallon	$17.76
95-gallon	$21.07
95-gallon & 68-gallon	$37.27



Disposal

Santa Monica takes all collected waste to the Santa Monica Transfer Station. From there, the city transfers the waste to the Puente Hills Landfill located in Los Angeles County.

Landfill:	Puente Hills Landfill, pre-RCRA
Tipping Fee:	$48
Hauler Type:	public

Recycling

Santa Monica began a curbside recycling program in January 1981. The city currently services 7,500 single-family homes and 5,000 low-density multi-family households. The city collects recyclables weekly on the same day as refuse pick-up. Residents use two five-gallon buckets for glass, metals and plastics and a 14-gallon bin for newspaper. One-hundred drop-off recycling zones serve 34,000 high-density, multi-family units. Each recycling zone consists of at least three, 2-cubic yard bins. One bin is for newspaper; one is for glass bottles and jars; and one is for tin and aluminum cans and plastics (coded 1 through 5). While the city collects curbside recycling put-outs, the private sector processes the recyclable goods. Recycle America and Waste Management Incorporated maintain responsibility for processing recyclables and selling them to vendors on secondary materials markets. The regional markets for recyclable materials are strong.

Curbside Program Adopted:	1981
Collection Frequency:	weekly
Hauler Type:	public
Recycled Materials:	glass (brown, clear, green) plastic (coded 1, 2, 3, 4, 5) metal cans newspaper mixed paper
Recycling Destination:	private processing facilities
Drop-off Centers:	yes

Yard Waste Collection

Santa Monica does not provide a separate yard waste collection service. According to city officials, Santa Monica households' waste stream includes only about 13% yard waste. A separate collection program for yard waste would not be cost-effective for the city given this low percentage. The city sells backyard composting bins and holds periodic workshops on composting for city residents. Santa Monica collects all city park landscape trimmings and sends them to a facility for shredding.

Curbside Collection Program Adopted:	n/a
Container:	n/a
Fee:	n/a
Collection Frequency:	n/a
Yard Waste Destination:	n/a
Backyard Program:	yes

Education

Santa Monica provides information brochures on source reduction and reuse, grasscycling, and household hazardous wastes. The city prints brochures in English and Spanish. The city also provides informational workshops on backyard composting.

The city provides informational presentations to local neighborhood associations, businesses and community groups. In addition, Santa Monica employs local newspaper advertisements, newspaper articles, targeted direct mail, press releases and press conferences. The city produced a video entitled "Untrashing Santa Monica" for Santa Monica City-TV. This video explains the city's solid waste management program and the concept of source reduction.

Administration and Enforcement

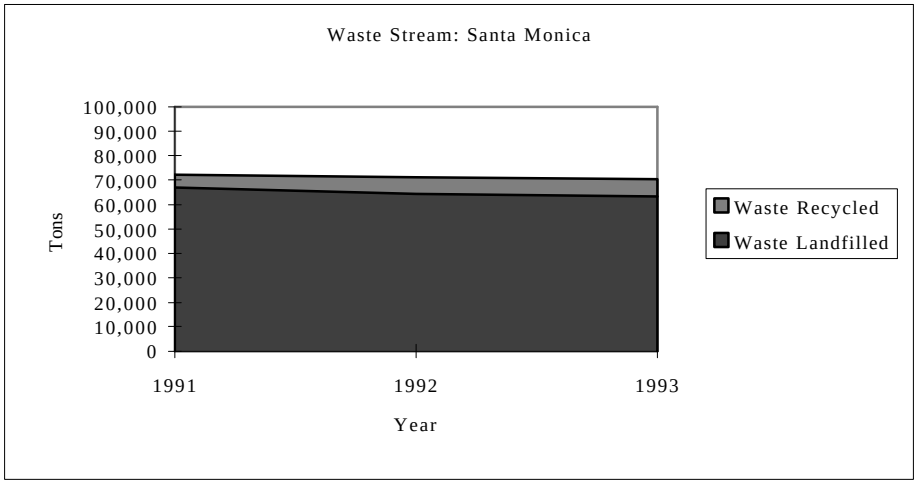
The Santa Monica Recycling Division employs seven recycling workers, one crew leader and one waste reduction coordinator. The budget for fiscal year 1994-1995 was $899,000. The unit pricing program revenues fully support trash collection and disposal; year round street sweeping services; litter collection containers throughout business districts; and comprehensive recycling services for the residential sector. The city bills residents bi-monthly. Santa Monica also provides a customer service office to respond to residents' complaints, requests for information and questions about the unit pricing program.

