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REDUCING CONTAMINATION IN CURBSIDE RECYCLING PROGRAMS

SWANA
APPLIED RESEARCH FOUNDATION

Prepared for:
SWANA Applied Research Foundation
Sustainable Materials Management Group Subscribers

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INTRODUCTION

Background

This report has been prepared by the SWANA Applied Research Foundation (ARF) to provide recycling and sustainability managers with up-to-date information and guidance on the costs and effectiveness of programs designed to reduce the contamination contained in residential curbside recycling programs.

This topic, which was submitted by the Monterey (CA) Regional Waste Management District, was described as follows:

> *"We in the recycling community are all struggling with efforts to meet higher standards for recycling quality. In this regard, there is an urgent need for applied research to be conducted that will identify, analyze, and document the most effective methods of reducing contamination in single stream and mixed commercial recycling programs."*

The SWANA Applied Research Foundation (ARF)

This report was prepared by the SWANA ARF staff with input and guidance provided by the ARF Recycling Group Subscribers,[1] who are listed in Table 1-1.

Table 1-1: SWANA ARF FY2021 Sustainable Materials Management Group Subscribers

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[1] *The SWANA Applied Research Foundation was founded in 2001 with the purpose of conducting collectively-defined and funded applied research on pressing solid waste issues. It is funded by local governments and other organizations that contribute a "penny per ton" of waste managed to the Foundation on an annual basis. For more information on the SWANA Applied Research Foundation, please contact Jeremy O'Brien, Director of Applied Research, SWANA, (301) 585-2898.*

About this Report

The issue of contamination in curbside recycling programs has grown in importance in recent years as its costs and safety impacts on recyclables processing at material recovery facilities (MRFs) become more widely recognized and better understood.

To address this issue, many state and local governments have implemented "recycle right" programs that provide clearer and simplified instructions to residents on what recyclables are included in their curbside programs. In addition, national organizations such as The Recycling Partnership (TRP) have developed "Recycling Anti-Contamination Kits" that are made available free of charge to recycling program managers and have provided grants to numerous communities to support cart inspection programs. SWANA appreciates and supports the efforts of these organizations and governments to address the curbside recycling contamination issue.

The purpose of this report is to compliment those initiatives by identifying and addressing the key reasons why residents place contaminants in their recycling bins. A better understanding of what causes these recycling behaviors will enable recycling and sustainability program managers to develop and implement more effective anti-contamination programs that address the underlying reasons for curbside recycling contamination.

UNDERSTANDING THE CAUSES OF CURBSIDE RECYCLING CONTAMINATION

Introduction

The placement of recyclables and other items or waste in curbside recycling containers that are not targeted by curbside recycling programs is referred to as "contamination." This contamination causes maintenance and safety issues at MRFs where curbside recyclables are processed. It also causes additional MRF processing costs to be incurred by processing these contaminants instead of being recycled through drop-off recycling options or being sent directly to the landfill in the resident's mixed waste.

The amount of contamination in curbside recycling programs is significant. In its 2020 "State of Curbside Recycling" report, the Recycling Partnership (TRP) estimated that the national average inbound contamination rate was 17 percent by weight of the material collected at the curb.[2] In light of the 11.9 million tons of recyclables collected annually, and an assumed MRF processing costs of $82 per ton, it is estimated that approximately $166 million are spent in the U.S. each year to needlessly process contaminants at MRFs before transporting them to the landfill for disposal.[3]

A recent ARF report on *Resetting Curbside Recycling Programs in the Wake of China*[4] states that contamination of curbside recyclables is due to the following practices of the residents participating in the program:

1. The placement of recyclable materials and products in recycling containers that are not targeted by the curbside recycling program.
2. The intentional or accidental inclusion of non-recyclable materials in recycling containers by residents.
3. The contamination of recyclable materials by other materials in the recycling mix (broken glass shards in paper) as well as food and other residues that have not been removed from the recyclables.

The purpose of this section is to explore the reasons why residents are engaging in these practices. Such insight can help inspire development programs that remedy these behaviors.

Misunderstanding of what Recyclables are Included in Curbside Recycling

One reason that residents place unacceptable materials and products in their curbside recycling containers is the confusing and sometimes contradictory information they receive from their state and local governments, as well as consumer-facing companies, as to what can and cannot be recycled. This confusion is caused by inconsistent messaging, the "recycling arrows" and "wishful" recycling.

