J. ENVIRONMENTAL SYSTEMS, Vol. 25(4) 331-343, 1996-97

GREEN WASTE RECYCLING: A GROWING SYSTEM FOR CONSERVING THE ENVIRONMENT

STUART OSKAMP

SALLY AUGUSTIN

Claremont Graduate University, California

ABSTRACT

As landfill space becomes scarcer, green waste recycling has emerged as a promising form of recycling. Green waste (grass clippings, leaves, and branches) constitutes 18 percent of the U.S. solid waste stream and can surpass 40 percent in leafy rural and suburban areas. Although community-wide green waste recycling has been legislated in at least twenty-three states, it has scarcely been studied in social science research. This article describes green waste recycling in the eighty-eight cities of Los Angeles County and twelve nearby cities in San Bernardino County. Telephone interviews with knowledgeable city officials yielded a 94 percent response rate and covered all major aspects of current and planned programs. Results indicated that thirty-four of the ninety-four cities had green waste recycling programs as of mid-1995, and that thirty-five additional cities planned to start them in the future. The estimated average household participation rate was 65 percent, but no systematic studies of participation had been made. In nineteen cities supplying data, the annual amount of green waste recycled averaged 6,300 tons per year. On average, cities estimated that they were diverting 15 percent of their solid waste stream from landfills through green waste recycling. Seven cities reported the potential to generate income from their programs, but only one (a city of 80,000) had received any, earning $300,000 last year.

The recycling of green waste materials is becoming more important as available landfill capacity in the United States becomes scarcer. Green waste, also called yard waste, is defined by the U.S. Environmental Protection Agency as organic waste generated from landscaping, such as grass trimmings, leaves, and pruned

doi: 10.2190/4NWX-W3BD-0GNY-PG1H
http://baywood.com

tree branches [1]. In the United States green waste generally does not include table scraps. Some European areas have programs for joint recycling of both green waste and food scraps [2]. The Environmental Protection Agency estimated that green waste constitutes 18 percent of the nation's municipal solid waste [3]. In Los Angeles, yard waste comprises between 27 percent and 35 percent of the waste stream, reflecting seasonal variations [4]. In leafy rural and suburban areas the figure can be more than 40 percent.

This article examines community-wide green waste curbside collection programs, which have been widely introduced throughout the United States in recent years. These are the largest-scale programs and therefore have the most potential to reduce the nation's solid waste stream. Green waste recycling programs can take many forms. Some small-scale forms of green waste recycling have been practiced for years, such as backyard composting of yard wastes by gardeners and farmers and even household worm bins for treating food wastes [5]. Other forms of community green waste recycling include city drop-off centers where green waste can be left by residents, "grass cycling" programs that encourage residents to use mulching mowers and leave grass clippings on the lawn instead of collecting them after mowing [6], and municipal promotion of the broad use of individual backyard composting bins.

In many community collection programs the collected materials are composted—decomposed biologically under controlled conditions to produce humus. As recently as 1989 there were only six municipal composting facilities in the United States [7]. An estimated thirty-five million tons of yard waste were collected nationwide at curbside by municipalities in 1992, of which six million tons were collected for composting. It has been projected that 8.6 million tons will be collected at the curb for composting in the year 2000 [8]. Besides conserving landfill space, green waste recycling can save cities money. A study in Newark, New Jersey, determined that composting a source-separated ton of leaves cost less than $30, compared with $108 a ton to deposit them in a landfill [9].

Systematic research on community-wide green waste recycling has not appeared in the social science literature despite the fact that twenty-three states have enacted green waste disposal bans [3]. Almost all of the available literature is based on single-city data and anecdotal reports in recycling trade journals, such as *BioCycle*. After summarizing background information from these reports, we present an empirical study of green waste recycling programs in all cities in Los Angeles County and in nearby cities in San Bernardino County.

