

OSWØØØ 776

A NATIONAL SURVEY OF
SEPARATE COLLECTION PROGRAMS

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER AND
HAZARDOUS MATERIALS

To Municipal Officials:

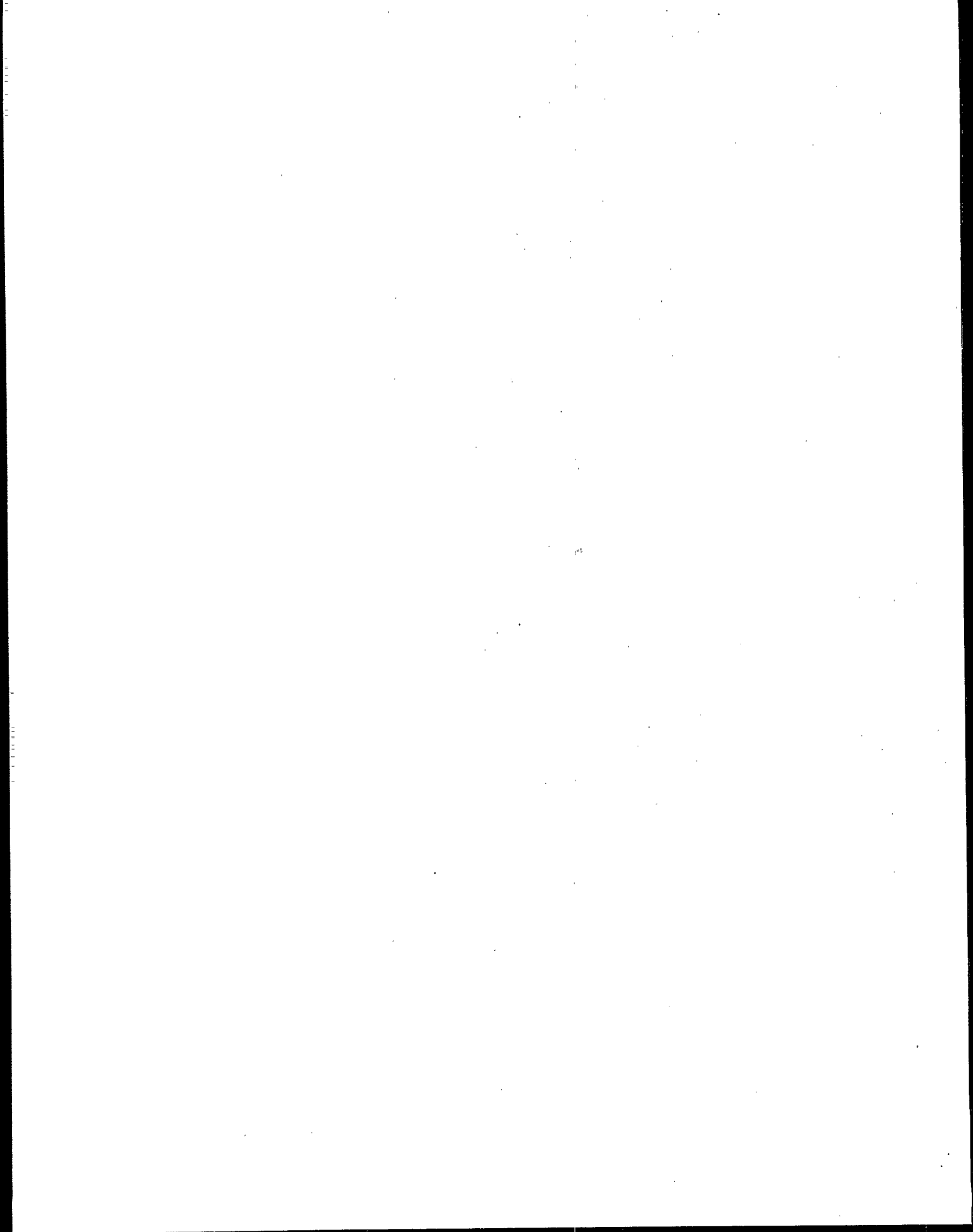
The purpose of this publication is to provide you with a comprehensive overview of separate collection program activities throughout the United States. This information should be particularly helpful to those of you who are interested in implementing a separate collection program. Moreover, we view this publication as complementing the more in-depth technical assistance which can be provided through the Technical Assistance Panels program mandated by the recently enacted Resource Conservation and Recovery Act of 1976.

Since the Environmental Protection Agency began tracking nationwide newspaper recovery activities, we have seen the number of separate collection programs increase from two programs in 1970 to 218 programs in 1978. Separate collection programs have successfully helped to reduce municipal waste quantities and, in turn, extended the life of our sanitary landfills. At the same time, separate collection has also helped to conserve resources having significant economic value.

We hope that this publication will be an informative and useful document for both you and your community.

Sincerely yours,

Steffen W. Plehn
Deputy Assistant Administrator
for Solid Waste



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I. SUMMARY

THE NATIONAL PICTURE

- ° The number of separate collection programs increased from 118 programs in August 1974 to 218 programs in May 1978.
- ° The majority of separate collection programs are located in the northeastern, mid-Atlantic, mid-western, and mid-Pacific sections of the United States. More than one-half of all programs are found in the northeastern and mid-Atlantic sections of the United States. It appears that the regional solid waste disposal problem in these areas has prompted many communities to initiate programs.
- ° Ninety-nine percent of the programs surveyed collected some form of wastepaper (76 percent collected newspaper, while 23 percent collected mixed wastepaper). Glass was collected by 16 percent of the programs surveyed, while metal was collected by 14 percent of the programs.
- ° The number of multimaterial separate collection programs increased from two programs in 1974 to 40 programs in 1978. The majority of multimaterial programs are located in the northeastern and western sections of the United States. The formation of an intermediate processing industry in the Northeast and the abundance of glass plants and metals markets on the West Coast have prompted communities in these areas to initiate multimaterial programs.
- ° Forty-six percent of the communities surveyed cited a desire to conserve resources as a major reason for separate collection program initiation. Forty-one percent of the programs cited community interest in recycling, 16 percent cited a desire to reduce solid waste volumes, and 15 percent cited a desire to reduce landfill costs as their major motivation.

Significantly, 42 percent of the communities in the Northeast cited the need to reduce solid waste volumes as a major reason for starting separate collection as compared to only 18 percent of the midwestern communities and 16 percent of the communities in the Washington, D.C.-Maryland-Virginia area.

- Forty-two percent of the programs reported participation rates of 20 to 49 percent. Twenty-seven percent of the communities had participation rates of 50 to 100 percent. Thirty-one percent of the communities had participation rates of less than 20 percent.
- Although not a strong relationship, participation rates were found to be significantly related to the mean income and the median education of residents in a separate collection community. Likewise, newspaper diversion rates were also significantly related to the mean income and median education of residents in a separate collection community. Therefore, it appears that the likelihood of higher participation rates increases as the income and education of residents rises.

MARKETS

- Thirty-nine percent of the programs surveyed had contracts with materials dealers or manufacturers to sell the recyclable materials. A majority of the material contracts pertained to the sale of newsprint and mixed wastepaper.
- More than 75 percent of the contracts signed by communities surveyed had a duration of 1 year. Approximately 11 percent had contracts of 2 years, the remaining 13 percent had contracts of 3 years or more.
- Forty-five percent of the programs signed contracts with both a floor price and a floating price above the floor price. Thirty-seven percent of the communities signed contracts with only fixed price provisions.

- ° The recession in the United States between August 1974 and July 1975 severely affected separate collection programs. Thirty-eight separate collection programs were discontinued between 1974 and 1975. More than one-third of the 38 communities cited the lack of markets for newspaper as their major reason for stopping the program. One-fourth of the 38 communities cited declining newspaper prices as one of several reasons for discontinuing their separate collection program.
- ° Approximately 75 percent of the programs that continued separate collection throughout the recession responded that material prices were reduced during that period.
- ° Nineteen percent of the programs could not find markets interested in purchasing wastepaper during certain periods of the recession. These programs continued collection and either stored or landfilled the paper until markets were found.
- ° Communities holding contracts with paper dealers and manufacturers during the recession reported much higher prices than the majority of those programs that did not have material contracts.

COLLECTION PRACTICES

- ° Municipalities were responsible for collecting recyclables in 57 percent of the programs surveyed. The remaining 29 percent and 12 percent of collection responsibilities were undertaken by private collection firms and community organizations, respectively.
- ° Approximately 72 percent of all separate collection programs use the separate truck approach to collect recyclables, 22 percent of the programs use the rack method, 5 percent use the trailer method, and 2 percent use the compartmentalized vehicle method. Since 1974, use of separate truck method decreased by 12 percent, while use of the rack method increased 7 percent.
- ° Forty percent of the programs surveyed collected recyclables at a frequency of once a week. Approximately 29 percent of the programs collected recyclables at a frequency of once a month.

ORDINANCES

- ° Twenty-four percent of the programs surveyed had ordinances mandating that residents separate desired recyclable materials from mixed refuse.
- ° It appears that most separate collection ordinances are not enforced. Enforcement of separate collection ordinances, when it was reported, ranged from phone calls to residents who failed to separate recyclables from mixed refuse to refusal of the collector to pick up mixed refuse.
- ° The likelihood of a high participation rate appears greater in a mandatory program than in a voluntary program, given similar socioeconomic characteristics of residents, collection frequency, and publicity campaigns. Fifty-nine percent of the mandatory programs had participation rates of 50 percent or more, while only 19 percent of the voluntary programs had participation rates in the same category. Similarly, only 11 percent of the mandatory programs had participation rates of 19 percent or less as compared to 36 percent of the voluntary programs.
- ° The likelihood of high newspaper diversion rates also appears greater in mandatory programs than in voluntary programs.
- ° Approximately two-thirds of the programs surveyed stated that scavengers were a problem, especially when market prices for wastepaper were high. However, only 51 percent of the programs had an antiscavenging ordinance.
- ° Sixty-one percent of the 51 communities responding to the ordinance enforcement question stated that the ordinance was enforced. However, results of scavenger ordinance enforcement appear questionable given the large number of communities that did not respond to the question. Many of the 39 percent of those communities that claimed the scavenger ordinance was not enforced stated that the ordinance was not enforceable.

PUBLICITY

- ° Approximately 99 percent of the programs surveyed publicized their separate collection programs prior to its implementation.
- ° Newspaper publicity, usually in the form of advertisements and articles about program operation, was used by 91 percent of the communities before implementation. Circulars and announcements to civic groups, announcing the start of the program, were used by 51 percent and 31 percent of the programs, respectively. A letter from the mayor or other elected official, perceived to be the most effective publicity to generate participation, was used by 21.7 percent of the programs before implementation.
- ° Local environmental groups, garden clubs, and neighborhood organizations played a large role in setting up publicity campaigns.
- ° Publicity campaigns after implementation of separate collection programs were very similar to the types of publicity used prior to implementation. However, many communities significantly reduced the amount of publicity going to its residents once separate collection had begun. In addition, many communities used less expensive forms of publicity once the program had started.

II. INTRODUCTION

Municipal solid waste management is a significant problem for municipal governments.*

- o Presently, collection, transportation, and disposal of one ton of solid waste averages \$43. By 1985, collection, transportation, and disposal costs are expected to increase to \$50 per ton of solid waste because of escalating landfill disposal costs, costs associated with strict antipollution requirements, and general inflation.¹ Collection, transportation, and disposal costs currently exceed \$55 per solid waste ton in Washington, D.C., and New York City.
- o Municipal solid waste generation in the U.S. has doubled since the early 1950's and is expected to grow substantially over the next 10 to 15 years.²
- o Many communities are finding it increasingly difficult to locate new landfill disposal sites because of rising land costs and public opposition toward landfill siting.

*Appendix A presents a breakdown of the municipal solid waste stream.

Solid Waste Management Alternatives

A variety of alternatives can be considered by local communities in reducing the amount of solid waste which must be disposed of. Although each alternative has its advantages and disadvantages with regard to the costs associated with collection, transportation, and disposal of municipal solid waste, no alternative by itself provides an all encompassing solution to the solid waste problem.

Reduction

Some States have chosen to reduce their solid waste volumes by using mandatory deposits on beverage containers, product design regulations, or disposal taxes. Waste stream reduction generally results in reduced costs for solid waste collection, transportation, and disposal.

Resource Recovery Systems

Some municipalities have constructed resource recovery facilities. Most large-scale resource recovery systems recover energy from the organic fraction of waste and ferrous metals from the inorganic fraction. A few municipalities have also attempted to recover glass and aluminum from the waste stream (these subsystems are still in the developmental stages).

Source Separation

Many municipalities have implemented source separation programs. Source separation is defined as the setting aside of recyclable materials at their point of generation (home, place of business, etc.) by the generator.³ Once recyclable materials are separated, they may be transported to a secondary materials dealer or manufacturer by the generator, municipal collection crews, private haulers, or community organizations.

The success of source separation programs depends heavily on gaining resident cooperation in separating the desired recyclable materials. Two methods of source separation are currently practiced by municipal governments in the U.S.: reclamation centers and separate collection programs.

Reclamation centers were first established circa Earth Day 1970 by environmentally concerned community organizations.⁴ The reclamation center method of source separation asks residents to set aside and transport recyclable material to a central storage point, e.g., warehouse, storage yard.

Because each recyclable material is housed in a different storage container, reclamation centers can choose to accept an unlimited number of recyclable materials depending on the

availability of local material markets. The quality of recyclable materials at a reclamation center is generally very good because of the considerable amount of handsorting by the center management and by the resident. Startup and operating costs of reclamation centers are very low in comparison to resource recovery plants.

The first city-wide separate collection program was started in Madison, Wisconsin, in 1968. The separate collection method of source separation asks residents to set aside and place recyclable materials out for collection. Materials are collected by either municipal collection crews, private haulers, or community organizations.

The likelihood of resident participation is significantly greater in separate collection programs than in reclamation centers because residents are provided the convenience of having their recyclable materials collected from their homes. As a result of the greater expected resident participation, it is also expected that solid waste disposal quantities and costs on a per ton basis would be substantially more reduced in separate collection programs than in reclamation centers. However, contamination levels of materials are frequently greater in separate collection programs than reclamation centers because of the greater volumes of materials recovered and decreased amounts of hand sorting.