- **Inconsistent Messaging** – Lists provided to residents regarding what recyclables are included in curbside recycling programs are often inconsistent. For example, two posters—one from the state of North Carolina

[2] *SWANA has collected contamination data from a variety of other sources, including Waste Management, that are consistent with the TRP report's conclusion.*

[3] *The Recycling Partnership. 2020 State of Curbside Recycling Report. In this report, TRP stated that 69.8 million households in the U.S. have access to curbside recycling services and that, on average, these households set out 11.9 tons of recyclables (including contaminants) for pickup each year. The report also indicates an average MRF processing cost of $82 per ton.*

[4] *SWANA Applied Research Foundation. Resetting Curbside Recycling Programs in the Wake of China. September 2019.*

and another from a North Carolina county—identifying what can and cannot be recycled are presented in Figures 2-1 and 2-2. Based on these messages, the resident would be confused as to whether:

- ◊ Plastics tubs should be placed into the curbside container.
- ◊ Labels need to be removed from bottle and cans before recycling.

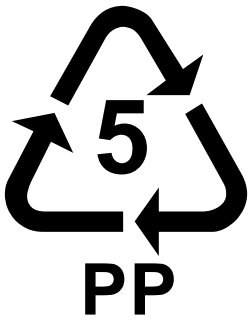
- **Recycling Arrows** – Residents are also often confused by the recycling symbols, generally consisting of triangulated chasing arrows and numbers, that are embedded in many types of plastic packaging. For example, plastic food tubs typically have a PP-5 chasing arrows sign on them (See Figure 2-3) indicating that these packages are recyclable. As a result, a resident may not understand why these items are not accepted in the County's curbside recycling program shown in Figure 2-2. To add to the confusion, no explanation is given on the County's website as to why this type of container is not included in the County's curbside recycling program.
- **Wishful Recycling** – *Wishful recycling* refers to the placement of items in a recycling container by residents who wish they were included in the curbside recycling program. Often, residents want items such as holiday lights or plastic bags to be recycled and place them in their curbside recycling containers even though such materials are not included in their local recycling programs.

Figure 2-1: State of North Carolina Recycling Education Poster

Figure 2-2: North Carolina County: Recycling Education Poster

SOURCE: Mecklenburg County Government

Figure 2-3: Recycling Symbol on the bottom of a plastic tub of cream cheese



The education of residents is the primary method that governments are using to address confusion regarding what recyclables are included in curbside recycling. However, it is clear that, in addition to providing educational materials, consistency is needed between local governments in a region with respect to the types of recyclables that are included in curbside recycling programs. Ideally, states, provinces, and localities would all have the same items on their list of acceptable curbside recyclables. However, this is generally not the case due to regional differences in secondary materials markets, different laws and policies, and varying solid waste systems. For example, mixed paper was eliminated from curbside recycling programs in Lancaster County, PA in 2018 due to the lack of local markets for recycled paper, as well as the county's inability to recover enough energy from the paper to produce electricity in its waste-to-energy facility.[5]

Different Levels of Commitments to Curbside Recycling

Another factor that is often overlooked in responding to the curbside recycling contamination issue is the varying levels of recycling commitments of residents who are provided with curbside recycling collection services. Recycling and sustainability program managers often overestimate the commitment of certain residents and mistakenly assume that contamination issues can be resolved through increased spending on recycling public education programs.

Many residents are voluntary participants in curbside recycling programs, and some level of effort is required on their part to participate in the program. This effort includes learning about and keeping up-to-date on what recyclables are included in their local program, cleaning out food and other residues from containers, breaking down and tearing cardboard containers, storing recyclables in temporary containers inside the house, moving them to their curbside container, and setting out and retrieving their curbside container from the curb.

Residents are asked to do these tasks on a regular basis to accomplish local goals such as conserving landfill airspace and avoiding disposal costs, as well as broader societal goals such as conserving natural resources and protecting the environment. In many cases, residents pay directly for curbside collection service, and thus financially support their service while contributing their labor voluntarily.

The chief benefactors of this activity are often the industries who can buy these recovered materials at a reduced price (due in part to residents subsidizing costs of recovering materials). For these and other reasons, some residents are not sufficiently motivated to participate in curbside recycling, or to abide by rules and policies established for the program. This can clearly be seen from an analysis of the findings of a waste characterization study done in Ohio, as described below.