GREEN WASTE DISPOSAL BANS AND THEIR IMPACT

By the end of 1993, prohibitions of green waste disposal in landfills had been enacted by twenty-three states, and fourteen states had already implemented these bans. Additional green waste disposal restrictions have been enacted in cities in other states [3]. The first state to divert green waste from its waste stream was

New Jersey, which banned leaves from its landfills in 1988 [10]. Green waste bans have significantly reduced the tonnage sent to landfills and incinerators, but it is difficult to quantify this impact. One reason is that even when comparative data are available from studies completed before and after a ban was implemented, these data are confounded by environmental factors (for example, a drought or a rainy, heavy-growth year) [3].

Seattle reported that a green waste disposal ban and other green-waste-related policy changes resulted in a 14.3 percent reduction in residential disposal weights, and a ban in the Twin Cities area of Minnesota was reported to reduce green waste from 11 percent of the municipal solid waste sent to disposal facilities to 2.8 percent [3]. Many recycling managers agree that a ban on disposal of yard trimmings needs to be supplemented by diversion programs. Such measures together can reduce yard trimmings to between 2 percent and 4 percent of the municipal solid waste stream by reducing the flow of materials to landfills and incinerators. The principal diversion method is curbside collection and composting at centralized facilities [3].

Yard waste disposal bans are not always successful. For instance, bans have been in place in Missouri since 1992, yet the response in Kansas City has not been satisfactory. Since the state prohibited the mingling of green waste and garbage, some residents have subscribed to private collection services. Many other residents and businesses began to dump yard waste illegally [4]. In order to counteract these problems, Kansas City provided additional seasonal green waste pick-ups and several drop-off sites around the city.

PAST RESEARCH ON GREEN-WASTE-RELATED TOPICS

The topic of green waste recycling has scarcely been studied by social science researchers. Two related topics have received minimal attention [1]. One article appeared on grass *cycling*—leaving grass clippings on a lawn or field after they are cut, instead of collecting and bagging them [11]. It indicated that participants assigned to a group that was committed to grass cycling and was asked to talk to neighbors about grass cycling put significantly fewer grass bags into the waste stream than did a control group or a group of participants who had only "committed." Neighbors of participants who committed to grass cycling and to talking with their neighbors "grass-cycled" significantly more often than did the members of the control group, suggesting a diffusion effect which increased during a year-long follow-up period [11]. The grass-cycling study shows how social pressures can affect recycling behavior.

Backyard composting of organic materials was studied by a group of Canadian researchers [12]. Previous reports from Canadian cities concluded that when compost boxes were delivered directly to a household or distributed from a convenient centralized location, the level of participation in backyard composting

programs was increased dramatically, and that subsidizing the cost of the composter unit had a significant positive effect on the number of compost boxes purchased by city residents. Using discriminant analysis, McKenzie-Mohr et al. found clear differences between householders who never composted and householders who composted year-round [12]. The latter group of householders rated the reduction of waste as being more important, and composting as less unpleasant, less inconvenient, and less time-consuming than did householders who never composted. Composters also reported recycling glass and cans more frequently, were more personally satisfied with composting, thought that the development of richer soil was an important reason to participate, and reported buying products with recycled content more frequently than did non-composters.

Descriptions in recycling trade journals make it clear that no two green waste recycling programs are exactly alike and that each green waste recycling program reflects tradeoffs. For instance, "The lowest cost system for collection (plastic bags in compactor trucks) is often the most problematic at the composting facility. The alternatives—biodegradable bags, bins of various types, and loose collection equipment—all have pluses and minuses according to capital outlay, operating costs, and a community's needs" [13, p. 40]. Another major factor is the degree of automation of the recycling collection trucks.

EMPIRICAL STUDY OF GREEN WASTE RECYCLING—METHOD

Sample

Appropriate officials in the eighty-eight incorporated cities of Los Angeles County and twelve nearby cities in San Bernardino County were contacted for information about the green waste recycling programs in their cities during the summer of 1995. Telephone interviews with city officials familiar with local green waste recycling programs were conducted, with a 94 percent response rate. Interviewees often were recycling coordinators with responsibility for all recycling programs in the city, or sometimes only the green waste recycling program. If a recycling coordinator was unaware of program operating costs, participation rates, or similar data, interviews were also conducted with financial officers or other appropriate officials.