The number of separate collection programs increased substantially between 1970 and 1974. In 1970, San Francisco, California and Madison, Wisconsin were operating the only separate collection programs in the U.S. In August of 1974, the U.S. Environmental Protection Agency (EPA) conducted a telephone survey and identified 118 separate collection programs in the U.S.⁵ Also at that time, EPA received detailed information on the performance and costs associated with 22 separate collection case study locations.⁶

Since August 1974, however, no specific research has been conducted on the growth and operation of separate collection programs in the U.S. Because of the perceived growth of separate collection programs since 1974, EPA decided in June 1977, to perform an in-house national study on separate collection programs.

Purpose and Scope

This report presents the results of a national telephone survey of 205 separate collection programs* throughout the country from July 1977 to September 1977. Using a survey sample of 177** programs, this report sought:

- o To describe national and regional trends in separate collection program growth since August 1974.
- o To describe trends in separate collection program design markets for recovered materials, publicity, collection practices, and ordinances.
- o To determine which aspects of separate collection program design encourage high resident participation and high solid waste diversion rates.
- o To inform municipalities interested in starting a separate collection program how communities are presently operating programs.

*For purposes of this study, a separate collection program was defined as scheduled collection (once per week, twice per month, etc.) of separated recyclable waste material(s) from residences and/or commercial establishments. The definition pertains to all political jurisdictions.

**As of September 1977, 205 separate collection programs had been identified by EPA. Only 177 of the 205 programs had enough information to be included in the sample. Since September 1977, an additional 13 programs have been located by EPA. The additional 13 programs were not included in the survey.

Chapter III, THE NATIONAL PICTURE, provides a general overview of separate collection program growth; program location; materials collected; multimaterial programs; reasons for program initiation; participation rates; diverted disposal quantities; and relationships between socioeconomic characteristics of communities and program success.

Chapter IV, MARKETS, reviews those practices used by communities to sell recyclable materials. In particular, this chapter provides information on the number of communities holding contracts with material dealers, the duration of material contracts, and material contract provisions. Chapter II also documents the effect that the 1974-75 recession had on separate collection programs and their material markets.

Chapter V, COLLECTION PRACTICES, describes the procedures communities are using to collect separated recyclable materials. More specifically, Chapter III outlines collection responsibilities, collection area size, methods of collection, and frequency of separate collection.

Chapter VI, ORDINANCES, provides information on the number of communities with separate collection ordinances and how these ordinances are enforced. Chapter IV also looks at the effect that separate collection ordinances have on

participation rates and waste diversion rates. In addition, this chapter provides information on the number of communities with antiscavenging ordinances and methods for enforcing these ordinances.

Chapter VII, PUBLICITY, describes and evaluates the publicity methods used by separate collection communities throughout the U.S.

III. THE NATIONAL PICTURE

As of May 1978, EPA had identified 218 separate collection programs operating in the United States (Appendix B). The 1978 total represents an 82 percent increase over the 118 programs operating in August 1974 (Figure 1). Approximately 140,000 tons of wastepaper*, 13,000 tons of glass**, and 9,000 tons of metal*** were recycled in 1977 through these programs.

Program Location

The majority of separate collection recycling programs are located in the northeastern, mid-Atlantic, mid-western, and mid-Pacific sections of the U.S. (Figure 2). In particular, strong wastepaper markets in New Jersey, New York, Connecticut, Massachusetts, Wisconsin, and California have encouraged many communities to initiate separate collection programs.

More than one-half of all separate collection programs are found in the northeastern and mid-Atlantic sections of the U.S. In addition to the strong markets for wastepaper, it

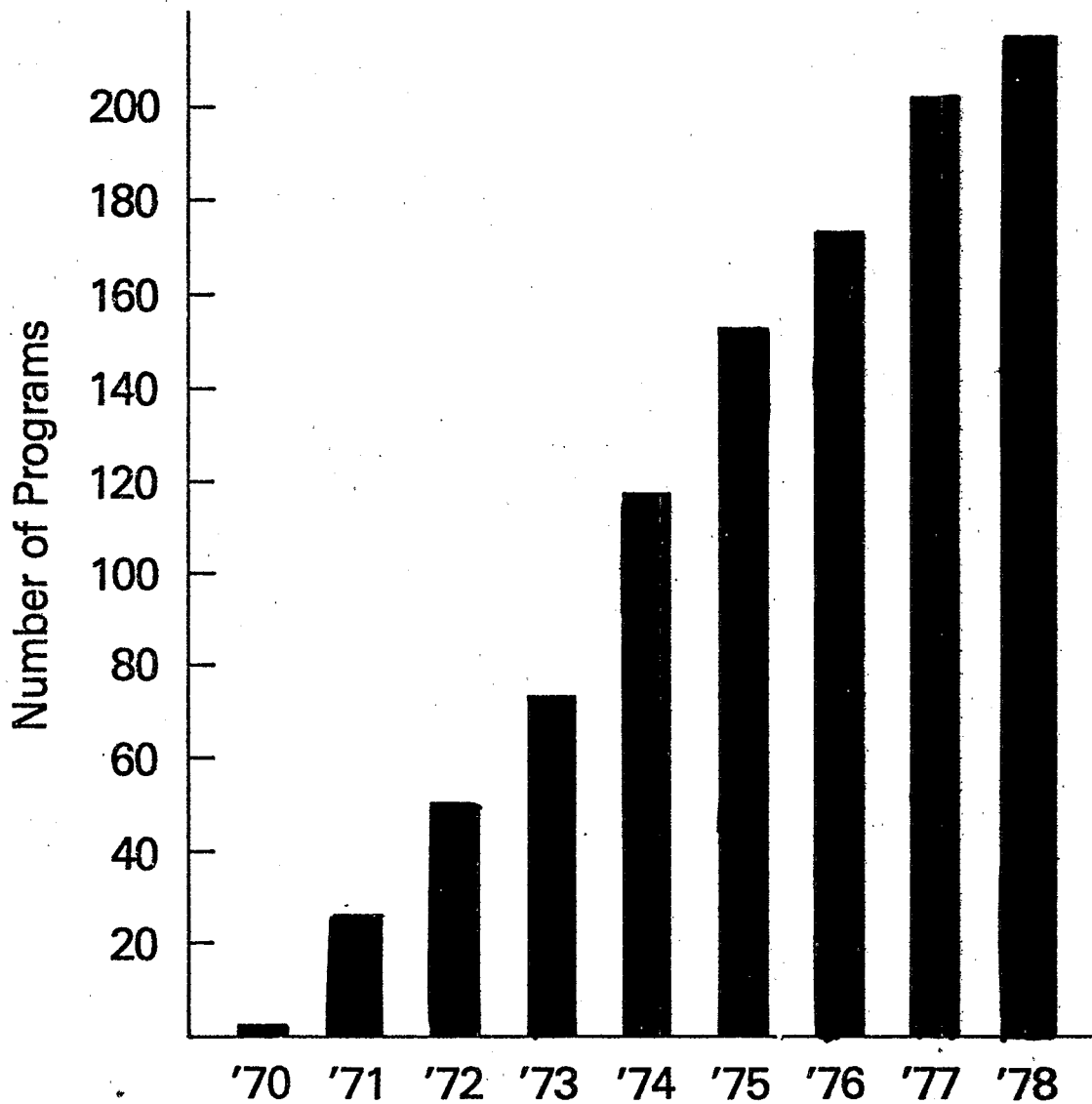
*Based upon estimates from 156 programs collecting wastepaper. Estimate does not include the unknown quantity of wastepaper collected by unauthorized scavengers and volunteer efforts.

**Based upon estimates from 22 programs collecting glass.

***Based upon estimates from 16 programs collecting metals.

FIGURE 1

SEPARATE COLLECTION PROGRAMS (1970-1978)



SEPARATE COLLECTION PROGRAMS 1978

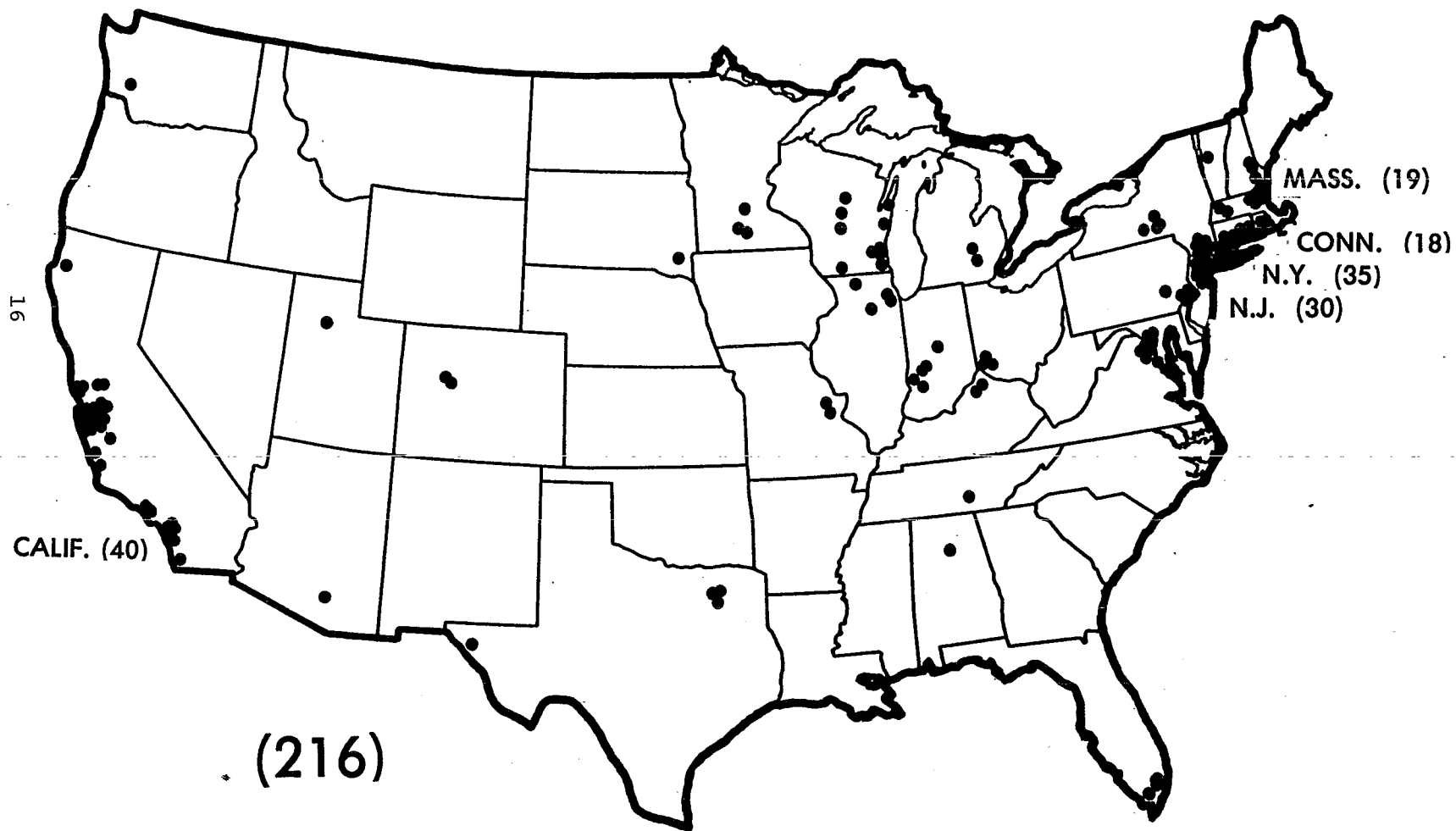


FIGURE 2

appears the abundance of programs in the northeastern and mid-Atlantic regions is also a result of the regional solid waste disposal problem. The need to reduce solid waste disposal volumes has become acute because: 1) many existing landfills are near capacity; 2) new landfill sitings within or near municipalities are very difficult due to political and social opposition; and 3) many communities are experiencing increased costs associated with longer hauling distances to new landfill sites.

Although little separate collection activity has taken place in the southeastern section of the U.S., it appears that a large paper manufacturer's recent decision to locate its plant in Dublin, Georgia will influence many communities to implement separate collection programs there. Since October of 1977, six separate collection programs have begun in the Southeast. The lack of separate collection activity in the remaining sections of the U.S. can largely be explained by either the lack of material markets, competition from recycling centers, and/or a lesser need to reduce solid waste volumes.

Materials Collected

Approximately 99 percent of the 177 programs surveyed collected some form of wastepaper (Table 1). More specifically, newspaper* was collected by 76 percent of the

*Consists of old newspaper recovered from residential sources.

programs. Mixed wastepaper* was collected by 22.9 percent of the 177 programs surveyed. Only three of these programs did not collect any type of wastepaper, but solely collected glass and/or metal.

TABLE 1

RECYCLABLES COLLECTED

Recyclables	Number of Programs Collecting Recyclables	Percentage (177 programs)
Newspaper	133	76.0
Mixed wastepaper	41	22.9
Glass (mixed and color sorted)	28	15.8
Metal (aluminum, bi-metal, tin)	24	13.5

Of the 133 programs collecting newspaper, 110 (82.7 percent) solely collected newspaper and no other recyclables. Likewise, 32 (78 percent) of the 41 mixed wastepaper programs only collected mixed wastepaper. The high percentage of communities collecting only one type of wastepaper and no other recyclables points to the growing desire of communities to remove that portion of the waste stream with the greatest volume. In addition, when compared to other recyclable materials, wastepaper markets are most readily available.

*Consists of approximately 80 percent old newspapers (by weight) and 20 percent unsorted mixed papers (by weight).