The Solid Waste Authority of Central Ohio (SWACO) performed a four-season waste characterization study in 2018 to determine the composition of refuse generated within its service area and destined for disposal. The study was performed by the Project Team of MSW Consultants and Cascadia Consulting Group (Cascadia).[6]

During the course of the study, two communities changed their recyclables collection methods. At the start of the study, the cities of Gahanna and Reynoldsburg were using 18-gallon recycling bins for their curbside collection program. In May 2018, both communities converted to 64-gallon roll carts that replaced the bins. Conversion from bins to carts was sponsored by TRP, which supplied grant funds to help acquire them.

[5] https://lancasteronline.com/news/local/lancaster-county-residents-struggling-with-recycling-reset/article_08e00106-9a77-11e8-867b-ebfd0891561b.html.

[6] *MSW Consultants.* Comparing Capture Rate Methodologies in Two SWACO Communities. *May 21, 2020.*

Located in the eastern portion of Franklin County, Gahanna and Reynoldsburg are comparably-sized cities. Table 2-1 summarizes the number of households served by their recycling programs and the annual waste tonnages generated by both communities. As shown in the table, the total generation of refuse remained reasonably consistent before and after deployment of the recycling carts.

Table 2-1: Annual Generation of Refuse for Participating Communities

		18-Gallon Recycling Bins		64-Gallon Recycling Carts	
City	Households	Total Tons	Tons/HH	Total Tons	Tons/HH
Gahanna, OH	10,002	12,752	1.27	12,350	1.23
Reynoldsburg, OH	10,475	12,088	1.15	12,086	1.15
Total	**20,477**	**24,840**	**2.42**	**24,436**	**2.38**

There were two iterations of sampling and sorting of curbside recyclables that occurred for this project. These were held on Feb 11–15 and Aug 19–23, 2018. As indicated in Table 2-2, the average contamination rate of the households sampled in the "Pre-Cart Distribution" study was estimated to be 17.4 percent.[7]

After the recycling bins were replaced by carts, the average contamination contained in the carts was found to be 19.6 percent as shown in Table 2-3.[8] The percentage of households in each contamination range are also presented in the table.

Table 2-2: Curbside Contamination Rate: Pre-Cart Distribution

Contamination Ranges		% Households	Calculated Average Contamination—All Households
Range	Median		
<5%	3%	22%	0.6%
5–9%	7%	17%	1.2%
10–14%	12%	15%	1.8%
15–19%	17%	12%	2.0%
20–24%	22%	11%	2.6%
>25%	40%	23%	9.2%
			17.4%

Note: Pre-Cart contamination of 17.4% reported on page 3–10 of SWACO Gahannna and Reynoldsburg Capture Rate Study Review.

[7] *In light of this rate, and assuming the median contamination value for the five contamination ranges below 25 percent, a median contamination value of 40 percent was calculated for the ">25 percent" contamination range for the Pre-Cart Distribution study.*