Instrument

The telephone survey covered topics related to the inception and goals of each city's green waste recycling program, the mechanics of the program, household participation rates, program promotion methods, citizen attitudes toward green waste recycling, program outcome figures and financial data, information about backyard composting programs, and related topics. The specific questions were

original to this survey but similar in content to those asked by Oskamp et al. [14] and Folz [15]. The interviews emphasized community-wide curbside green waste recycling rather than smaller-scale programs. One question asked whether the city sponsored backyard composting. No questions asked specifically about use of mulching mowers.

Procedure

All interviews were conducted by the same person. A complete interview usually took several calls to a city. Interviews with officials from cities with green waste recycling programs lasted about half an hour; interviews with officials from cities without green waste recycling programs lasted about five minutes. Responses that seemed confused or inconsistent were probed for further details. The turnover rate among recycling coordinators appeared to be quite high, and many persons interviewed had only recently assumed their current jobs.

RESULTS

As of mid-1995, thirty-four of the ninety-four cities providing data had city-wide green waste curbside recycling programs. Another community had a pilot program. An additional thirty-five cities planned to introduce green waste recycling programs in the future. Respondents in five other cities said that their cities might one day have such a program. Citizen participation was compulsory in three of the cities with green waste recycling programs; these were the only city-sponsored programs for the disposal of green waste in those cities. Nineteen cities without green waste recycling programs did have some sort of related activity, such as a composting program. Thirty-one percent of the cities surveyed had household composting programs.

Sixty-two percent of the cities with green waste recycling programs started them in order to meet the requirements of a specific California state regulation, AB939, which requires that local governments divert 25 percent (by weight) of their waste stream from landfills by 1995 and 50 percent by 2000. Some cities (9%) started their programs in order to meet other diversion goals, 6 percent began them to meet goals for citizen participation in a green waste program, and 3 percent in order to make green waste recycling available to citizens in general. "Other" (14%), and "don't know" (6%) responses accounted for the remainder.

Program Descriptions

In 82 percent of Los Angeles-area cities with green waste recycling programs, green waste was defined as grass, leaves, and bush clippings. Tree branches could be recycled with grass and bush clippings in 94 percent of the cities that had green waste recycling programs.

On average, green waste recycling programs began thirty months prior to the survey. Most (43%) were implemented city-wide at one time rather than in phases (27%). Of the other cities, 10 percent piloted a program before starting one simultaneously throughout the city, 7 percent piloted a program and then phased in a green waste recycling program. Thirteen percent of the respondents did not know how the programs in their cities began.

In 71 percent of the towns that had green waste recycling programs, the respondents reported that all residents were able to participate in the programs. However, further questioning revealed that green waste recycling was available for small multifamily apartments (3 units or less) in 81 percent of the cities, and for larger apartments in 65 percent of the cities.

In most cities (71%), a single private waste management company collected all municipal green waste, generally once per week (97%), on the same day that trash (94%) and other recyclables (87%) were collected. Barrels and cans were used in 84 percent of the cities to collect green waste. In 56 percent of the cities these containers were provided by the residents. The median container size for cities reporting a specific container size was 33 gallons; 13 percent of the cities used containers of 15 gallons or less, 60 percent used 30 to 35 gallon sizes, and 27 percent used 60 to 95 gallon sizes. In 33 percent of the cities with green waste recycling programs, multiple bin sizes were allowed. In a plurality of cities the recycling containers did not have lids (43%), however, in 30 percent of cities several container configurations were used, and some of these additional configurations may have included lids. Lids prevent water from collecting in the recycling container during rainy periods. Their effect on odor and putrefaction in hot weather was not studied. Just 28 percent of the cities used recycling containers with wheels for easy transport, although, again, the multiple container configurations available in some cities may have included some wheeled containers.

In the cities with green waste recycling programs, 60 percent did not require that all green waste be put in the recycling container (37% did). In the former cities, extra green waste was typically recognized by collectors by the way it was bundled (48% of cities with green waste recycling), by the presence of a required tag (13%), by no special marking or bundling (13%), by several allowed types of markings (4%), or by other identification techniques (17%). Any extra tags required to mark green waste were most often available only from the city (47%); in 5 percent of the cities they were obtained from the hauler, in 32 percent they could be requested from either the city or the hauler, and in 16 percent of the cases other distribution techniques were used.