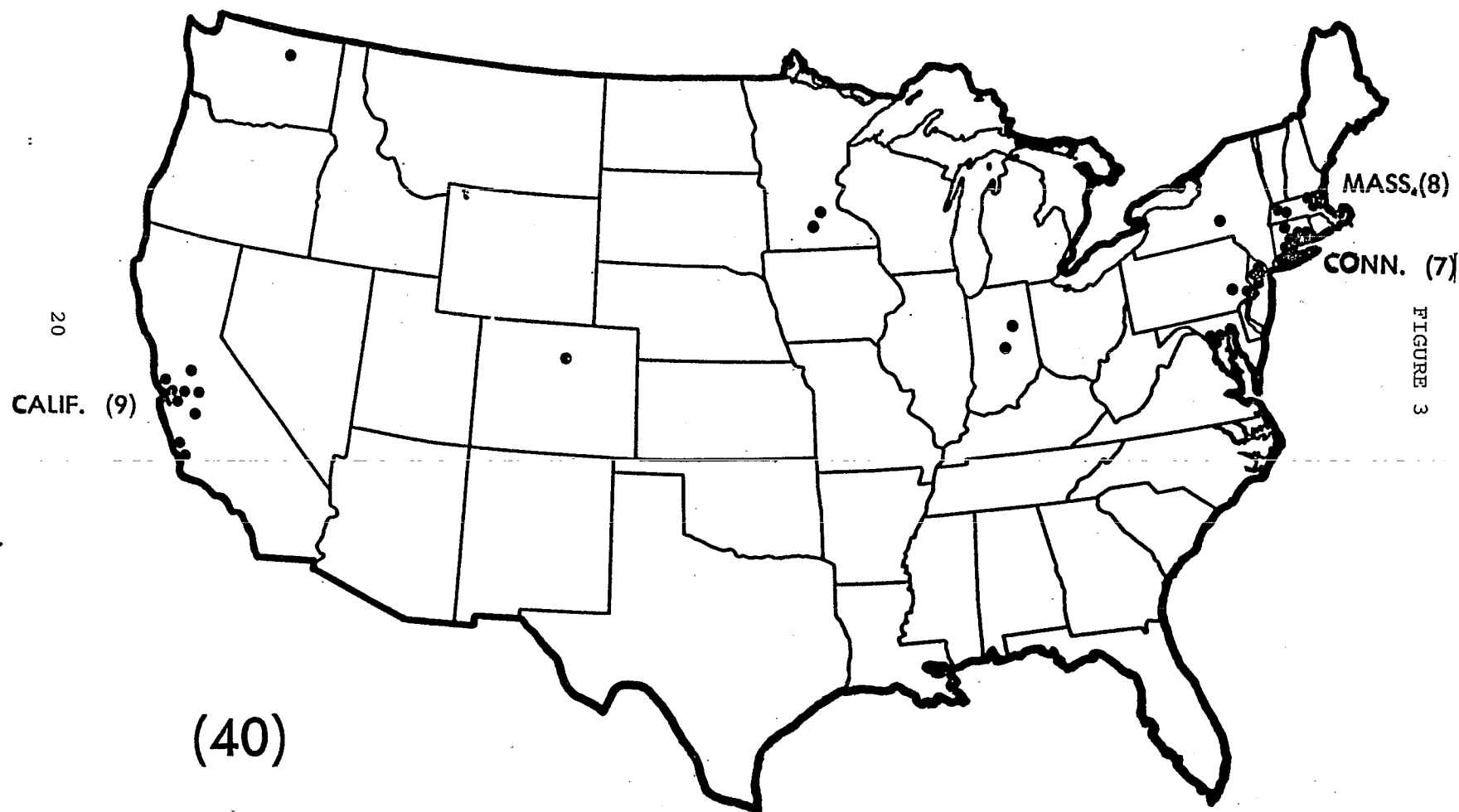
Glass was collected by 15.8 percent of the programs surveyed, while metal was collected by 13.5 percent of the programs. As mentioned above, only three programs solely collected glass and/or metals.

Multimaterial Programs

The number of multimaterial separate collection programs, i.e., programs where two or more recyclables are collected, significantly increased from two programs in 1974 to 40 programs in 1978. Of the 177 programs surveyed, approximately 20 percent were conducting multimaterial programs. Appendix C is a listing of multimaterial program locations in the U.S. and the materials collected.

Multimaterial separate collection programs are concentrated in the northeastern and western sections of the U.S. (Figure 3). The formation of an intermediate processing industry in the Northeast has provided communities with the opportunity to collect a mixture of sorted glass (by color) and cans.⁷ The intermediate processing industry purchases the glass and can mixture from separate collection programs and prepares the recyclables for the final market through an operation of magnetic can separation and glass crushing and screening. The abundance of multimaterial programs in the western U.S.

MULTIMATERIAL SEPARATE COLLECTION PROGRAMS 1978



is partially a result of the large number of glass plants and metals markets in this section of the country. More importantly, communities can collect a mixture of clear, green, and brown glass because wineries in California do not require that glass be sorted by color.

Program Initiation

Table 2 presents the reasons communities initiated separate collection programs. A desire to conserve resources was cited by 46.3 percent of the separate collection programs. Forty-one (41) percent of the programs cited community interest in recycling as their reason for separate collection initiation. The desire to reduce solid waste volumes and the desire to reduce landfill costs (Table 2) were cited by 16 percent and 15 percent of the programs respectively. Taken together, these two reasons for separate collection initiation highlight local concern over increased solid waste transportation and disposal costs. Only 10 percent of the 177 programs cited the desire for financial profit as a reason for starting a separate collection program. Significantly, the majority of these programs were operated by community organizations, unsupported by public funds.

TABLE 2

REASON FOR STARTING PROGRAM

Reason	Number of Programs*	Percentage of 177 Respondents**	Percentage Responding
Conserve resources	82	46.3	31.4
Community interest in recycling	73	41.2	28.0
Reduce solid waste	41	23.1	15.7
Landfill costs	39	22.0	14.9
Financial profit	26	14.7	10.0
TOTAL	261	-	100.0

*177 programs responding. However, multiple reasons cause the sum to exceed the total number of respondents.

**Multiple responses cause the sum to exceed 100 percent.

Total Missing Cases: 0

Significantly, 42 percent of the communities in the Northeast cited the need to reduce solid waste volumes as a major reason for starting separate collection, as compared to only 17.8 percent of the midwestern communities and 16 percent of the communities in the Washington, D.C., Maryland, and Virginia area. Landfills are also apparently nearing capacity on the West Coast, as 32 percent of these communities noted that they began a separate collection program to reduce the volume of solid waste. As expected, 32 percent

of the communities in the Northeast and 24 percent of the communities in the New York/New Jersey area cited rising landfill costs as a major reason for starting a separate collection program. In comparison, only 16 percent of the communities in the Washington, D.C., Maryland and Virginia area, 18 percent of the communities in the Midwest, and 11 percent of the communities on the West Coast cited rising landfill costs as a major reason for starting separate collection.

Participation Rates

As mentioned earlier, the success of separate collection programs depends most heavily on getting residents to separate the desired recyclables from mixed refuse. Participation rates of residents help the program sponsor determine the community response to a separate collection program.

Participation rates can be measured using two major methods:

- o Determining the percentage of residents who place recyclables out each collection day.
- o Determining the percentage of residents who place recyclables out during a given time period, e.g., weekly or monthly.

The percentage of persons placing recyclables out each collection day is usually less than the percentage of residents placing recyclables out over a longer time period, e.g., week, month, because most individuals do not participate in the program each collection day. Participation rates are also affected by the frequency of separate collection. Therefore, the decision to use one method of measuring participation rates over another should be tailored to the information needs of the program.

Few of the separate collection programs surveyed kept adequate participation rate records because of the time and expense involved in collecting the data. Therefore, the majority of the separate collection programs estimated, rather than calculated, the participation rate.

Table 3 is a breakdown of monthly participation rates based on the responses of 124 programs. Participation rate was defined as the percentage of residents who placed out recyclables at least once per month, regardless of collection frequency. The majority of the 124 separate collection programs (42 percent) reported monthly participation rates between 20 and 49 percent. Approximately 31 percent of the programs reported participation rates of less than 20 percent. Twenty-eight (28) percent of the programs had participation rates of 50 percent or more. Participation

rate estimates from 24 separate collection programs were classified as "bad data" and not used in the study. Estimates from these 24 programs were totally unrealistic, given the reported material tonnage recycled each month and the reported collection area size (Table 3).

TABLE 3
PARTICIPATION RATES

Participation Rate (percent of persons placing out recyclables at least once per month)	Number of Programs	Percentage
High (50-100)	34	27.4
Medium (20-49)	52	41.9
Low (less than 20)	38	30.7
TOTAL	124	100.0
Bad Data: 24		
No Answer: 29		
<u>Total Missing Cases: 53</u>		

Diverted Disposal Quantities

One of the best methods for measuring the performance of separate collection programs is to calculate the quantity of waste that is diverted from disposal . Unfortunately, reliable waste disposal data was not available from the

majority of the communities surveyed. Table 4 presents the quantity of newspaper diverted per month per 1,000 persons. Newspaper diversion rates were computed for 114 programs and categorized according to poor, fair, good, or excellent diversion rates (Table 4). Approximately 32 percent of the 114 programs had diversion rates of less than .44 tons per 1,000 persons per month. Twenty-eight (28) percent of the newspaper programs had diversion rates from .45-1.11 tons of per thousand people per month. Approximately 25 percent of the newspaper programs had diversion rates from 1.12-2.09 tons per thousand people per month. Only 15 percent of the newspaper programs had diversion rates of more than 2.10 tons per thousand persons per month.

TABLE 4
NEWSPAPER TONNAGES DIVERTED
PER THOUSAND PERSONS PER MONTH

<u>Tons Diverted per Thousand Persons per Month</u>	<u>Number of Programs</u>	<u>Percentage</u>
Poor ($\leq .44$)	36	31.6
Fair (.45-1.11)	32	28.1
Good (1.12-2.09)	29	25.4
Excellent (≥ 2.10)	17	14.9
<hr/>		
TOTAL	114	100.0
<hr/>		
No Answer: 21		
Not Applicable: 42		
Total Missing Cases: 63		
<hr/>		

Table 5 presents the quantity of mixed wastepaper diverted per month per thousand persons. Approximately 21.7 percent of the mixed wastepaper programs diverted less than 0.85 tons per thousand persons per month. The majority of mixed wastepaper programs (37.8 percent) had diversion rates from .86-2.01 tons per thousand persons per month. Sixteen (16) percent of the mixed wastepaper programs had diversion rates of 2.92-2.79 per thousand persons per month. Approximately 24 percent of the mixed wastepaper programs had diversion rates of more than 2.8 tons per thousand persons per month (Table 5).

TABLE 5

MIXED PAPER TONNAGES DIVERTED
PER THOUSAND PERSONS PER MONTH

Tons Diverted per Thousand Persons per Month	Number of Programs	Percentage
Poor (0.85)	8	21.7
Fair (0.86-2.01)	14	37.8
Good (2.02-2.79)	6	16.2
Excellent (2.8)	9	24.3
TOTAL	37	100.0
No Answer: 3		
Not Applicable: 137		
Total Missing Cases: 140		

Socioeconomics and Program Success

Tables 6, 7, 8, and 9 present 1970 census data describing median age, median education, mean income of individuals, and population density in approximately 165 separate collection programs.⁸ Because separate collection programs generally only collect from single family residences, an attempt was made to collect socioeconomic data from single family residences in each of the program locations. Unfortunately, census data was only available for the general population in each separate collection location.

TABLE 6
MEDIAN AGE

Median Age (years)	Number of Programs	Percentage
Less than 24.9	25	15.1
25-29.9	54	32.5
30-34.9	54	32.5
More than 35	33	19.9
TOTAL	166	100.0

Missing Data: 11

Source: U.S. Department of Commerce. General population characteristics, 1970 Census of Population, Bureau of the Census, Washington, D.C. 1972.

TABLE 7
MEDIAN EDUCATION

Median Education (school years completed of persons 25 years or older)	Number of Programs	Percentage
Less than 11.9	18	10.9
12.0-12.4	63	38.
12.5-13.4	56	33.9
More than 13.4	28	17.0
TOTAL	165	100.0

Missing Data: 12

Source: U.S. Department of Commerce. General population characteristics, 1970 Census of Population, Bureau of the Census, Washington, D.C. 1972.

TABLE 8
MEAN INCOME

Mean Income (gross \$ per year)	Number of Programs	Percentage
Less than \$10,499	21	12.7
\$10,500-13,499	60	36.4
\$13,500-16,499	39	23.6
More than \$16,500	45	27.3
TOTAL	165	100.0

Missing Data:

Source: U.S. Department of Commerce. General population characteristics, 1970 Census of Population, Bureau of the Census, Washington, D.C. 1972.

TABLE 9

DENSITY

Density (persons per square mile)	Number of Programs	Percentage
0-2634	48	28.7
2635-4568	51	30.5
4569-7430	43	25.8
Above 7430	25	15.0
TOTAL	167	100.0

Missing Data: 10

Source: U.S. Department of Commerce. General population characteristics, 1970 Census of Population, Bureau of the Census, Washington, D.C. 1972.

This study tested the relationship between socioeconomics and program success. It was hypothesized that median age, median education, mean income and population density played a role in determining participation rates and waste diversion rates. No significant relationship was found to exist between the median age of residents in a separate collection community and participation rates. Likewise, there was no relationship found between density of a separate collection area and participation rates.

Although not a strong relationship, the mean income (Tau C = .26) and the median education (Tau C = .24) proved to be significant.* Forty-four percent of the programs with mean incomes of \$16,500 or more per year had participation rates of 50 percent or more. Forty-three percent of programs with mean incomes of \$10,500 to \$13,499 and fifty percent of the programs with mean incomes of less than \$10,499 per year had participation rates of less than 20 percent. Likewise, forty-eight percent with a median education of 13.4 years or more had participation rates of 50 percent or more. Fifty-eight percent of the communities with a median education of 11.9 years or less had participation rates of less than 20 percent.

Median education (contingency coefficient = .46)** and mean income (contingency coefficient = .53)*** were found to be correlated with newspaper diversion rates. Thirty-five percent of the programs with mean incomes of \$16,500 per year or more had newspaper diversion rates in the highest category (more than 2.1 tons per thousand people per month). In contrast, sixty-seven percent of the programs with mean incomes of less than \$10,499 per year had newspaper diversion rates in the lowest category (0-.44 tons per thousand people per month). Thirty-seven percent of the programs with a

*Income and education were significant at the .001 level.