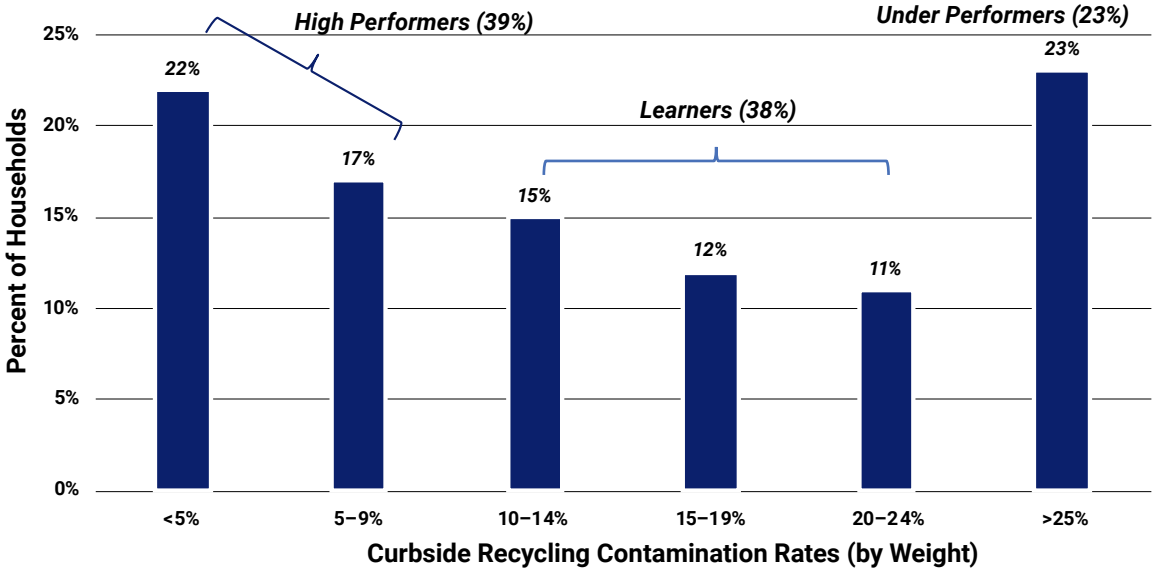
[8] *Ibid.*

Table 2-3: Curbside Contamination Rate: Post-Cart Distribution

Contamination Ranges		% Households	Calculated Average Contamination—All Households
Range	Median		
<5%	3%	30%	0.8%
5–9%	7%	20%	1.4%
10–14%	12%	6%	0.7%
15–19%	17%	10%	1.7%
20–24%	22%	6%	1.3%
>25%	49%	28%	13.7%
			19.6%

The data presented in Table 2-2 and Table 2-3 are presented visually in Figure 2-1 and Figure 2-2 respectively.

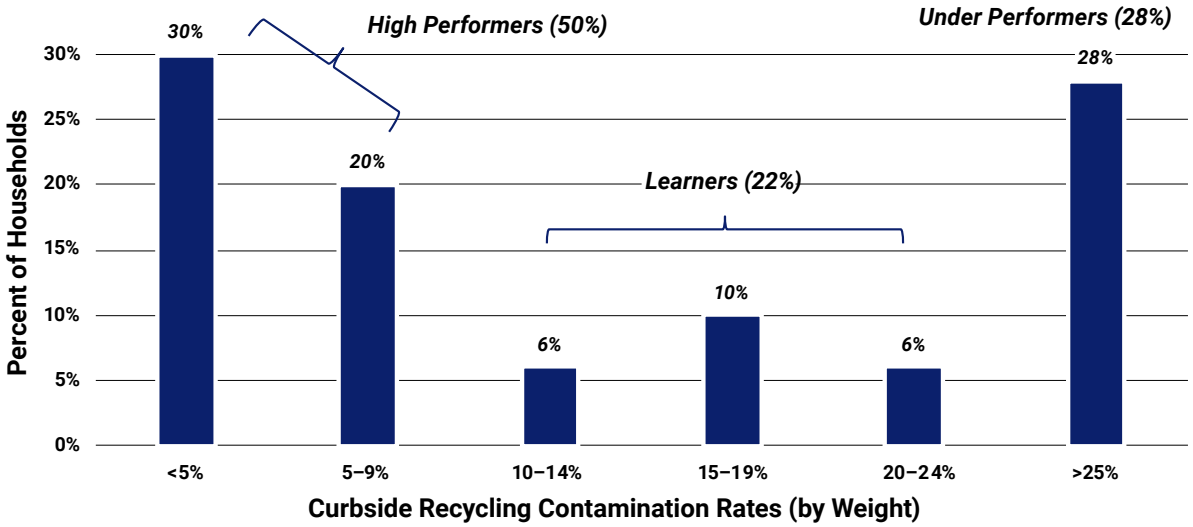
Figure 2-4: Curbside Contamination Rates: Pre-Cart Distribution



As Figure 2-1 indicates, prior to the distribution of recycling carts, 39 percent of households had contamination levels of less than 10 precent. Based on this low contamination rate, these households were classified as "High Performers." A second group classified as "Learners", representing 38 percent of households served, had contamination rates of 10–24 percent. Finally, a third group, representing 23 percent of households served, had contamination rates of over 25 percent. This group comprised the "Under Performers" category.

As shown in Figure 2-2, following the distribution of the recycling carts, the percentage of High Performers jumped from 39 to 50 percent of households served, while the percentage of Learners dropped from 38 to 22 percent. What is most interesting is the fact that the percentage of Under Performers increased from 23 to 28 percent following distribution of the carts.

Figure 2-5: Curbside Contamination Rates: Post-Cart Distribution



The data presented in Table 2-2 and Table 2-3 are summarized for each of these three recycling groups in Table 2-4 (Pre-Cart Distribution) and Table 2-5 (Post-Cart Distribution). Comparing these tables can provide some valuable insights.