Residents in 83 percent of the cities with green waste recycling were charged for their green waste recycling collections; in half of the cities these charges were levied as part of a combination trash/recycling bill. The average charge for green waste recycling was $1.55 per month in the six towns that broke out green waste separately on citizen recycling bills. Only two of the towns responding had

multi-tier pricing schedules through which residents were charged different amounts for recycling based on whether or not they sorted their materials in accordance with established criteria.

Some operational problems were reported in 85 percent of cities with green waste recycling programs. The most common problem was contamination; i.e., non-green-waste materials being placed in the recycling container (35%). No other problem was present in more than one of the towns reporting problems with their green waste recycling programs. Of the twelve cities where a problem with contamination was reported, it was classified as not serious in ten and serious in two. Five cities had made operational changes since introducing their green waste recycling programs, usually to streamline operating procedures. Two cities had changed to more efficient trucks, one city discontinued collecting palm fronds because they were difficult to chip, and two cities had made other changes.

In cities with green waste recycling programs, respondents were asked to evaluate the promotional programs that introduced the recycling programs. On a scale of 1 (low) to 5 (high), the mean self-rating of the quality of the introductory program was 3.73. Later, we rated these introductory programs in terms of the number of program components mentioned. Any discernible portion of an introductory program was classified as a component; for example, each mailing was a program component. Fifty-two percent of the programs were rated as minimal (2 or less components). Similarly, we classified the citizen-reminder program used in cities with green waste recycling programs as absent in 19 percent of the cities, minimal (two or less program components) in 29 percent, comprehensive (3 to 4 components) in 26 percent, and very comprehensive (5 or more components) in 12 percent; 3 percent of respondents did not know if their city had a reminder program, and 10 percent of reminder programs were classified as "other." Of the interviewees, 73 percent did not know the impact of the introductory program that their city had used, and 52 percent did not know the impact of their reminder programs.

Some respondents from cities with green waste recycling programs offered suggestions for starting green waste recycling programs; multiple responses were tabulated on this question. Educating residents about the program before it was implemented was regarded as important by 21 percent of respondents; 8 percent mentioned making the program easy to use, 8 percent suggested implementing the program in conjunction with an automated collection program, and 8 percent said citizens need to know how important the program was for the city. No other responses were received more than twice.

Multiple responses also were tabulated for suggestions regarding the continuing operation of green waste recycling programs. The importance of continuing to promote the program to residents was stressed by 15 percent of respondents, an additional 15 percent stressed the importance of educating residents about green waste recycling, and 9 percent advised becoming familiar with markets for green

waste materials and maintaining a market for collected green waste. No other response was given more than once.

The estimated citizen participation rates in green waste recycling programs were generally high; the average was 65 percent in the twenty cities reporting data on this topic. However, it is important to note that 40 percent of the cities responding to this question based their answer on a "guesstimate" by the recycling coordinator and not on "hard" data, such as hauler tallies. In the five cities that did use hauler tallies to calculate green waste recycling participation rates, the *weekly* average of these rates was 37 percent—perhaps a more accurate figure, but one that omits the participation in other weeks of residents who did not recycle in a particular week.

Only five of the cities with green waste recycling programs indicated that they had surveyed their citizens regarding the program; all five reported that their citizens liked it. Coordinators in other cities were asked how their citizens had reacted to the city's green waste recycling program; 69 percent thought that the response had been positive or very positive, 19 percent reported a neutral response, 8 percent felt that their citizens were negative or very negative about their green waste recycling program, and 4 percent were unsure how the residents felt.

Program Outcomes

Sanitary landfills spread dirt over the trash deposited each day to prevent it from attracting rodents and spreading noxious odors and disease. In 1995, California state regulations allowed green waste to be counted toward the city's solid waste diversion goal if it was used as "alternative daily cover" (but see the Discussion for later regulations). In 58 percent of the cities with green waste recycling programs, the collected material was used in this way as alternative daily cover, in 12 percent it was composted, and in 15 percent it was made into some type of biomass product (e.g., fireplace logs). The remaining 15 percent of responses were classified as uninformed or "other."