City waste collectors only pick up waste from city carts or city bags. The city does not collect waste from carts which are more than twelve inches ajar. Residents must separate recycled goods and place them in the appropriate bins. The city does not collect contaminated recyclables. If the collectors leave behind waste or recyclables, they place a non-collection notice indicating the violation on the cart or bin. Santa Monica has implemented an anti-scavenging ordinance preventing people from taking recyclable goods from bins set out for collection.

OUTCOMES

Waste Stream (tons)

Fiscal Year	Waste Landfilled	Waste Recycled	Total
1991	66,960	5,334	72,294
1992	64,368	6,636	71,004
1993	63,240	6,924	70,164



Undesirable Diversion

City officials do not consider undesirable diversion behavior a serious problem in Santa Monica. Occasionally, residents illegally dump white goods and furniture, however, city officials believe that their white goods collection and bulk waste collection alternatives minimize this behavior. Santa Monica has banned waste burning, and burning is not a problem. Most dumping of waste in commercial dumpsters results from illegal dumping by nearby businesses and not from the residential sector.

Total Waste Generated

Since Santa Monica implemented its unit pricing program in 1992, the city has experienced marginal decreases in its total waste generated and in its waste landfilled. Landfilled waste dropped about 5% and total waste generated dropped about 3% between the year preceding implementation of unit pricing, 1991, and the second year of the program, 1993.

WOODSTOCK, ILLINOIS

DEMOGRAPHICS[1]

Jurisdiction:	Village of Woodstock
Population:	
Population:	14,353
Population Density (individuals per square mile)	291
Number of Households:	5,411
Education (percent):	
Earned High School Diploma:	32.40
Earned Bachelor's Degree:	11.60
Ethnic Breakdown (percent):	
African-American:	0.56
Asian:	1.40
Hispanic:	7.43
Native American:	0.18
Economic Characteristics:	
Mean Per Capita Income:	$17,302
Median Household Income:	$31,458
Median Housing Value:	$99,777

Brief Description:

Woodstock is located about 65 miles northwest of Chicago in McHenry County. Once considered a remote, rural area, Woodstock has become more suburban as Chicago's urban sprawl overtakes it. Its population presently grows faster than any other municipality's in the area. Some of the manufacturing industries in Woodstock include Automatic Liquid Packaging, Claussen Pickle Company and Guardian Electric. The McHenry County government, the largest employer in Woodstock, employs 895 people.

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[1] All demographic data are based on the 1990 U.S. Census, except for population density which is derived from the U.S. Bureau of the Census. 1994. County and City Data Book: 1994. Washington, DC: G.P.O .

WASTE MANAGEMENT SYSTEM

Collection

Woodstock was the first municipality in Illinois to implement a volume-based fee when it switched to a pay-per-bag system in 1988. As local landfills neared capacity, the area searched for an alternative to curb the increasing waste generation. Under the unit pricing program, residents may purchase bags at City Hall and several retail establishments. Woodstock has a pure unit pricing program: there is no flat fee which the residents must pay. The city collects refuse bags on a weekly basis on two different days throughout the municipal limits. Only single household units participate in the program. Every three years the village awards the collection program to a private firm through a bidding process. The city sets the unit fees in order to guarantee a stable hauler revenue stream. Marengo Disposal presently services Woodstock.

In addition to waste collection, recyclable materials pick-up and composting, Woodstock also collects Christmas trees in January and bagged leaves in Autumn, free of charge. The Salvation Army collects appliances in working order free of charge for all residents in McHenry County. Through the McHenry County Spring Clean-Up, Woodstock residents may donate old clothes to several charitable organizations which will resale them. The village does not provide for special collection of bulk waste.