Table 2-4: Contamination Rates of Single-Family Household Recycling Groups: Pre-Cart Distribution

Recycling Group	% of Households	Contamination Range	Contamination Percentage Points Attributable to Each Group
High Performers	39%	<10%	1.8%
Learners	38%	10–24%	6.4%
Under Performers	23%	>25%	9.2%
Total	**100%**		**17.4%**

Table 2-5: Contamination Rates of Single-Family Household Recycling Groups: Post-Cart Distribution

Recycling Group	% of Households	Contamination Range	Contamination Percentage Points Attributable to Each Group
High Performers	50%	<10%	2.2%
Learners	22%	10–24%	3.7%
Under Performers	28%	>25%	13.7%
Total	**100%**		**19.6%**

First, the replacement of recycling bins with larger roll-out carts actually resulted in an increase in contamination: from 17.4 to 19.6 percent. This occurred even though the percentage of High Performers increased from 39 to 50 percent of the households served. In summary, the study found that following the distribution of the recycling carts almost two thirds of the cart contamination (13.7%/19.6%) was coming from 28 percent of households. This increase in contamination occurred despite extensive educational outreach conducted during the bin-to-cart conversion program. This finding suggests that increased education alone is not likely to have a significant impact on the contamination caused by this group.

Recognizing the distinctions between the Higher Performers, Learners, and Under Performers customer groups can help recycling and sustainability managers design and implement more effective anti-contamination programs. For example, the "High Performers" group may need occasional "oops tag" reminders and periodic mail inserts to address their contamination issues. The "Learners" group may need more regular cart inspections and cart rejections to correct their behavior. Finally, if cart rejections do not result in reduced contamination levels, recycling services to Under Performers may need to be suspended to encourage them to comply with applicable curbside recycling rules. These options are discussed below in this report.

Unintended Consequences of PAYT Programs

In addition to confusing recycling messages and different levels of motivation among curbside recycling service participants, another factor that sometimes contributes to contamination is the utilization of "Pay-As-You-Throw" (PAYT) fee structures.

PAYT fee structures are intended to encourage recycling behaviors by charging residents the full costs of waste and recyclables collection based on the size of the waste container they select for their mixed waste collection service. The fee structure typically varies by the size of the waste container selected. For example, a 64-gallon waste container might incur a waste/recycling collection charge of $12.00 per household per month while a 96-gallon waste container might have an associated charge of $20.00 per household per month. In either case, the resident is not directly charged for the recycling and yard waste/organics collection services. Rather, the costs of these services are included in the fee charged for the waste collection service.

By charging a lower fee for a smaller waste container, the service provider hopes that residents will be encouraged to divert more recyclables, yard waste, or organics by placing these materials in their respective containers. An unintended consequence of this approach, however, is that residents can pay for a small waste container and place their overflow waste into the recycling or yard waste containers.

Figure 2-6: Pay As You Throw Program Notice: Concord, NH

SOURCE: https://www.concordnh.gov/911/Trash

Conclusions

As recycling and sustainability managers develop programs to address curbside recycling contamination, it is important that they recognize the recycling commitments of residents who participate in their programs. These include:

- **High performers** – Residents who are motivated to participate in curbside recycling according to the rules and are experienced recyclers. These residents may need occasional educational reminders regarding what items are targeted for recycling.
- **Learners** – Residents who are also motivated to recycle correctly but are just learning the ropes of the program. In addition to educational materials, they may need to have their cart inspected occasionally to ensure that they are recycling correctly.
- **Under Performers** – Residents who are not motivated to responsibly participate in curbside recycling but rather view their recycling and yard waste carts as overflow carts that can be used for excess waste. If these residents do not benefit from educational programs, they may respond to enforcement mechanisms such as cart removal and fines.

By recognizing the different motivations and perspectives of these groups, more cost-effective anti-contamination programs can be developed and implemented.

CART INSPECTION AND TAGGING

Introduction

TRP recommends that communities implement four strategies to reduce curbside recycling contamination:

- **Cart Inspection and Tagging** – using field personnel to inspect recycling carts on collection days and putting "Oops" tags on carts that inform a resident what materials were found in their carts that do not belong
- **Contaminated Cart Rejection** – rejecting contaminated carts (not picking them up and leaving them on the curb)
- **Direct Mailing** – sending direct mailers or bill inserts to residents identifying what recyclables are and are not accepted
- **General Advertising** – using general advertising to promote what recyclables are and are not accepted

The rejection of contaminated carts involves the implementation of a policy of not emptying contaminated carts, but tagging them instead with instructions for residents to remove contaminants from their carts before their recycling containers will be emptied.