**Median education was significant at the .001 level.

***Mean income was significant at the .0000 level.

median education level of 13.4 years or more had newspaper diversion rates in the highest category. Seventy-three percent of the programs with median education levels of 11.9 years or less were in the lowest newspaper diversion rate category.

Median education and mean income were not found to be significantly correlated with mixed wastepaper diversion rates. Likewise, median age and density were not found to be correlated with newspaper and mixed wastepaper diversion rates. However, when mean densities for each of the ten EPA regions were compared, it appears that densities could be related to the number of programs in a particular region, i.e., as the population density of an area increases, the likelihood that an area will initiate a separate collection program to reduce solid waste quantities also increases.

IV. MARKETS

This chapter will review practices used by separate collection communities to sell recyclable materials. In addition, this chapter will outline the effect the 1974-75 recession had on recyclable material markets and separate collection programs.

Sale of Recovered Materials

Sale Approaches

There are two major approaches to recyclable material sales: 1) the open market approach; and 2) the contract approach. In the open market approach, the program sponsor compares the prices offered by materials dealers and either sells the materials to the dealer offering the highest price or sells to the same dealer on a regular basis. In the contract approach, the program sponsor contracts to regularly sell materials to a single dealer for a specified period of time. A predetermined price and/or a percentage of the market price is always included in the contract.

The open market approach provides for flexibility. If several materials dealers are competing for recyclables, the

program sponsor can shop for the highest market price. Assuming that a stable demand for recyclables exists and that the program sponsor has the time and money to shop the market, higher prices may be received in certain months or weeks using the open market approach rather than the contract approach. In addition, if a poor business relationship develops between the program sponsor and a materials dealer, the sponsor has the option of switching to another materials dealer.

The major disadvantage of the open market approach is the possibility of severe financial losses could be experienced during periods of low market demand. For instance, wastepaper prices during the recession were substantially reduced because of an oversupply of wastepaper coupled with little or no wastepaper demand. Communities subscribing to the open market approach to materials sales may find that the advantage of slightly higher material prices during high market demand is more than offset by the disadvantage of very low prices during periods of little or no market demand (especially wastepaper). In periods of little or no market demand, communities may find that they cannot even give wastepaper away.

Unlike the open market approach, the contract approach to material sales guarantees that the recyclable materials will be purchased, at a predetermined price, under all

market conditions. The contract also guarantees that the buyer will receive a predetermined minimum tonnage of materials at certain material specifications.

Although the contract approach provides for stable market prices during periods of unstable market demand, contract provisions are sometimes inflexible during the entire contract period. Communities signing a materials contract cannot take advantage of high market prices to the same extent as communities subscribing to the open market approach of supplying wastepaper to its market. Some communities with contracts have also found that the incidence of load rejections and downgradings due to contamination tend to increase during periods of low market demand.

Table 10 presents a breakdown of separate collection programs which signed contracts with secondary materials dealers or manufacturers to sell recyclable material(s).^{*} Thirty-nine of the programs responding to the contract question had contracts to sell waste materials. A majority of the material contracts pertained to the sale of newsprint and mixed wastepaper because glass, bi-metal, and aluminum markets are relatively new and undeveloped.

^{*}Appendix D is a listing of programs with material contracts.

TABLE 10
SALES APPROACHES

Response	Number of Programs	Percent
Contract	66	39.0
Open Market	103	61.0
TOTAL	169	100.0
No Answer: 8		
Total Missing Cases: 8		

Forty-five percent of the municipally collected programs had contracts, compared to the 39 percent of municipally collected programs in August 1974. It appears that the 6 percent increase in municipal contracts since 1974 is partially attributable to municipal concern over the historically unstable market for newspaper. In addition, it appears that long-term contracts with attractive floor and floating price provisions have influenced many communities to sign contracts.

The majority of separate collection programs with contracts are found in the mid-Atlantic and western portions of the United States, particularly in New Jersey and California. It appears that the abundance of material contracts in these areas is a result of a large paper manufacturer's demand for a steady supply of uncontaminated newspaper. In return for the steady supply of paper, the manufacturer guarantees its communities in New Jersey and California, through its paper dealers, floor/floating pricing provisions in all market situations.

Contract Length

More than 75 percent of the contracts signed by 53 programs had a duration of 1 year (Table 11). A total of 11.3 percent of the 53 programs had contracts of 2 years, while the remaining 13 percent had contracts of 3 years or more. If a long-term contract (2 years or more) is negotiated, some material dealers or manufacturers will often provide material storage equipment, publicity, and technical assistance for the separate collection program.

The majority of communities signing contracts for 2 years or longer were found in the State of California. Until recently, the State of New Jersey limited the duration of material contracts to 1 year.

TABLE 11
CONTRACT LENGTH

Length (years)	Number of Programs	Percent
1	40	75.5
2	6	11.3
3	2	3.8
5	4	7.5
6 or more	1	1.9
TOTAL	53	100.0

No Answer: 13

Not Applicable: 111

Total Missing Cases: 124

Contract Provisions

Contracts sometimes provide for "fixed" prices, guaranteeing the same price per material ton sold during each month of the contract period. Another type of contract provides for "floating" prices, which are determined by an agreed upon percentage of the price index quoted in weekly material trade journals. The most common type of materials contract provided for both a "floor" and a "floating" price. A floor price is the minimum price that the program sponsor will receive during any market condition. The floor price protects the program sponsor from low market prices, i.e., when the floating price drops below a certain price level.

Table 12 presents the responses of 59 separate collection programs to the contract provisions question. Forty-four and one-tenth percent of the programs signed contracts with both a floor price and a floating price above the floor price determined by a set percentage of the weekly material market price. Thirty-seven and three-tenths percent of the programs signed material contracts with fixed price provisions.

TABLE 12

CONTRACT PROVISIONS

<u>Contract Type</u>	<u>Number of Programs</u>	<u>Percentage</u>
Fixed Price	22	37.3
Floor/Floating Price	26	44.1
Floating Price	11	18.6
<hr/>		
TOTAL	59	100.0

No Answer: 7

Not Applicable: 111

Total Missing Cases: 118

Although the communities which signed contracts with fixed price provisions are protected against a significant drop in market demand, the fixed price contract does not afford communities the opportunity to share larger revenues from material sales when prices increase. Contracts with both floor and float provisions, however, provide communities with a minimum price for materials when demand is low, and a higher price above the floor price when market demand increases. Thus, the floor/float price contract is much more flexible than both the fixed or floating price contracts.

Recession

EPA's Third Report to Congress noted that although precise data were not available, it appeared tha the recession severely affected the economics of existing separate collection programs. This section will briefly review the wastepaper market prior to and during the recession. In addition, the section will offer a detailed account on the recession's effect on separate collection recycling programs.

Historical Background

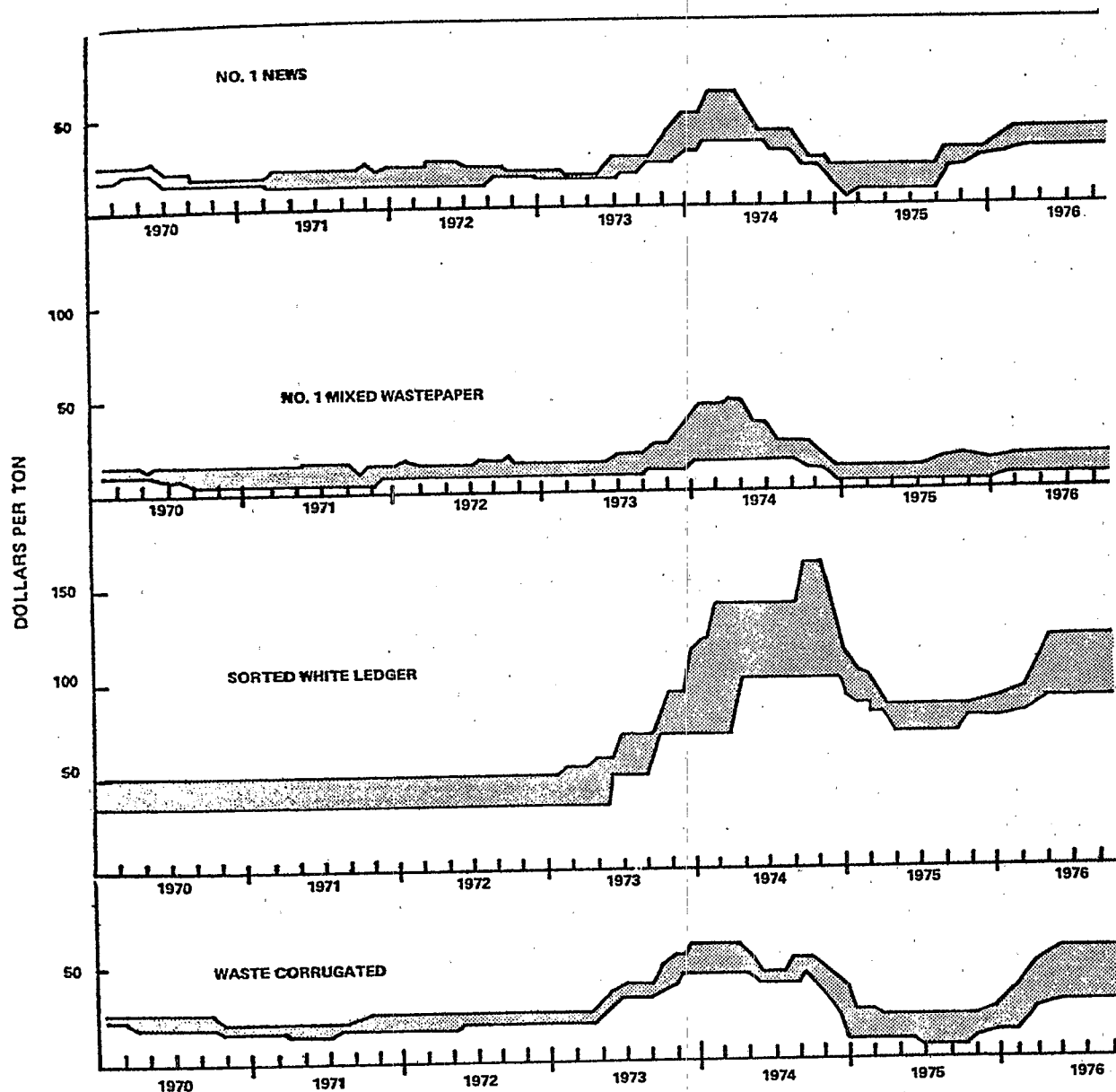
To a greater extent than the prices of most commodities bought and sold in the United States, recyclable material prices are determined by supply and demand in the market place. Market prices for waste glass and waste aluminum cans have remained relatively stable since 1970.

In contrast, because industry demand for wastepaper depends in large part on the production of boxboard and wallboard, fluctuations in the U.S. economy will impact most heavily on wastepaper prices (Figure . Given that most separate collection programs collect wastepaper, it is important to understand the effect that widely fluctuating paper prices have on the proliferation and operation of separate collection programs.

The market price for waste newspaper remained low but relatively stable from 1970 through 1972, averaging \$5 to \$10 per ton. However, in 1973 wastepaper prices increased significantly. Wastepaper inventories at this time were severely reduced because of scarce supplies of market pulp, along with dramatic increases in wastepaper exports and domestic wastepaper use.⁹ Consequently, when wastepaper demand began to increase in June of 1973, wastepaper prices jumped to their highest level since the Korean War.

Although wastepaper prices declined slightly and then stabilized by the beginning of 1974, municipalities were paid \$20 to \$40 per ton for loose newspaper in the first six months of that year. Responding to increased wastepaper prices, many communities initiated separate collection programs. More than 75 separate collection programs were begun between June 1973 and the summer of 1974. By August of 1974, 118 separate collection programs were operating in the United States.

FIGURE 4



Market prices for wastepaper were subject to extreme fluctuations during the 1973-76 period. Plotted on the graphs are weekly price quotes appearing in *Official Board Markets* for four important wastepaper grades since 1970. The price range presented for each grade reflects the spread of the high weekly quoted prices among four representative market areas: New York, Chicago, Los Angeles, and the South (sic). (Prepared by SCS Engineers and EPA staff.)

Unfortunately, by October 1974 the recessionary economy had severely reduced the demand for wastepaper. The home building industry, a large purchaser of wastepaper for the production of wallboard and roofing felt, and the boxboard industry slowed during this period.¹⁰ In addition, the recession abroad caused a curtailment of wastepaper exports. Because of severely reduced demand along with replenished supplies of wastepaper, No. 1 waste newspaper prices decreased from a range of \$38 to \$60 per ton in the first half of 1974, to \$5 to \$25 per ton a few months later.^{11,*}

Program Discontinuance

Between August 1974 and September 1977, 38 separate collection recycling programs were discontinued. It appears that a majority of program discontinuance is a direct result of the recessionary economy in the U.S. between September 1974 and June 1975.

Table 13 presents a breakdown of responses from 38 communities whose separate collection programs were discontinued. Thirty-seven percent of the 38 communities responding cited

*Official Board Markets (OBM) price for No. 1 newspaper.

TABLE 13
PROGRAM DISCONTINUANCE
1974-1975 (38 programs)

<u>Reason</u>	<u>No. of Programs</u>	<u>Percentage</u>
1. No market for newspaper	14	37
2. Poor participation	6	16
3. Newsprint price declined, scavenger problems	3	8
4. Newsprint price declined, poor participation	2	5.2
5. Newsprint price declined, labor costs, poor participation	2	5.2
6. Newsprint price declined, competition from community groups	2	5.2
7. Scavenger problems, poor participation	2	5.2
8. Labor problems and/or labor costs	2	5.2
9. Poor collection economics	1	2.6
10. Inadequate equipment	1	2.6
11. Community group pressure against program	1	2.6
12. Poor weather	1	2.6
13. Transfer of city program to community organization	1	2.6
	<hr/> 38	<hr/> 100.0

the lack of a market for newspaper as their major reason for stopping the program, and 23.6 percent of the communities cited declining newspaper prices as one of several reasons for discontinuing separate collection. Poor participation from residents was cited by 16 percent of the communities as a major reason for discontinuing separate collection.