Respondents in the eighteen cities reporting pertinent data estimated, on average, that they were diverting 15 percent of their solid waste stream from local landfills through green waste recycling. These diversion estimates were made in terms of the California state computational regulations in effect at the time. However, only 41 percent of these estimates were based on hauler "weigh tickets," 6 percent were based on other types of hauler reports, 6 percent on waste hauler "guesstimates," 6 percent on visual inspections, 12 percent on coordinator guesstimates, and 29 percent on "other" bases. Coordinators, on average, estimated that 54 percent of the residential green waste in their cities was being recycling, but in 31 percent of the cities reporting data in this category the responses were based on coordinator guesses. The actual tonnage of green waste

recycled was reported for nineteen cities; the average was 6300 tons per year. These data came from weigh tickets in 79 percent of the cases, from hauler reports in 11 percent, and from other sources in 11 percent. Revealingly, only 70 percent of the cities with citizen green waste recycling programs recycled all the green waste from city property such as parks.

The average reported city tipping fee (charge to dispose of green waste) was $10.41 per ton. This figure is low compared to those for other locations in the United States; tipping fees have exceeded $100 in some areas of New York and New Jersey [7]. Indeed, two of the fourteen cities reporting said they had free tipping for green waste. In 31 percent of the cities, either the hauler paid the continuing yearly operating costs of the green waste recycling program or the cost of the program to the city was minimal. Twenty-eight percent of the respondents did not know the continuing yearly costs of their city's green waste recycling program. All financial calculations were performed by the respondents. More specific questions about economics and logistics were not asked. Recycling coordinators from seven cities reported that it was possible in the future for their cities to generate income through their green waste recycling programs, but only one city had done so in the past year. This city of 80,000 earned $300,000 through its green waste recycling program.

Differences by County, City Size, City Income Level, and Program Age

Chi-square tests were made on differences in green waste recycling programs for different counties, different size cities, cities with different median household incomes, and programs of different ages. Largely owing to the small sample size, very few significant differences were found. Cities with populations of 50,000 or more were more likely to bill residents as part of an overall trash bill, and cities of 50,000 or less were more likely to bill for green waste recycling as part of a general recycling bill (likelihood ratio = 3.0, $p < .08$). Cities with low to medium estimated participation levels collected fewer adjusted tons of green waste than did cities in high participation categories (likelihood ratio = 8.8, $p < .01$). Older programs were significantly more likely to restrict their residents to a single size recycling container than newer programs (Fisher's exact test, one-tail $p < .01$) and were also more likely to devote more effort to the promotion of their recycling program (likelihood ratio = 3.1, $p < .08$). Estimated participation rates in Los Angeles County were significantly more likely to be high than in (more rural) San Bernardino County (likelihood ratio = 3.0, $p < .08$). Cities in Los Angeles County also devoted significantly more effort to promoting their green waste recycling programs than did cities in San Bernardino County (likelihood ratio = 6.1, $p < .01$).

DISCUSSION

Typical Green Waste Recycling Programs

A synthesis of the descriptions of various exemplary green waste recycling programs presented in trade journals yields a picture very similar to that given by the representative green waste recycling programs we found in Los Angeles and San Bernardino Counties, as described above. Weekly collection of green waste has been the preferred schedule [13]. Many programs use special bins for the collection of green waste, and many prohibit use of plastic bags—because programs do not have shredding equipment, because emptying the bags is time consuming and expensive, and because grass clippings become anaerobic in plastic so that the waste quickly begins to smell bad [13]. Kraft bags are used in some communities, but in moist areas paper bags quickly become useless [13]. In many cities, the green waste recycling bins are emptied by trucks with automated arms, rather than by hand. Some communities, particularly those in the leafy Northeast, also use trucks outfitted with giant vacuum cleaners to suck up fallen leaves that have been raked to the curb.