TRP has concluded that providing residents with direct feedback through cart tagging is a critical component of effective anti-contamination programs, and that programs that rely on education alone are not effective in addressing contamination. In a recent report, TRP states that

> *"In 2016, we deployed only the education component in one community and saw no significant changes to overall contamination or the specifically targeted issue (bagged recyclables) in that community. This supports our belief that combining education and direct feedback at the curb is a best practice and will more likely achieve the best outcomes."*[9]

This section presents case studies on cart-tagging programs as well as their cost and financing options.

Examples of Cart Tagging Programs

Atlanta, GA

Feet on the Street is a recycling education campaign facilitated by the City of Atlanta (COA) Department of Public Works (DPW) and TRP to improve the quantity and quality of recyclables collected from single-family homes in the city of Atlanta, while achieving the city's waste diversion goals and better serving residents. The *Feet on the Street* program puts a team of people on the street to audit residential recycling carts for contamination. The program is a citywide expansion of a 2017 pilot and launched in fall of 2019. The program provides residents real-time feedback on the quality of their recycling through the "Oops" tag left on the cart if contamination if found, and delivers a broad-based educational campaign across the cty to improve recycling outcomes.[10]

In the *Feet on the Street* program, auditors remain on a recycling route for four consecutive weeks, checking household carts for contamination. All five solid waste service areas in the city will have auditors tagging carts in each of these rotations until all single-family households have received this service. Various marketing and promotional tools are being implemented throughout the city during the program. Single-family households in

[9] *The Recycling Partnership.* 2020 State of Curbside Recycling Report.
[10] https://www.atlantaga.gov/government/departments/public-works/recycling-program.

the city received in-home mailers at the beginning of the campaign. The mailer included a letter from the DPW Commissioner announcing the program, plus a magnetic info card with additional resources.[11]

During the program, a resident's cart will not be serviced if contaminants are found. The resident is then asked to remove the contaminants marked on the "Oops" tag. Once those items have been removed, the cart will be serviced on the next scheduled collection day. Residents are responsible for removing the recycling cart from the right-of-way until the next collection day, and removing the "Oops" tag prior to setting the cart out for collection. The *Feet on the Street* auditors are only focused on a few dangerous and costly contamination categories: foods or liquids, plastic bags, recyclables within a plastic garbage bag, textiles or clothing, rope, cords, hoses, tanks, wood, plastic furniture, scrap metal, or chains (often known as "tanglers" by recycling experts).

Figure 3-1: Feet on the Street Recycling Campaign: Atlanta, GA

SOURCE: https://www.midtownatlanta.org/feet-street-recycling-campaign/

As a result of this program, the routes targeted to date showed a 19 percent decrease in contamination and a nine percent increase in recyclable materials captured.

Phoenix, AZ

Following a successful pilot project conducted in 2018, the city of Phoenix implemented TRP's cart-tagging model across the city. The objective of the program is to reduce the city's curbside recycling contamination rate—which has historically been about 30 percent—to below 20 percent.[12]

In this program, solid waste workers inspect recycling carts in sections of the city with historically high contamination rates. Working in teams of two, the inspection team members open the recycling container on collection day, inspect its contents, and fill out a report card based on their observations. A red "Oops" tag, which identifies which items in the bin can't be recycled, along with a handwritten explanation of what needed to be corrected, is left for contaminated bins. A green "Shine On" tag, telling the residents to keep up their good recycling behaviors is left for the compliant containers. The house's status is then logged in a database by the second team member, who is also marking which houses they've inspected and which route they'll take.[13]

[11] *Atlanta* Feet on the Street *FAQ https://www.atlantaga.gov/government/departments/public-works/recycling-program.*
[12] *Morse, S. "Oops or Shine On? Phoenix program helps residents recycle better." Cronkite News, Oct. 19, 2018. (https://cronkitenews.org).*
[13] *Schank, H. "How America's least sustainable city learned to love recycling",* Fast Company, *March 27, 2020.*

Figure 3-2: Recycling Contamination Post: Phoenix, AZ

SOURCE: https://www.phoenix.gov/publicworks/recycling

The first time a house gets an "Oops" tag, the city will still empty the bin. After that, it's up to the resident to either correct the error or risk having his or her recycling bin left without being serviced. If a house gets two "Oops" tags in a row, the city will drag the bin back up to the house without it being serviced. If someone insists on placing recycling bins full of contaminated trash at the curb after that, the city will take away the bin.