Unit Pricing Program Adopted: 1988

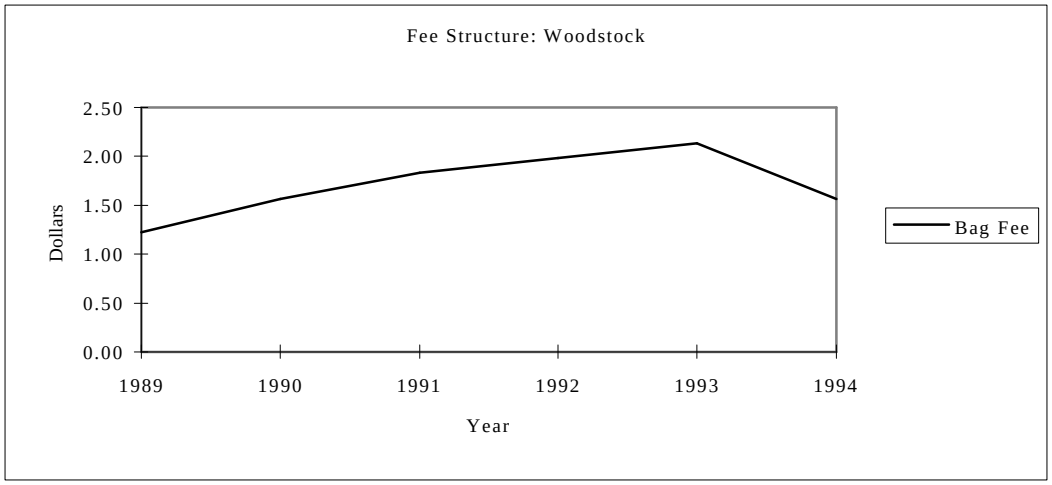
Container Type: bag

Collection Frequency: weekly

Households Served: 3,500

Fee Structure:

Year	Fee
1988	$1.12
1989	$1.22
1990	$1.56
1991	$1.83
1992	$1.98
1993	$2.13
1994	$1.56



Disposal

Marengo Disposal disposes Woodstock's waste at the Winnebago Reclamation Landfill, a post-RCRA facility, in Wisconsin.

Landfill:	Winnebago Reclamation Landfill **,** post-RCRA
Tipping Fee:	$35 per ton
Hauler Type:	private

Recycling

McHenry County is the first area to introduce a mandatory recycling ordinance in Illinois. Woodstock expanded its recycling program in 1987. The waste hauler maintains responsibility for curbside pick-up of recyclables on the same day as refuse collection. If a household generates recyclables in excess of the space in their recycling bin, they should place the excess in paper grocery bags. In addition, households must separate their recyclables into one of three categories: newspaper; other fibers (e.g., chipboard, magazines, office paper, junk mail, paper grocery bags); and plastic, glass and metal containers.

In addition to curbside pick-up, the McHenry County Defenders operates three recycling drop-off sites that handle some materials not collected at the curb, such as lead acid batteries and used motor oil. The recycling markets in the Chicago area are strong, although the price for fibers does fluctuate through time.

Curbside Program Adopted:	1987 (expanded)
Collection Frequency:	weekly
Hauler Type:	private
Recycled Materials:	glass (brown, clear, green) plastic (coded 1, 2, 3, 4) metal cans (aluminum, steel, tin) newspapers paper goods
Recycling Destination:	three private processing facilities
Drop-off Centers:	yes

Yard Waste Collection

Residents must place yard waste in Kraft paper bags, bundles or in open 30-gallon garbage cans. Residents must affix a yard waste sticker to each bag, bundle or can. Households may purchase yard waste stickers at the Woodstock City Hall. Marengo Disposal collects yard wastes weekly on the same day as refuse and recyclables collection. The hauler takes yard waste to the Laidlaw Compost facility in Rockridge. Woodstock provides informational brochures on composting from the county health department and the state government. In addition, the city has begun a backyard composting pilot program.