Effect on Existing Programs

Table 14 presents responses from those programs that continued separate collection throughout the recession. Slightly more than one-half of the respondents stated that the recession did affect the separate collection program (Table 14, Question 1). More specifically, 73 percent of the programs responded that material prices were reduced during the recession (Table 14, Question 2). Madison, Wisconsin collected approximately the same volume of newsprint in 1975 as it collected in 1974. However, the average price per ton of newsprint decreased from \$23.41 in 1974 to \$10.32 in 1975.¹² Birmingham, Michigan received \$34 per ton for newsprint during January and February of 1974. By December of 1974, the newsprint price dropped to \$3 per ton and averaged \$3.25 per ton from January through August of 1975.¹³ North Haven, Connecticut only received \$2 per ton for newsprint in

TABLE 14
EFFECT OF RECESSIONARY ECONOMY
ON SEPARATE COLLECTION PROGRAMS

	<u>Yes</u>	<u>No</u>	<u>No. of Respondents</u>
1. Did the recession between 1974 and 1976 have any effect on your program?	76 (52%)	70 (48%)	146 (100%)
2. Were material prices reduced during the recession?	93 (73%)	35 (27%)	128 (100%)
3. Were material markets reduced during the recession?	38 (31.4%)	83 (68.6%)	121 (100%)
4. Did markets stop purchasing materials during the recession?	23 (19.2%)	97 (80.8%)	120 (100%)
5. Was the volume of recovered materials reduced during the recession?	24 (19.2%)	97 (80.8%)	121 (100%)

February 1975. Likewise, Rolling Meadows, Illinois received \$40 per ton for newsprint from January to March of 1974, but could not find a wastepaper market in January of 1975.¹⁴

Ninety-seven of 120 programs responding stated that the volume of recovered material was not reduced during the recession (Table 14, Question 5). Interestingly enough, 15 of the 97 programs mentioned above responded that wastepaper tonnages had in fact increased during the recession because competing community organizations and scavengers could not find markets for the paper. Consequently, paper that was normally collected by community groups and scavengers went instead to the separate collection programs.

Approximately one-third of the programs responded that material markets for wastepaper were reduced during the recession (Table 14, Question 3). The data suggests that these programs had to find new markets for wastepaper and accepted substantially lower prices. Although the majority (80.8 percent) of separate collection programs did locate buyers for recovered wastepaper, 19.2 percent could not find markets interested in purchasing wastepaper (Table 14, Question 4). These programs continued collection and either stored or landfilled the paper until wastepaper markets were found.

Communities holding contracts with paper dealers and manufacturers during the recession received much higher prices than the majority of those programs that did not have material contracts (Figure). Like many other separate collection recycling programs in April of 1974, Rockford, Illinois received \$35 per ton for newspaper. However, when newspaper demand dropped late in 1974 and the prices communities received for newsprint fell below \$10 per ton, Rockford's contract with a large paper manufacturer guaranteed the city \$20 per ton for newspaper.¹⁵

MATERIAL PRICES WITH AND WITHOUT CONTRACTS

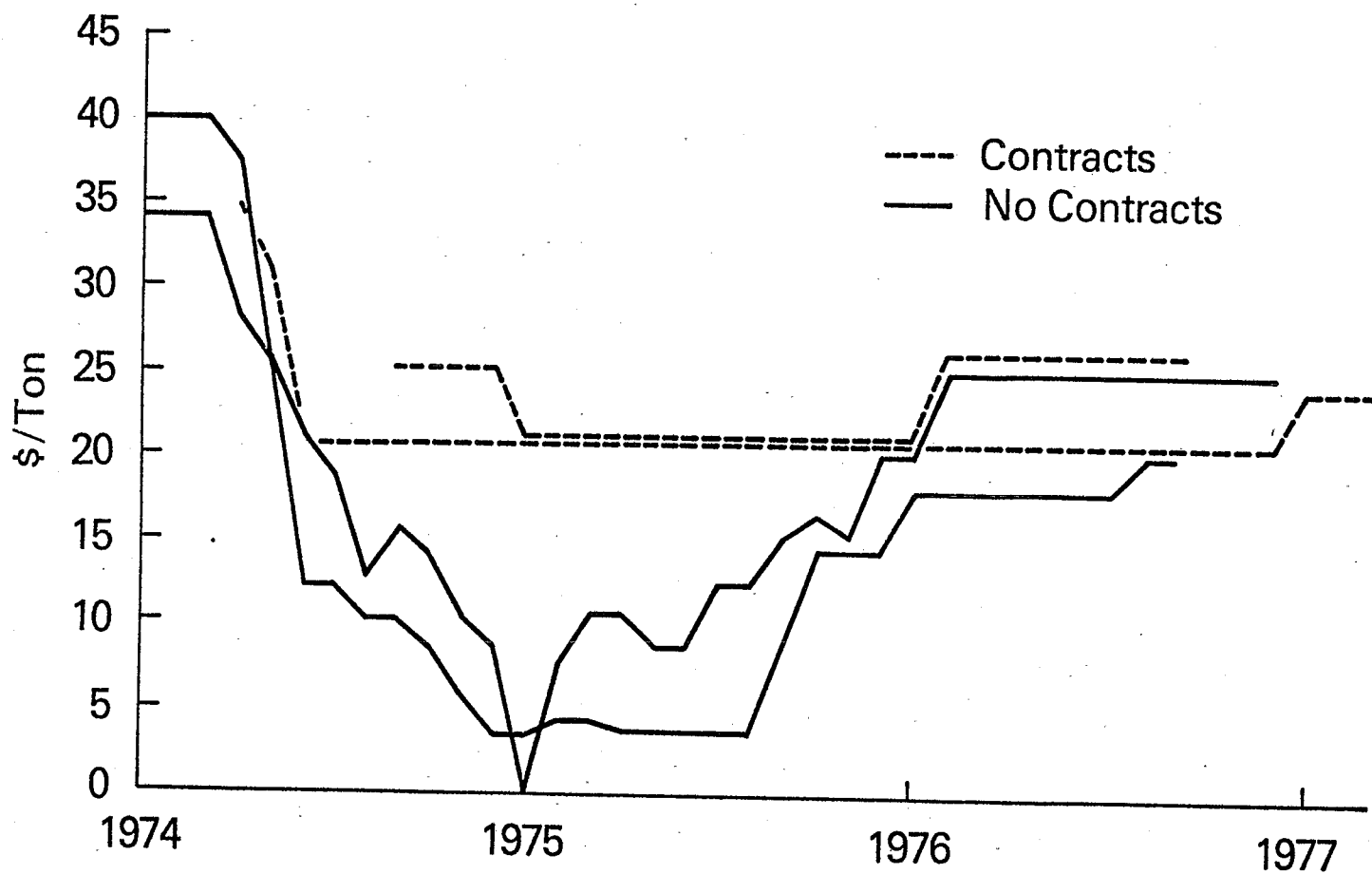


FIGURE 5

V. COLLECTION PRACTICES

This chapter will describe the procedures communities are using to collect separated recyclable materials. In particular, this chapter will outline collection responsibilities, collection area size, methods of separate collection, and frequency of separate collection.

Responsibility for Collection

Municipalities were responsible for collecting recyclables in 56.5 percent of the 177 programs surveyed. The remaining 29.4 percent and 12.4 percent of collection responsibility were undertaken by private collection firms and community organizations respectively (Table 15). Municipal collection responsibility percentages closely parallel the collection responsibility percentages of separate collection programs in August 1974.

TABLE 15
RESPONSIBILITY FOR COLLECTION

<u>Collector</u>	<u>Number of Programs</u>	<u>Percentage</u>
Municipal	100	56.5
Private	52	29.4
Community Organizations	22	12.4
Municipal/Private	3	1.7
	177	100.0

Total Missing Cases: 0

Many of the 52 privately collected separate collection programs were operated by municipalities, i.e., the municipality either paid the private hauler a flat fee to collect recyclables or allowed the hauler to keep a predetermined percentage of the material revenues. Some separate collection programs, however, were organized and operated by private haulers or community organizations. In this situation, the hauler/community organization received support from the municipality, e.g., program publicity, scavenger ordinance, but the program was ultimately controlled by the sponsor. By aiding the hauler/community organization in a separate collection program, the municipality benefits by reducing its solid waste disposal volumes without having to finance a recyclable collection. The hauler/community organization benefits from the sale of recyclables.

Methods of Collection

Four methods of separate collection are practiced in the U.S.: 1) rack; 2) trailer; 3) separate truck; and 4) compartmentalized vehicle.

Racks

The rack or "piggyback" method of separate collection stores recyclables in racks that are attached to packer trucks. Racks can be installed for side, rear, or overhead loading of materials (Figure 6). The small capacity of racks dictates that only one material can be collected, usually newspaper.

The rack method allows for simultaneous collection of mixed refuse and recyclables. Thus, operating costs are minimal because additional collection crew members and trucks are not needed to collect recyclables. Simultaneous collection of mixed refuse and recyclables also encourages resident participation. Residents have the option of placing out bundled newspapers every collection day, thus reducing storage requirements on the resident and minimizing the likelihood that a separate collection schedule will be forgotten. Startup costs are very low in comparison to other collection methods, averaging \$80 to \$250 per truck for rack fabrication and

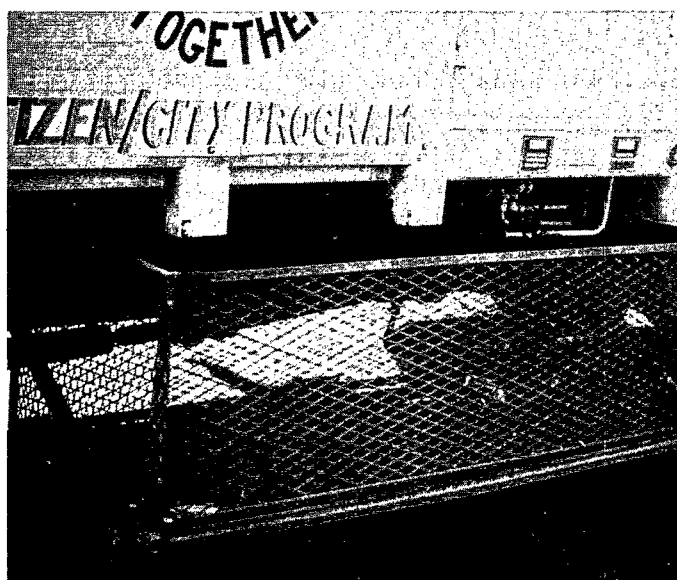


Figure 6. Rack methods
of collection



installation in 1974.¹⁶ Although racks are not commercially available, public works departments have found that racks can be easily fabricated and tailored to the type of truck body. The rack methods allows a community to measure resident participation in a program prior to making large investments in more expensive collection equipment.

Because of their small storage capacity, 0.5 to 1.5 cubic yards, racks often fill to capacity before the packer truck reaches its mixed refuse capacity. Therefore, the time and money spent on hand loading and unloading of the racks will increase as participation rates increase. Another problem associated with the rack approach is that side racks are sometimes not adaptable to all packer trucks because of the placement of gas tanks and hydraulic equipment.

Trailer

The trailer method of separate collection also provides the opportunity for simultaneous collection of mixed refuse and recyclables. Recyclables are placed in a trailer that is mounted to the rear of a refuse collection vehicle. However, Storage capacity of trailers is much larger than racks, ranging from 4 to 6 cubic yards (Figure 7). Because of its ability to simultaneously collect mixed refuse and recyclables, the trailer method also has low operating costs and encourages



Figure 7. Trailer method of collection

resident participation. Many trailers can be mechanically unloaded, thus producing a great savings in time. Finally, trailers can be modified for the storage of two or more materials.

One of the major problems associated with the trailer method is that maneuverability could be difficult and perhaps dangerous, especially when collection occurs on narrow streets and alleys. Presently, many States forbid the use of trailers because of the safety problems associated with maneuverability. Capital costs for the trailer method are considerably higher than rack methods, ranging from \$3,000 to \$3,500.

Separate Truck

In 1974, the majority of separate collection programs in the U.S. used the separate truck method. The separate truck method requires the use of an independent truck and crew to collect recyclables (Figure 8). Startup costs are generally very low because, in many cases, existing mixed refuse vehicles and crews can be diverted to collect recyclables. For example, in 1974 only three separate collection programs purchased vehicles for separate truck collection out of a total of 100 separate truck operations. Those communities that purchased a compactor vehicle in 1974 paid about \$40,000 per vehicle, significantly more than other communities using other

collection methods. Storage capacity of separate trucks is significantly greater than the storage capacity of the rack and trailer collection methods. Storage capacities will vary according to the type of compaction and/or noncompaction truck used.

Although startup costs for the separate truck method can be very low, operating costs may be high. Most communities using the separate truck method must divert enough recyclable material to offset the cost of operating the separate collection system. Several communities noted that their volume of recyclables diverted from the mixed refuse collection was enough to justify reducing the amount of trucks and crews needed for mixed refuse collection. Therefore, trucks and crews that were customarily used for mixed refuse collection could be diverted to the separate collection program.

Most communities using the separate truck method, however, must collect recyclables on a day other than mixed refuse collection so that trucks can be borrowed for the separate collection program. Unless recyclable collections are performed on a given day of the week, e.g., every Monday, collection of recyclables on a day other than regular refuse collection often makes the collection schedule confusing to residents. Therefore, participation may be decreased. If noncompactor trucks are used for collection, recyclables must either be unloaded by hand or by using a forklift at a storage area or market, thus increasing



Figure 8. Separate truck
approach to collection

collection time and cost. Generally, only one material can be collected using an uncompartmentalized separate truck method because of the difficulty in isolating separated materials in the truck body.

Compartmentalized Vehicle

The compartmentalized vehicle is the newest method for collecting two or more recyclables. Presently, there are two major kinds of compartmentalized vehicles: a separate collection truck which is divided into 2 or 3 material compartments; a trailer housing 2 or 3 storage bins which is pulled behind a pickup truck (Figure 9). The former type of compartmentalized vehicle is being used in Newton, Marblehead, and Somerville, Massachusetts, while the latter type is being used by Project SORT in San Luis Obispo, California.