Of all the ways Phoenix is trying to reduce contributions to the landfill, the Oops Program—simply reinforcing good behavior and helping guide people toward recycling—has been the most successful. Oops team specialists typically observe an average 80 percent improvement from the first week of the program to the sixth week with respect to the placement of "Shine On" tags.

Ft. Worth TX

The city of Fort Worth is continuing its curbside inspection efforts to improve material quality and reduce a 30 percent contamination rate, following an annual net loss of more than $1 million incurred through its recycling processing contract with Republic Services in Fiscal Year 2019. This loss was a result of costs associated with removing and disposing of recycling contaminants, as well as the drop in recycling revenues resulting from China's National Sword policy.

In Fort Worth, a "Blue Crew" of six workers checks residents' blue carts. (See Figure 3-3). They remove items that should not be in there and leave a note explaining the situation to the customer. Those repeatedly found to have put non-recyclable goods in the recycling carts can be charged additional garbage fees and have their blue carts taken away.

Figure 3-3: Fort Worth's Blue Crew bag non-recyclable items from the blue bin

Cart Tagging Program Costs and Financing

Cart tagging has been found to be one of the most effective methods of reducing curbside recycling contamination. However, it is also labor intensive and therefore relatively expensive.

As noted above, Fort Worth has six people who inspect their residents' carts on collection days. In light of the 291,739 single-family households served and the weekly collection of recyclables, an estimate is provided in Table 3-1 of the labor costs associated with this program. As indicated, the cost of the cart inspection program in Fort Worth is estimated to cost $0.67 per household per year or $0.06 per household per month.

This program cost can be compared to an estimate of the costs of recycling contamination in Fort Worth, which is provided in Table 3-2. This cost estimate is based on an assumed MRF processing cost of $82 per ton and a recyclables (including contaminants) setout rate of 0.23 tons per household per year.

As the table indicates, the city can expect to save $0.08 per household per month if contamination levels are reduced by five percentage points. This savings is more than enough to cover the costs of the cart inspection personnel. If contamination levels are reduced by ten percentage points, the city could save $0.16 per household per month.

Table 3-1: Cart Tagging Program Costs: Fort Worth, TX

Single family households	291,739	
Persons/HH	2.88	
Collection Frequency	Weekly	
Blue Crew workers	6	
Salary, including fringe	$32,448	
Total labor costs: Blue Crew	$194,688	
Cost per household	Annual: $0.67	Monthly: $0.06

Table 3-2: Annual Savings Due to Reduced Contamination

Parameter	Units	Contamination Reduction	
		5%	10%
Recyclables set out rate	Pounds/HH/Week	8.8	8.8
	Tons/HH/Year	0.23	0.23
MRF processing costs	$/Ton	$82.00	$82.00
Original contamination rate	Percent	15%	15%
New contamination rate	Percent	10%	5%
Reduced contamination	Tons/HH/Year	0.011	0.023
Processing cost savings	$/HH/Year	$0.94	$1.88
	$/HH/Month	$0.08	$0.16

ENFORCEMENT OPTIONS FOR NON-COMPLIANT HOUSEHOLDS

Introduction

As described above, it is likely that a significant percentage of residents in any given community belong to the Under Performers group. Research has shown that this group is often not motivated to recycle properly and may not be impacted by increased or improved recycling education programs. Research has also shown that this group is responsible for over 50 percent of the contamination in curbside recycling programs.

Two strategies have been found to have an impact on reducing the contamination caused by this group. The first is the removal of their recycling carts with the stipulation that the carts will only be returned if they demonstrate a good faith effort to comply with the recycling program's rules. The second strategy is to impose fines if recycling carts are found to be highly contaminated and to remove the carts until the fines have been paid.

The rationale behind the adoption of these strategies is that participation in curbside recycling programs must be considered a privilege that is earned by commitments from residents to comply with applicable rules. Furthermore, this privilege can be revoked from those residents whose improper behavior is adding significant costs and safety problems at the MRF and detracting from the community's ability to achieve the program goals.

In implementing these types of enforcement options, recycling and sustainability program managers must have the support of their local elected officials as there is likely to be pushback from the underperforming residents.