Curbside Collection Program Adopted:	1994
Container:	biodegradable bag or can with sticker
Fee:	$1.15 per sticker
Collection Frequency:	weekly
Yard Waste Destination:	private compost facility
Backyard Program:	pilot program (100 households)

Education

Woodstock's education programs include outreach efforts at local schools, distribution of pamphlets which describe alternatives for disposing of waste, and information on backyard composting. Woodstock also makes available state and county informational brochures on solid waste issues, such as composting options, alternatives to burning wastes, and paints disposal among others. McHenry County publishes a quarterly newsletter, Solid Waste Matters, to inform residents of the County's Total Solid Waste Management Plan.

Administration and Enforcement

Since the village contracts out its waste management services, Marengo Disposal maintains most of the administrative responsibilities for the program.

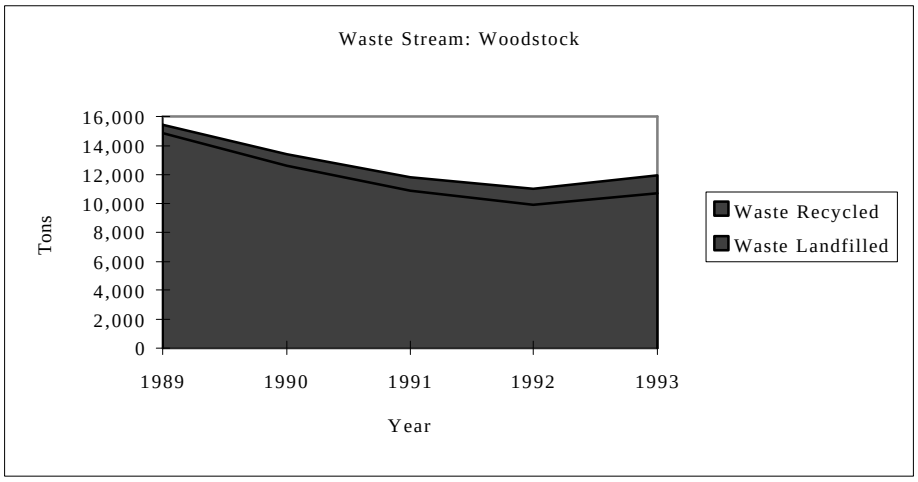
Through a state law, McHenry County must recycle 15% to 25% of its waste stream over the next several years. The McHenry County Department of Solid Waste Management enforces the county recycling ordinance which ensures the County's compliance with the state law. The Department addresses all household complaints and conducts monitoring for compliance. Under the county ordinance, households must separate their waste stream, and either place recyclables on the street for curbside pick-up or take them to a drop-off center. If a household does not separate its waste, then the waste collectors do not pick-up any of that household's trash. The recycling law applies to single-family residences as well as multi-family buildings.

In addition to the monitoring and compliance conducted by McHenry County, the Woodstock Police Department and the Woodstock Public Health Department receive and address complaints regarding illegal dumping. Village fines for illegal dumping range from $5 to $500. The village does not have an ordinance prohibiting the burning of yard waste.

OUTCOMES

Waste Stream (tons)

Fiscal Year	Waste Landfilled	Waste Recycled	Yard Waste Collected	Total
1989	14,829	623	0	15,452
1990	12,604	755	0	13,359
1991	10,874	956	0	11,830
1992	9,886	1,112	0	10,998
1993	10,710	1,238	0	11,948



Undesirable Diversion

Burning refuse has become a particular problem in Woodstock since the implementation of the unit pricing program. In addition to burning yard waste, some residents burn refuse. The low population density facilitates the incineration of large piles of refuse and yard waste without detection. County health officials claim that this is the worst side effect attributable to Woodstock's unit pricing program. Littering has also become a problem on isolated roads and lots. Many residents claim that the littering problem predates the implementation of the unit pricing program.

Total Waste Generated

Since the implementation of the unit pricing program, the number of refuse bags used by a household per week has decreased 28%. At the same time, recycling ton nages have increased by 50%. Woodstock could not provide

data on yard waste collection since the village implemented the program in 1994.