The major advantage of the compartmentalized vehicle method is that it allows for simultaneous collection of two or more recyclables. If a standard compactor were used, each material would have to be collected on alternating weeks because of the inability to segregate materials in the truck body. Thus, collection costs on a per ton basis are significantly lower using the compartmentalized vehicle than a standard compactor. The compartmentalized vehicle also encourages resident participation. By providing simultaneous collection



Figure 9. Collection
by a compartmentalized vehicle

of materials on the same day each week, residents become familiar with the collection schedule and are therefore more likely to participate.

Although collection costs on a per ton basis are less using a compartmentalized vehicle than a standard compactor, capital costs of the compartmentalized vehicle are significantly higher than other collection methods. In 1976, the compartmentalized vehicle cost approximately \$20,000.

Collection Methods Breakdown

Approximately 72 percent of all separate collection recycling programs use the separate truck approach (Table 16). The 72 percent represents a 12 percent decrease in separate truck use since August of 1974. Rack collection of recyclables, however, increased from 15 percent in August 1974 to 21.5 percent in September of 1977. Likewise, the trailer approach is becoming increasingly popular for the collection of recyclable materials.

TABLE 16
METHOD OF COLLECTION

Method	No. of Programs	Percentage
Separate Truck	127	71.8
Rack	38	21.5
Trailer	8	4.5
Compartmentalized Vehicle	4	2.2
	177	100.0
Total Missing Cases: 0		

The increased use of racks, along with the decreased use of separate trucks, signals an apparent trend in the way communities view the economics of separate collection recycling. Communities are becoming increasingly conscious of both the labor and capital costs associated with recyclable collections.

Successful separate truck economics requires that a program collect enough recyclable tonnage to justify diverting labor and equipment from mixed refuse collection operations. For example, it was found that approximately 27 percent of the separate truck programs had participation rates of 19 percent or less. Given the costs associated with

wages for additional collection crews along with low material revenues because of low material diversion rates, the economics of separate truck programs with participation rates of 19 percent or less are questionable.

Although 52 percent of the programs using the rack method had participation rates of 19 percent or less, the economics of these programs appear more favorable than programs using the separate truck method. Capital costs for rack programs are very low. In addition, no additional labor costs are incurred by programs using the rack approach. It can be concluded, therefore, that more communities are using the rack method because it is in many cases a relatively low risk, cost effective method of a separate collection program. Communities are afforded the opportunity to measure participation rates and material diversion rates without making an intensive commitment to capital and labor.

Collection Area Size

Table 17 presents a breakdown of collection area sizes based on a sample of 168 programs. Approximately 70 percent of the programs had collection area sizes of less than 50,000 persons, with only 14.3 percent of the programs having collection area sizes of 100,000 persons or more. The data suggests

that small communities are interested in separate collection programs because of the perceived ability of programs to reduce predominate portions of the waste stream, e.g., wastepaper, at a relatively small cost.

TABLE 17
COLLECTION AREA SIZE

CAS (Persons)	Number of Programs	Percentage
Under 9,999	29	16.4
10,000 to 24,999	57	33.9
25,000 to 49,000	30	17.9
50,000 to 99,999	28	16.7
100,000 to 500,000	20	11.9
Above 500,000	4	2.4
	168	100.0
No Answer:	9	
Total Missing Cases:	9	

Frequency of Collection

Sixty-eight percent of the 175 separate collection programs surveyed collected recyclables at a frequency of at least twice a month (Table 18). The majority of programs had separate collection frequencies of once a week. Monthly collection of recyclables is undertaken by approximately 28.6 percent of separate collection communities.

A study conducted in 1974 found that separate collection frequency was positively related to diverted disposal volumes, i.e., material volumes increased as collection frequency increased. The study concluded that residents are more willing to separate larger quantities of recyclables if storage requirements are reduced. In this study, however, no significant relationship was found between the participation rate and collection frequency data ($\text{Tau } C = .114$, significance .0685). The lack of a significant relationship can be partially explained by the difficulty in controlling for the effect of other variables on participation rates (e.g. publicity, ordinances, socio-economics, number of materials collected). Although no relationship was seen in this study, it is still believed that participation rates are related to the frequency of separate collection.

TABLE 18
FREQUENCY OF COLLECTION

Collection Frequency	Number of Programs	Percentage
Twice/week	14	8.0
Once/week	70	40.0
Once/2 weeks	13	7.4
Twice/month	22	12.6
Once/month	50	28.6
Other	6	3.4
Total	175	100.0

No Answer: 2
Total Missing Cases: 2

VI. ORDINANCES

This chapter will provide information on the number of communities with separate collection ordinances and antiscavenging ordinances and methods employed by those communities to enforce these ordinances. In addition, this chapter will look at the effect that separate collection ordinances have on participation rates and waste diversion rates.

Separate Collection Ordinances

The majority of separate collection programs in the United States are presently voluntary, i.e., citizens are "requested" to separate one or more recyclable materials from mixed refuse. However, in attempting to increase participation and waste diversion rates, many communities have adopted ordinances which "mandate" that certain materials be separated from mixed refuse.

Most separate collection ordinances state which geographic areas and/or persons within a refuse collection area must participate in the program. In addition, most ordinances state the type of material(s) being collected in the program and the procedure for properly separating and preparing recyclables for collection. For example, the following

paragraphs were part of the North Hempstead, New York's separate ordinance for newspaper recycling:¹⁷

Section 3-A. After adequate notice has been published, posted, and publicized for a garbage and refuse district or for a particular collection area, it shall be mandatory for persons who are owners, leasees, or occupants of residential dwellings in the town to separately bundle newspapers for collection and recycling. Said newspapers shall be placed in kraft bags or tied securely with rope or cord in packages not exceeding fifty (50) pounds, and said packages shall be placed separately at the curb for collection on days specified by the Commissioner of Public Works under the rules and regulations prescribed.

Many mandatory collection ordinances also state that mixed refuse containers holding clean newsprint will not be serviced until the clean newspaper has been removed. Some communities threaten fines for failure to separate recyclables from mixed refuse. Other communities affix a tag or sticker to the refuse container which explains the violation to the separate collection ordinance and requests that the householder separate recyclables from mixed refuse.

Political opposition to the enactment of a proposed mandatory ordinance is sometimes common. Politicians often oppose a mandatory separate collection ordinance because they perceive that residents will object to a change in refuse preparation habits. Therefore, many municipalities choose to support a voluntary

approach until the collection operation is stable and public acceptance is evident. However, in attempting to sell the mandatory approach to separate collection program, many communities have developed community awareness campaigns which explain the benefits of the program, the need for a mandatory approach, and the need for community support.

Mandatory/Voluntary Breakdown

Table 19 presents a breakdown of voluntary and mandatory separate collection programs.* As expected, voluntary programs exceed mandatory programs by 3 to 1. The mandatory/voluntary breakdown remains relatively unchanged from the August 1974 survey.

The majority of mandatory separate collection programs are found in the mid-Atlantic and northeastern sections of the United States. It appears that the concentration of mandatory programs in this section of the United States is a result of the need to reduce waste tonnages because of reduced landfill space and increased solid waste hauling costs. A particularly high percentage of mandatory programs is found in New Jersey. In addition to a desire to reduce disposal volumes, the abundance of mandatory programs in

*Appendix D is a listing of programs with mandatory ordinances.

New Jersey is a result of a large paper manufacturer's desire for guaranteed large volumes of used newspapers from its contracted communities.

TABLE 19
MANDATORY/VOLUNTARY PROGRAMS

Type	Number of Programs	Percentage
Voluntary	134	75.7
Mandatory	43	24.3
Total	177	100.0

Total missing cases: 0

Mandatory Ordinance Enforcement

Slightly more than one-half of the mandatory programs responded that ordinances were enforced (Table 20). Enforcement methods ranged from phone calls to residents who failed to separate recyclables from mixed refuse to refusal of the collector to pick up mixed refuse. In the latter enforcement method, many communities placed circulars or stickers on trash bags and cans explaining why the mixed refuse had not been collected (Figure 10).



TOWN OF WEST ORANGE, NEW JERSEY

Department of Waste Management
Town Hall
66 Main Street
West Orange, N.J. 07052

Dear Resident,

On _____ a quantity of _____ was found in your garbage at _____.

Perhaps you are not aware of Town ordinance #406-76, 11:10-3a which states "...it shall be mandatory for all persons who are owners, lessees, or occupants of residential premises within the Town of West Orange having interior or exterior curbing to separate used newspapers and glass from all other solid waste produced on such premises." At your option, you may dispose of your newspapers and glass by any lawful means. However, as you know, the Town provides you with a regular curbside collection service of newspaper and glass so that these items may be recycled. If you have misplaced your schedule of these collections in your neighborhood, please call 325-4159 and request another.

We would like this letter to serve as a general reminder because, although we have the authority to write a summons which requires a court appearance and possible fine, we only employ it as a last resort. The program is of great value to our environment alone. Fuel oil savings from recycling newspapers is 40%, and energy savings from glass recycling can be as high as 30%. Furthermore, every ton of recycled newspapers means 17 trees need not be cut down. Besides, the Town receives a rebate from the regular garbage contractor of \$6.00 for each ton of newspaper and glass it recycles.

So please, don't throw away something that can be re-used, AND THEN PAY TO HAVE IT BURIED! If you have any questions, please contact the Department of Waste Management at 325 - 4159. Your anticipated cooperation is greatly appreciated.

Cordially,

The Department of Waste Management
Tel. 325 - 4159

TABLE 20
MANDATORY ORDINANCE ENFORCED

<u>Response</u>	<u>Number of Programs</u>	<u>Percentage</u>
Yes	15	53.6
No	13	46.4
Total	28	100.0

No answer: 15

Total missing cases: 15

Although it appears from Table 20 that slightly more than one-half of the mandatory programs were enforced, this conclusion is questionable in light of the fact that more than one-half of the mandatory programs chose not to respond to the "enforcement" question. The majority of mandatory programs that did not respond to the enforcement question appeared reluctant to state that the ordinance was not enforced. Given the abundance of no responses to the mandatory ordinance enforcement question, along with the time and expense involved in checking each refuse can and bag for recyclables, it should be concluded that most separate collection ordinances are not enforced.

Relationships with Participation and Diversion Rates

The study hypothesized that participation rates and waste diversion rates would be related to a mandatory/voluntary approach to separate collection, i.e., mandatory programs will promote higher participation and waste diversion rates than voluntary programs. Sixteen of the 43 mandatory programs were not included because they either had bad participation rate data (as defined in Chapter I), or did not respond to the participation rate question. Likewise, 37 of the 134 voluntary programs were also not included because of the same reasons.

Although not a strong relationship, participation rates appear to be related to mandatory/voluntary approaches ($\text{Tau } C = .32$).* Fifty-nine percent of the mandatory programs had participation rates of 50 percent or more, while only 19 percent of the voluntary programs had participation rates in the same category. The majority of voluntary programs (45 percent) had participation rates between 20 and 49 percent. However, only 11 percent of the mandatory programs, as compared to 36 percent of the voluntary programs, had participation rates of 19 percent or less.

*Significant at .0000 level.

Newspaper diversion rates also appeared to be related to mandatory/voluntary approaches to separate collection (Tau C = 0.36).^{*} Thirty-eight percent of the mandatory programs were in the highest newspaper diversion rate category (more than 2.1 tons per 1,000 people per month), while only 7 percent of the voluntary programs were in the same category. Seventy-one percent of the voluntary programs were in the two lowest newspaper diversion rate categories (0 to 1.11 tons per 1,000 people per month), as compared to only 28 percent of the mandatory programs in the same category. Thirty-five percent of the mandatory programs fell into the good diversion rate category (1.12 to 2.09 tons per 1,000 people per month), as compared to 22 percent of the voluntary programs. When wastepaper diversion rates were tested against the mandatory/voluntary program approach, no significant relationship was found (Tau C = 0.13, significant at the .2 level).

Antiscavenging Ordinances

Many separate collection recycling programs are plagued with scavenger problems. Scavengers^{**} are unauthorized persons picking up recyclable material before the authorized municipal or private collection truck arrives. If the goal

^{*}Significant at .0000 level.

^{**}In some areas in the U.S., licensed haulers are termed "scavengers."

of a separate collection program is primarily to reduce the volume of solid waste going to the landfill, scavengers do not pose a problem.¹⁸ However, if the program goal is to obtain revenues from material sales, scavengers can severely reduce the volume of separated recyclables and, therefore, reduce revenue.

The probability of scavenger problems occurring in a given community is greater when material prices are high than when prices are low. In the summer of 1974, Hempstead, New York received \$9 per ton for newspaper collected and delivered to the paper stock dealer. Although no scavengers were evident at the \$9 price, when paper prices increased to \$17 per ton, the city lost about 40 percent of its newsprint to scavengers.¹⁹

In response to actual or anticipated scavenger problems, many communities have enacted antiscavenging ordinances or added provisions pertaining to scavengers within existing mandatory and mixed refuse collection ordinances. Antiscavenging ordinances usually state that it is unlawful for any unauthorized person or firm to collect the separated materials(s). Most antiscavenging ordinances state fines for scavenging ranging from \$25 to \$250.

Although most antiscavenging ordinances claim municipal title to the recyclables once they are placed at curbside, antiscavenging ordinances do not restrict residents from giving their recyclables to volunteer organizations. Many service organizations for example, sponsor newspaper drives several times per year as a way of earning extra revenue for the organization. To avoid confusion, a municipality should indicate where recyclables for volunteer drives should be placed.

Scavenger Ordinance Breakdown

Approximately two-thirds of the 174 programs responding stated that scavengers were a problem, especially when market prices for wastepaper were high (Table 21). However, only 51.1 percent of the 174 communities surveyed had an ordinance to deter unauthorized individuals from collecting separated materials before the authorized collector arrived (Table 22).* The percentage of separate collection programs with scavenger ordinances in September 1977 remained relatively unchanged from those programs in August 1974.

*Appendix D is a listing of programs with antiscavenging ordinances.