Case Studies of Two Cities

The green waste recycling programs in Pasadena and Los Angeles have interesting features. Pasadena, a largely middle-class city of 138,000 close to Los Angeles, is unusual for its extensive green waste recycling and composting programs. The city has developed a variable-rate refuse collection schedule that encourages citizens to separate their yard waste. Residents who do so save almost $10 on every monthly trash bill [16]. City billing records indicate that 24 percent of city households have contracted for a refuse disposal option that requires separation of green waste from other materials. This participation figure may be underestimated, however, because many households in Pasadena have gardeners who remove all green waste materials they generate. The city has also developed an attractive, attention-getting promotional program to present the green waste recycling program to residents.

Los Angeles is the second largest city in the nation, but its size has not resulted in a green waste recycling program that is different in any significant way from the typical green waste recycling program in nearby suburbs. Los Angeles' green waste recycling program is an important part of the city's plans to meet the California state goal of 50 percent solid waste diversion by 2000. Careful advance planning is crucial for meeting such overall recycling goals, as the experience of Los Angeles underscores. Although the city distributed separate carts for collection of green waste to households in 1990, collection of separated green waste did not begin until April 1992 because the city did not contract with processors to recycle the green waste until that time [4]. The city aimed to re-educate residents

who were accustomed to commingling green waste and trash to separate the green waste from the trash; this process was soon reported to be difficult [4].

Converting Green Waste to Saleable Products

Several U.S. cities have created saleable products from the green waste material that they collect for recycling. Austin, Texas, mixes brush clippings with wastewater sludge to produce "Dillo Dirt" (named for native armadillos), which is popular with wholesalers and consumers [4]. Jacksonville, Florida, has been receiving 50 percent of the revenue generated by compost sales made by the city's green waste processor [17].

A processor for the city of Los Angeles mixes yard trimmings with biosolids to produce a retail product called TOPGRO, which is marketed by the processor. Most of this product is sold in bulk to farmers in the southern San Joaquin Valley, with Los Angeles receiving a 5 percent rebate on all sales of compost that includes its biosolids [18].

The city of San Jose, California, has contracted with several composting sites, which sell a finished compost product. The demand for the product exceeds the supply, and the city was receiving 1,800 tons a year for its own use. Composted material from San Jose has also been used as fuel by energy plants, but these sales contracts may lapse as utilities begin to use less expensive sources of power, like gas, in place of the biomass material [19].

State Regulations

Historically, there have been dramatic fluctuations in market prices for composted products. California has several times revised state policies on how to credit recycling toward state-mandated diversion goals. Contradicting the 1995 state policies, the Sacramento County Superior Court ruled early in 1996 that green waste used as alternative daily cover (ADC) could not be counted toward state waste-diversion goals because it was in point of fact *not* being diverted from landfills. This ruling was appealed and held in abeyance,[1] for if implemented, it could significantly affect cities' enthusiasm for green waste recycling programs unless they could be combined with composting and made financially remunerative. A later California law, AB1647, allowed green waste used as ADC at landfills to be classified as diverted municipal waste. However, the percentage of each municipality's diversion goal that can be met with green waste used as ADC has yet to be determined[2]

[1] Personal communication, Bill George, April 29, 1996.

[2] Personal communication, Dan McCarroll, January 30, 1997.

Limitations of This Research

There were several limitations in our empirical study. Some interviewees were reluctant to release details of their green waste recycling programs, especially financial details. A few officials indicated that they had negotiated very favorable contracts with their processors and did not want other cities and towns learning about these financial arrangements because this might jeopardize their ability to maintain this pricing. Moreover, high employee turnover and lack of knowledge about past program details appeared to limit the value of the information provided in some interviews. Information about the current operations of the programs appeared to be most credible. New employees not familiar with historical circumstances often could not state city motivations for specific actions. Roughly 10 to 15 percent of those interviewed seemed unaware of contradictions in their responses, indicating a lack of thorough thought about some of their survey responses.

Further research should examine green waste recycling in other regions of the country and begin to gather demographic and attitudinal data from individual participants in green waste recycling programs.