TABLE 21
SCAVENGER PROBLEMS

Response	Number of Programs	Percentage
Yes	114	65.5
No	60	34.5
Total	174	100.0

No answer: 3

Total missing cases: 3

TABLE 22
SCAVENGER ORDINANCE

Response	Number of Programs	Percentage
Yes	89	51.1
No	85	48.9
Total	174	100.0

No answer: 3

Total missing cases: 3

Scavenger Ordinance Enforcement

Approximately 61 percent of the 51 communities responding to the scavenger ordinance enforcement question, 60.8 percent stated that the ordinance was enforced, while 39.2 percent stated that the ordinance was not enforced (Table 23). Enforcement methods ranged from fining the scavenger(s) to publicizing the scavenger's name in the local newspaper. However, results of scavenger ordinance enforcement appear questionable in light of the fact that close to one-half of the 89 communities with scavenger ordinances did not respond. In addition, many of the 39.2 percent of those communities that claimed that the scavenger ordinance was not enforced stated that the ordinance itself was not enforceable.

TABLE 23

SCAVENGER ORDINANCE ENFORCED

<u>Response</u>	<u>Number of Programs</u>	<u>Percentage</u>
Yes	31	60.8
No	20	39.2
Total	51	100.0

No answer: 38

Not applicable: 88

Total missing cases: 126

Like the mandatory separate collection ordinance, antiscavenging ordinances are difficult to enforce for several reasons. The major enforcement problem lies in the time and expense involved in spotting scavengers while they are collecting materials. Therefore, most separate collection programs rely on citizens to report scavengers to the police before separate collection begins. Secondly, although most antiscavenging ordinances cite several persons and/or departments which are responsible for enforcing the ordinance, it is usually never clear who has the major responsibility for enforcing the ordinance and prosecuting the scavenger. Finally, many municipal judges are reluctant to impose fines on scavengers because they view the crime as insignificant.

VII. PUBLICITY

Ongoing publicity about separate collection is essential in encouraging and retaining resident participation in the program. This chapter will describe and evaluate the publicity methods used by separate collection programs.

Publicity Before Implementation

Publicity before implementation of a separate collection program provides residents with a rationale for the program and instructions on how they can participate.²⁰ The program rationale explains why a separate collection program is important, e.g., conservation of materials and energy, decreased disposal costs, increased life of landfill, economic benefits. The participation instructions describe the procedure for separating, preparing, and placing the materials out for collection and inform residents of the separate collection schedule.

Approximately 99 percent of 156 separate collection programs publicized their separate collection program prior to its implementation. Table 24 presents numerous types of publicity used by 156 programs before implementation of the

TABLE 24
PUBLICITY BEFORE AND AFTER IMPLEMENTATION

Type of Publicity	Number and Percent of Programs Using Type of Publicity before Implementation*	Number and Percent of Programs Using Type of Publicity after Implementation+
Newspapers	142 (91.0%)	127 (75.5%)
Circulars	79 (50.6%)	67 (39.8%)
Announcements from/to civic groups	48 (30.7%)	56 (33.3%)
Radio spots	42 (26.9%)	45 (26.7%)
Posters	36 (23.0%)	32 (19.0%)
School programs	35 (22.4%)	43 (25.5%)
Speeches	34 (21.7%)	42 (25.0%)
Letter from mayor or elected official	32 (20.5%)	26 (15.4%)
Television spots	24 (15.3%)	20 (11.%)
Calendar showing collection dates	24 (15.3%)	10 (6.4%)
Notices in utility billings	21 (13.4%)	25 (14.8%)
Contests	11 (7.0%)	9 (5.3%)
Buttons	4 (2.5%)	4 (2.3%)

*156 programs responding.

+168 programs responding.

separate collection program. Newspaper publicity, ususally in the form of advertisements and/or articles about the program operation, was used by 91 percent of the communities. Circulars and announcements to/from civic groups, announcing the start of the program, were used by 50.6 percent and 30.7 percent of the programs respectively. Public service radio announcements and/or radio interviews were used by 26.9 percent of the programs. A letter from the mayor or other elected official, perceived to be the most effective publicity to generate participation, was used by only 20.5 percent of the programs before implementation.

Most communities did not have the personnel or money to coordinate large-scale publicity programs. Many communities received help from local environmental groups, civic and neighborhood organizations, garden clubs, and boy scout troops in carrying out the separation collection publicity. Groups like the local League of Women Voters often gave speeches, made posters, distributed circulars and organized school programs at little or no cost to the community.

Publicity After Implementation

Publicity campaigns after implementation of the program were very similar to the types of publicity used prior to

implementation of separate collection (Table 24). Requests for participation were most frequently found in newspaper articles and advertisements, circulars, and announcements to civic groups.

However, many communities significantly reduced the amount of publicity going to residents once the separate collection program was started. Approximately 11 percent of the 168 programs surveyed did not publicize the program at all once separate collection had begun. By comparing the amount and type of publicity before and after starting the program, it appears that publicity costs and personnel are the major reasons for reduced publicity after implementation of the separate collection program. Cost-intensive types of publicity, e.g., newspaper advertisements, circulars, posters, and calenders, were used by fewer communities after program implementation than before implementation. In contrast, less expensive types of publicity, e.g., announcements from and to civic groups, school programs, notices in utility billings, and speeches were used by more communities after implementation than before implementation of separate collection.

Although the amount of publicity decreased after program implementation, many communities saw the importance of encouraging resident interest and participation in the

program. Some communities publicized the quantity of material being recycled each month and the amount of revenue being received for the recovered materials (Figure 11).

Publicity Effectiveness

This study attempted to estimate the effectiveness of publicity in motivating resident participation. Based on the publicity effectiveness results of surveys conducted in Marblehead and Somerville, Massachusetts, and other similar surveys, 13 publicity methods were evaluated and assigned a value of 1 to 6, according to their estimated effectiveness in motivating participation, as follows:

<u>Effectiveness Categories (point values)</u>	<u>Publicity Methods</u>
6	Letter from local government
5	Circulars, calendars, notices in utility billings
4	Newspaper articles or advertisements
3	Contests, speeches, announcements to/from civic groups, school programs
2	Radio/television spots
1	Posters, buttons

Additional point values were added to take into consideration communities that used a variety of publicity methods. Publicity effectiveness scores were tallied for each community and four "publicity effectiveness" categories were established: poor, fair, good, and excellent.

FIGURE 11

EVERYDAY IS RECYCLING DAY FOR EAST LYME

We want:

- All glass bottles and jars
- All steel and aluminum cans
- Aluminum foil and pie plates
- Bundled newspapers



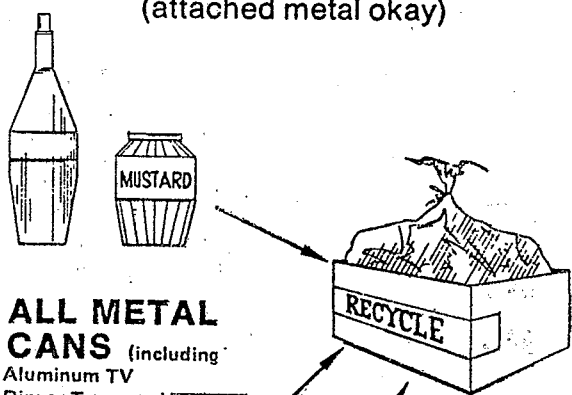
Please:

- No ceramics
- No plastics
- No garbage


 Your Board of Selectmen thanks you for your cooperation.

**AS A REMINDER...
TACK UP THIS SIDE**


ALL GLASS CONTAINERS
(attached metal okay)



ALL METAL CANS (including Aluminum TV Dinner Trays etc.)

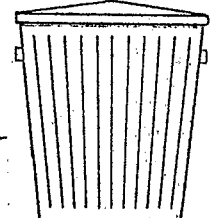


NEWSPAPERS
(untied)




REGULAR REFUSE

ALL OTHER TRASH AND PLASTICS
(including plastics and untied newspapers)



**FOR INFORMATION CALL 861-0361
EXT. 238 OR 239**

 **DART**
RECYCLING TEAM


 **PRINTED ON RECYCLED PAPER**

Table 25 is a breakdown of the estimated effectiveness of publicity before implementation of the separate collection program. Twenty-seven and five-tenths percent of the programs had "poor" publicity campaigns before program implementation. Publicity from these programs was generally limited to announcements in local newspapers or door-to-door circulars. Another 27.6 percent of the programs had "fair" publicity campaigns, using combinations of newspapers and circulars, newspapers and letters from the mayor, or newspapers and one of the publicity methods from Effectiveness Category 3 (see Figure 13). Twenty-seven percent of the programs had "good" publicity campaigns. Good publicity campaigns generally involved the use of three or four publicity methods. Combinations of newspapers, circulars, and several publicity methods in Effectiveness Categories 2 or 3 were usually found in good publicity campaigns. Sixteen percent of the programs produced "excellent" publicity campaigns prior to implementing the separate collection program. Combinations of newspaper publicity, circulars, letters from the mayor or an elected official, and several publicity methods from Effectiveness Categories 4, 5, and 6 were generally found in "excellent" publicity campaigns.

TABLE 25
ESTIMATED EFFECTIVENESS OF
PUBLICITY BEFORE IMPLEMENTATION

Estimated Effectiveness	Number of Programs	Percentage
No publicity	2	1.3
Poor	43	27.5
Fair	43	27.6
Good	43	27.6
<u>Excellent</u>	<u>25</u>	<u>16.0</u>
TOTAL	156	100.0

No Answer: 21
Total Missing Cases: 21

Table 26 is a breakdown of the estimated effectiveness of publicity after implementation of 168 separate collection programs. The majority of the programs had "fair" publicity campaigns, using combinations of newspapers and circulars, newspapers and a letter from the mayor, or newspapers and one of the publicity methods from Effectiveness Category 3 (see Figure 13). Twenty-three (23) percent of the programs had "good" publicity after implementation of separate collection. Combinations of newspapers, circulars, and several publicity methods in Effectiveness Categories 2 or 3 were usually found in good publicity campaigns. Approximately 21 percent of the

programs produced "poor" publicity campaigns, usually limited to occasional announcements in the newspaper or circulars. Fifteen (15) percent of the publicity campaigns after separate collection implementation were considered "excellent."

TABLE 26
ESTIMATED EFFECTIVENESS OF
PUBLICITY AFTER IMPLEMENTATION

Estimated Effectiveness	Number of Programs	Percentage
None (no publicity)	18	10.7
Poor	36	21.4
Fair	49	29.2
Good	39	23.2
<u>Excellent</u>	<u>26</u>	<u>15.5</u>
TOTAL	168	100.0
No Answer: 9		
<u>Total Missing Cases: 9</u>		

VIII. REFERENCES

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12. Duszynski, Director of Public Works, Madison, Wisconsin, to Cohen, U.S. Environmental Protection Agency, August 1977. "Resource Recovery Fact Sheet", January 20, 1977.
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17. Hansen. "Residential Paper Recovery." p. 24.
18. SCS Engineers, Inc. "Analysis of Source Separation Collection", [v. 1], p. 27.
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APPENDIX A

MUNICIPAL WASTE GENERATION AND COMPOSITION IN THE U.S., 1975*

Component	Total Tons in the Waste Stream in Millions of Tons (as discarded)	Percentage Composition (as discarded)
Paper	37.2	29.0
News	6.9	5.4
Corrugated	9.9	7.7
Office paper	4.5	3.5
Other	15.9	12.4
Glass	13.3	10.38
Metals	12.2	9.52
Ferrous	10.8	8.4
Aluminum	0.9	.7
Other	0.4	.3
Food waste	22.8	17.8
Yard waste	26.0	20.3
Other	16.6	12.96
Total	128.2	100.0

U.S. Environmental Protection Agency, Office of Solid Waste,
Resource Recovery Division, and Franklin Associates, Ltd.
Revised February 1977. Details may not add due to rounding.

APPENDIX B

SEPARATE COLLECTION PROGRAMS

(May 1978)

Region I

Bloomfield, CT
East Hartford, CT
East Lyme, CT
Greenwich, CT
Newington, CT
Norwalk, CT
Stamford, CT
Wethersfield, CT
West Hartford, CT
Manchester, CT
Waterford, CT
Durham-Middlefield, CT
Enfield, CT
Hartford, CT
Tewkesberry, CT
Waltham, MA
Lexington, MA
Springfield, MA
Andover, MA
Bedford, MA
Newton, MA
Pittsfield, MA
Somerville, MA
Topsfield, MA
Rocky Hill, CT
North Haven, CT
Waterbury, CT
Marblehead, MA
Cambridge, MA
Beverly, MA
Peabody, MA
Chelmsford, MA
Hamilton, MA
Brookline, MA
North Andover, MA
Salem, MA
South Hadley, MA
Stoughton, MA
Hampton, NH
New Market, NH

Barrington, RI
Lincoln, RI
Tiverton, RI
Northfield, VT
Winchester, CT
New Hartford, CT

Region II

Mount Kisco, NY
New Cassel, NY
Ossining, NY (town)
Pleasantville, NY
Harrison, NY
Tarrytown, NY
Oceanside, NY
Bronxville, NY
Ardsley, NY
Hastings, NY
Ossining, NY
White Plains, NY
Yonkers, NY
Lynbrook, NY
Carmel, NY
Ithaca, NY
Rye, NY
Dobbs Ferry, NY
Millburn, NY
Summit, NY
Union City, NJ
Ridgewood, NJ
Clifton, NJ
Tenafly, NJ
Lyndhurst, NJ
Leonida, NJ
Hasbrouck Heights, NJ
Bergenfield, NJ
Bloomfield, NJ