CONCLUSION

This is the first systematic empirical investigation of green waste recycling in the social science literature. We contacted city officials in all the cities in Los Angeles County and the adjoining West End of San Bernardino County, and obtained a 94 percent response rate. As of mid-1995, more than one-third of these cities already had city-wide curbside recycling of green waste, and an equal number were expecting to begin such programs in the future. The cities that provided tonnage figures recycled an average of 6,300 tons of green waste per year, and thereby diverted an estimated 15 percent of their waste stream away from landfills, according to California regulatory standards. These data indicate a serious and largely successful diversion effort. The amount of scarce landfill space being used for green waste is an important issue throughout the United States. Our results support cautious optimism for the future diversion of green waste from our country's landfills.

REFERENCES

1. A. Taylor and R. Kashmanian, *Study and Assessment of Eight Yard Waste Compost Programs in the United States* (EPA Publication No. 530-SW-89-038), U.S. Environmental Protection Agency, Washington, D.C., 1988.
2. H. W. A. Lustenhouwer, F. A. Reijenga, and H. C. van Weenen, Source Separation and Collection of Household Compostables, *BioCycle, 28*:7, pp. 33-36, 1987.
3. R. Steuteville, Measuring the Impact of Disposal Bans, *BioCycle, 35*:9, pp. 58-60, 1994.

4. J. Jesitus, Yardwaste Diversion Efforts Growing, *MSW Management, 5*:5, pp. 20-27, 1995.
5. E. S. Geller, R. A. Winett, and P. B. Everett, *Preserving the Environment: New Strategies for Behavior Change,* Pergamon, New York, 1982.
6. California Integrated Waste Management Board, *Send Your Grass Back to its Roots: Grasscycling,* Author, Sacramento, 1994.
7. J. R. Schubel and H. A. Neal, *Garbage and Trash: Can We Convert Mountains into Molehills?* Research Foundation of State University of New York, Stony Brook, 1992.
8. C. Canon, Half Empty or Half Full? *BioCycle, 36*:1, p. 86, 1995.
9. A. Sachs, Composting: Dirty Riches, *World Watch, 6*:4, pp. 36-39, 1993.
10. A. Magnuson, Compost: Hitting Pay Dirt, *American City and County, 109*:5, pp. 29-30, 1994.
11. M. K. Cobern, B. E. Porter, F. C. Leeming, and W. O. Dwyer, The Effect of Commitment on Adoption and Diffusion of Grass Cycling, *Environment and Behavior, 27,* pp. 213-232, 1995.
12. D. McKenzie-Mohr, L. S. Nemiroff, L. Beers, and S. Desmarais, Determinants of Responsible Environmental Behavior, *Journal of Social Issues, 51*:4, pp. 139-156, 1995.
13. R. Spencer, Which System Works Best for Collecting Yard Trimmings? *BioCycle, 34*:9, pp. 37-40, 1993.
14. S. Oskamp, R. Williams, J. Unipan, N. Steers, T. Mainieri, and G. Kurland, Psychological Factors Affecting Paper Recycling by Businesses, *Environment and Behavior, 26,* pp. 477-503, 1994.
15. D. H. Folz, Recycling Program Design, Management and Participation: A National Survey of Municipal Experience, *Public Administration Review, 51,* pp. 222-231, 1991.
16. D. Ferrell, Keeping a Lid on the Trash Cans—And Trash Can'ts, *Los Angeles Times,* pp. B1, B8, November 4, 1995.
17. S. Kelly, Large Scale Yard Waste Composting, *BioCycle, 34*:9, pp. 30-32, 1993.
18. R. Fabrikant and T. Kearney, Cocomposting in Los Angeles optimizes resource management, *BioCycle, 35*:12, pp. 58-60, 1994.
19. W. A. Toomey, Meeting the Challenges of Yard Trimmings Diversion, *BioCycle, 35*:5, pp. 55-59, 1994.

Direct reprint requests to:

Professor Stuart Oskamp
Center for Organizational and Behavioral Sciences
Claremont Graduate University
123 E. Eighth Street
Claremont, CA 91711-3955