East Windsor, NJ
Glen Rock, NJ
Paramus, NJ
River Edge, NJ
Closter, NJ
Ocean, NJ
Plainfield, NJ
Shrewsbury, NJ
Fair Haven, NJ
Little Silver, NJ
Rumson, NJ
Wharton, NJ
Ramapo, NY
Great Neck, NY
North Hempstead, NY
Briarcliff Manor, NY
Garden City, NY
Floral Park, NY
Irvington, NY
Mamaroneck, NY
Mamaroneck-Larchmont, NY
Pelham Manor, NY
New Rochelle, NY
Peekskill, NY
Pelham, NY
Oyster Bay, NY
Rockville Center, NY
Courtland, NY
North Tarrytown, NY
New York, NY
Rutherford, NJ
West Orange, NJ
Upper Saddle River, NJ
Bound Brook, NJ
Pasaic, NJ
Ringwood, NJ
Franklin, NJ
Somerville, NJ
Princeton, NJ
Hackensack, NJ
Lodi, NJ
Montclair, NJ
Teaneck, NJ
Palisades Park, NJ
Metuchen, NJ

Region III

Alexandria, VA
Falls Church, VA
Fairfax, VA
Vienna, VA
Allentown, PA
Abington, PA
Swarthmore, PA
Darby, PA
Clifton Heights, PA
Greenbelt, MD
Bowie, MD
Rockville, MD

Region IV

Boca Raton, FL
Oakland Park, FL
South Miami, FL
Signal Mountain, TN
Temple Terrace, FL
St. Matthews, KY
Lexington, KY
Birmingham, AL
Macon, GA

Region V

Shorewood, WI
Madison, WI
Sheboygan, WI
Racine, WI
Bayside, WI
Milwaukee, WI
Menasha, WI
Two Rivers, WI
Appleton, WI
Oshkosh, WI
Huntington Woods, MI
Birmingham, MI
Brooklyn Center, MN
Mankato, MN
Columbia Heights, MN
North Mankato, MN

Wyoming, OH
Indian Hill, OH
Rolling Meadows, IL
Rockford, IL
Aurora, IL
Bloomington, IN
Atlanta, IN
Wabash, IN
Speedway, IN
Greencastle, IN
Glendale, OH
Franklin Park, IL
Whitefish Bay, WI

Region VI

El Paso, TX
Dallas, TX
Unioncity Park, TX
Garland, TX

Region VII

Crestwood, MO
University City, MO
Sioux City, IA

Region VIII

North Glenn, CO
Boulder, CO
Fargo, ND
Salt Lake City, UT
Sioux Falls, SD
Helena, MT

Region IX

San Mateo, CA
Downey, CA
Palo Alto, CA
Santa Barbara, CA
Fresno-Clovis Metro Area, CA
El Cerrito, CA
San Francisco, CA
Fullerton, CA
Ontario, CA
Berkeley, CA
San Diego, CA
Santa Maria, CA
Foster City, CA
Burlingame, CA
Hillsborough, CA
San Mateo, CA
Belmont, CA
Half Moon Bay, CA
San Bernardino, CA
Pacifica, CA
Davis, CA
Palm Springs, CA
Sacramento County, CA
San Luis Obispo, CA
Santa Rosa, CA
Newport Beach, CA
San Anselmo, CA
Modesto, CA
Arcata, CA
Tuscon, AZ
San Carlos, CA
Redwood City, CA
Atherton, CA
Menlo Park, CA

Region X

Omak, WA

APPENDIX C

MULTIMATERIAL SEPARATE COLLECTION PROGRAMS

East Lyme, CT (np,* magazines, glass, cans)
Newington, CT (np, clear glass)
Durham-Middlefield, CT (np, glass)
Hartford, CT (np, metal)
Waltham, MA (np, corrugated, glass, cans)
Bedford, MA (np, glass, cans)
Hamilton, MA (np, glass, cans)
Marblehead, MA (np, glass, cans)
Newton, MA (np, glass, cans)
Somerville, MA (np, glass, cans)
Waterbury, CT (cans, glass)
Ithaca, NY (aluminum, glass, metals)
Summit, NJ (paper, glass)
Rutherford, NJ (np, clear glass)
West Orange, NJ (np, glass)
Bound Brook, NJ (np, glass)
Abington, PA (np, clear glass)
Greenbelt, MD (np, aluminum)
Bowie, MD (cans, clear glass)
Rockville, MD (np, metals)
Clifton Heights, PA (paper, glass)
Brooklyn Center, MN (np, cans, rags)
Mankato, MN (np, cans)
Atlanta, IN (np, magazines, glass, cans)
Wabash, IN (np, glass, cans)
Boulder, CO (np, glass, aluminum cans, tires)
Davis, CA (np, cans, glass)
San Luis Obispo, CA (np, glass, cans)
San Anselmo, CA (np, corrugated, tin, aluminum)
Modesto, CA (np, cans, glass, motor oil)
Downey, CA (np, cans, glass)
Omak, WA (np, glass, cans)
Fresno, CA (np, cans, glass)
El Cerrito, CA (np, cans, glass, magazines, corrugated)
Arcata, CA (glass, corrugated, tin)
Livermore, CA (glass, corrugated, tin)
Andover, MA (paper, clear glass, colored glass, cans)
Topsfield, MA (np, corrugated, cans, glass)
Winchester, CT (paper, glass, cans)
New Hartford, CT (paper, glass, cans)

*np = newspaper

APPENDIX D
PROGRAM DESIGN VARIABLES
(October 1977)

Region 1	Materials Collected					Collection Method				Material Contract	Mand. Ord.	Antiscav. Ordinance
	NP	Mixed	Glass	Cans	A	M	R	T	C	S		
Bloomfield, CT		*					*					*
East Hartford, CT	*			*				*			*	
East Lyme, CT		*	*						*			*
Greenwich, CT		*							*			
Newington, CT	*		*						*	*	*	*
Norwalk, CT		*					*			*	*	
Stamford, CT							*			*		
Wethersfield, CT	*								*	*	*	
West Hartford, CT	*							*		*		
Manchester, CT	*							*			*	
Waterford, CT		*							*			
Durham-Middlefield, CT	*								*	*		
Enfield, CT	*					*			*	*		*
Hartford, CT	*								*	*		
Rocky Hill, CT	*								*	*		
North Haven, CT	*								*	*		
Waterbury, CT			*	*					*	*		
Tewkesberry, MA	*								*	*		
Waltham, MA		*	*	*			*					*
Springfield, MA	*		*	*					*	*		*
Andover, MA		*	*	*					*	*		
Bedford, MA	*		*	*				*				*
Newton, MA	*		*	*					*	*		
Pittsfield, MA		*		*				*		*		*
Somerville, MA	*		*	*				*			*	
Marblehead, MA		*							*			*
Cambridge, MA	*								*	*		
Beverly, MA	*								*	*	*	
Peabody, MA	*								*	*	*	
Chelmsford, MA	*			*					*	*		*
Hamilton, MA			*	*					*	*		*
Swampscott, MA		*							*	*		*
Arlington, MA	*								*	*		
Hampton, NH		*							*	*		
New Market, NH		*							*	*	*	*
Dover, NH	*								*	*		
Barrington, RI	*								*	*		*
Lincoln, RI	*			*					*	*		
Tiverton, RI			*						*	*		
Northfield, VT		*							*	*		

NP = newspaper

mixed = mixed wastepaper

glass = mixed or color sorted

cans = aluminum and bi-metal

A = bulk aluminum scrap

M = bulk metal scrap

APPENDIX D
PROGRAM DESIGN VARIABLES
(October 1977)

Region 2	Materials Collected					Collection Method				Material Contract	Mand. Ord.	Antiscav. Ordinance
	NP	Mixed	Glass	Cans	A M	R	T	C	S			
Millburn, NJ	*								*	*	*	
Summit, NJ		*	*						*	*		
Union City, NJ	*								*	*		*
Ridgewood, NJ	*								*	*		*
Clifton, NJ	*								*	*		*
Tenafly, NJ	*								*	*	*	*
Leonia, NJ		*							*	*	*	*
Hasbrouck Heights, NJ	*								*	*	*	
Bergenfield, NJ	*								*	*		
Bloomfield, NJ		*				*			*	*		*
East Windsor, NJ	*								*			*
Glen Rock, NJ	*								*	*		*
Paramus, NJ	*								*	*	*	*
River Edge, NJ	*								*	*	*	*
Rutherford, NJ									*	*	*	*
West Orange, NJ	*		*						*	*	*	*
Bound Brook, NJ	*		*						*	*	*	*
Pasaic, NJ	*								*	*		*
Ringwood, NJ		*							*	*		
Franklin, NJ	*	*							*	*	*	*
Somerville, NJ	*								*	*		
Princeton, NJ	*								*	*	*	*
Lodi, NJ	*								*	*	*	*
Montclair, NJ	*								*	*	*	*
Teaneck, NJ	*								*	*		*
Metuchen, NJ	*								*	*		
Mount Kisco, NY	*								*	*		*
New Cassel, NY	*								*	*		
Ossining, NY (town)		*							*	*	*	
Pleasantville, NY	*								*	*		
Harrison, NY	*								*	*		
Tarrytown, NY		*							*	*		
Oceanside, NY	*					*			*	*		
Bronxville, NY		*							*	*		
Ardsley, NY	*								*	*		*
Hastings, NY		*							*	*	*	*
Ossining, NY		*							*	*	*	*
White Plains, NY	*								*	*	*	*
Yonkers, NY		*							*	*	*	*
Lynbrook, NY	*								*	*	*	*
Carmel, NY		*							*	*	*	*
Ithaca, NY			*		*	*			*	*	*	*
Rye, NY		*							*	*		
Dobbs Ferry, NY	*					*			*	*		
Ramapo, NY	*								*	*		
Great Neck, NY	*								*	*		
North Hempstead, NY	*								*	*		

APPENDIX D
PROGRAM DESIGN VARIABLES
(October 1977)

Region 2 (continued)	Materials Collected					Collection Method				Material Contract	Mand. Ord.	Antiscav. Ordinance
	NP	Mixed	Glass	Cans	A M	R	T	C	S			
Briarcliff Manor, NY	*								*		*	*
Garden City, NY	*								*	*	*	*
Floral Park, NY	*								*	*	*	*
Irvington, NY		*							*	*	*	*
Mamaroneck, NY		*							*	*	*	*
Mamaroneck-Larchmont, NY	*	*							*	*	*	*
Pelham Manor, NY	*								*	*	*	*
New Rochelle, NY	*								*	*	*	*
Peekskill, NY		*							*	*	*	*
Pelham, NY		*				*			*	*	*	*
Oyster Bay, NY	*								*	*	*	*
Rockville Centre, NY		*							*	*	*	*
Courtland, NY		*							*	*	*	*
New York, NY	*					*			*	*	*	*
<u>Region 3</u>												
Greenbelt, MD	*				*				*		*	*
Bowie, MD			*	*					*		*	*
Rockville, MD	*				*				*		*	*
Allentown, PA	*					*			*	*	*	*
Abington, PA	*		*						*	*	*	*
Swarthmore, PA		*							*	*	*	*
Darby, PA	*								*	*	*	*
Clifton Heights, PA	*		*						*	*	*	*
Alexandria, VA	*								*	*	*	*
Falls Church, VA	*								*	*	*	*
Fairfax, VA	*								*	*	*	*
Vienna, VA	*								*	*	*	*
<u>Region 4</u>												
Boca Raton, FL	*								*		*	*
Oakland Park, FL	*					*			*		*	*
St. Matthews, KY	*					*			*		*	*
Lexington, KY	*								*		*	*

APPENDIX D
PROGRAM DESIGN VARIABLES
(October 1977)

Region 5	Materials Collected					Collection Method					Material Contract	Mand. Ord.	Antiscav. Ordinance
	NP	Mixed	Glass	Cans	A	M	R	T	C	S			
Rolling Meadows, IL	*						*						
Rockford, IL	*						*				*		*
Aurora, IL	*									*			
Franklin Park, IL	*									*			
Bloomington, IN		*					*						
Atlanta, IN		*											
Wabash, IN	*		*	*		*		*					
Speedway, IN	*									*			
Greencastle, IN	*									*			
Huntington Woods, MI	*									*			
Birmingham, MI	*							*				*	*
Brooklyn Center, MN	*			*			*				*		
Mankato, MN	*			*			*				*		
North Mankato, MN	*						*				*		
Wyoming, OH	*						*						
Indian Hill, OH	*									*	*		
Glendale, OH		*					*						
Shorewood, WI	*									*	*	*	*
Madison, WI	*						*			*	*	*	*
Sheboygan, WI	*						*				*	*	*
Racine, WI	*						*					*	*
Bayside, WI	*						*					*	*
Milwaukee, WI	*									*	*		
Menasha, WI	*									*	*		
Two Rivers, WI	*									*	*		
Appleton, WI	*									*	*		*
Oshkosh, WI	*					*				*	*		*
Whitefish Bay, WI	*					*					*	*	*
Region 6													
El Paso, TX	*								*		*		*
Dallas, TX	*								*		*		*
University Park, TX		*							*				*
Garland, TX	*						*						*
Region 7													
Crestwood, MO		*							*		*	*	*
University City, MO	*								*		*		*

APPENDIX D
PROGRAM DESIGN VARIABLES
(October 1977)

Region 8	Materials Collected					Collection Method				Material Contract	Mand. Ord.	Antiscav. Ordinance
	NP	Mixed	Glass	Cans	A	M	R	T	C	S		
North Glenn, CO	*						*					
Boulder, CO		*	*						*			
Sioux Falls, SD	*								*			
Salt Lake City, UT	*						*			*		*
<u>Region 9</u>												
Tuscon, AZ	*						*			*		*
Downey, CA	*		*	*					*			*
Palo Alto, CA	*								*			*
Santa Barbara, CA	*								*			*
Fresno-Clovis, CA	*		*	*			*					*
San Francisco, CA		*					*			*		*
Fullerton, CA	*						*			*		
Ontario, CA	*								*	*		*
Berkeley, CA	*								*	*		*
San Diego, CA	*								*	*		*
Santa Maria, CA	*						*					
San Bernardino, CA	*						*			*	*	*
Pacifica, CA	*						*					
Davis, CA	*		*	*			*	*			*	*
Palm Springs, CA	*						*			*		*
Sacramento County, CA	*						*			*		*
San Luis Obispo, CA	*		*	*				*		*		
Santa Rosa, CA	*						*					
Newport Beach, CA	*								*	*		*
San Anselmo, CA		*			*	*			*	*		*
Modesto, CA	*		*	*					*	*		
<u>Region 10</u>												
Omak, WA		*		*					*			

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