Cart Pulling Programs

Introduction

As described above, a number of communities have implemented cart-tagging programs to provide direct feedback to residents regarding contamination issues found with their carts. In many cases, the contaminated cart is not serviced until the resident removes the contaminants from the cart.

Cart-pulling programs take this strategy a step further. If a cart is found to repeatedly contain a high percentage of contaminants, the cart is removed and is not returned until the resident demonstrates that they will comply with the rules of the program. A cart-pulling program that has been implemented in the city of El Paso, TX is described below.[14]

El Paso, TX

In early 2019, the El Paso's Environmental Services Department (ESD) stepped up its recycling enforcement by deploying inspectors into neighborhoods to spot check the inside of blue recycling bins. If inspectors find that a residential cart is contaminated with unacceptable materials, the bin will get tagged with an "Oops" tag and turned around, which signals the recycling truck driver to pass by the bin without servicing it. If a resident receives a second tag, a letter is sent to advise him or her that the bin will be retrieved if there is a third violation. If a resident receives three "Oops" tags, the blue bin will get taken away. To retrieve the bin, the resident must then:

- Take a class, which is offered once a month. Once the class is completed, a blue bin will be delivered to the residence (the standard $25 service fee is waived).

[14] https://kisselpaso.com/your-blue-bin-got-red-tagged-now-what.

- Wait a six-month probationary period. After the six months, the resident can call to re-participate in the program (but will incur the $25 service fee).

Residents who do not want to participate in the curbside recycling program can ask to opt out of the program. However, the resident's monthly $19 "Gray Trash Bin" fee will remain the same since the ESD does not charge an extra fee for recycling.

Figure 4-1: Recycling Contamination Poster: El Paso, TX

SOURCE: City of El Paso on Twitter

Issuance of Cart Contamination Fines

Introduction

Issuing fines for recycling contamination is another strategy that can be used to address the contamination coming from the Under Performers group. This approach is being used in Providence, RI as described below.

Providence, RI

In Providence, RI, teams of environmental inspectors regularly sweep through city neighborhoods checking to see if residents are recycling correctly and attempting to educate those who are not participating according to the rules. If a bin is found to contain unacceptable items or materials, a tag is left describing what can and cannot be recycled, and the bin is marked so that it is not serviced during the upcoming collection cycle. If a resident is found to repeatedly violate the recycling guidelines, the city can issue a $50 fine to the resident. In 2018, the city inspectors issued about 3,000 fines to residents.[15]

[15] *List, M. "Trash police? City says goal of recycling checks is improvement, not punishment"*, Providence Journal, *Feb 8, 2019.*

Figure 4-2: Providence DPW Inspector inspecting a recycling container

SOURCE: Providence Journal.

Providence implemented the cart inspection/rejection and fine issuance program to address fees that assessed by the Rhode Island Resource Recovery Corporation (RIRRC) when city recycling loads are found to be too contaminated. RIRRC can reject recycling loads at its MRF if their contamination rates are above 10 percent, but typically accepts loads with contamination in the range of 30–40 percent. If a city recycling load is rejected for excessive contamination, the city is charged a $250 rejection fee, plus the cost of disposing of the entire load at the state's Central Landfill (currently $47 per ton).[16] The major contaminants found in curbside recycling bins are plastic bags and food scraps. Participation in recycling programs is mandatory in Rhode Island.

[16] https://www.providencejournal.com/news/20190208/trash-police-city-says-goal-of-recycling-checks-is-improvement-not-punishment--video-audio.

CONCLUSIONS

The following conclusions are offered with respect to program options that recycling and sustainability program managers can utilize to significantly impact the levels of contamination in their curbside recycling programs.

- Residents participating in curbside recycling programs can be divided into three groups: High Performers, Learners, and Under Performers. To be effective, anti-contamination programs must be designed to address the perspectives and motivations of each of these three groups.
- Research has found that over 50 percent of curbside recycling contamination is attributable to the Under Performers Group.
- While education programs can impact the High Performers and Learners groups, they have been found to be ineffective in changing the recycling behaviors of the Under Performers Group. The primary strategies that have been found to be effective in reducing recycling contamination from this group involve cart-pulling and cart contamination fines.
- Cart-tagging anti-contamination programs have been proven to be effective for all three groups but are relatively expensive due to their labor requirements. These programs have been estimated to incur labor costs on the order of $0.06 per household per month. It is likely that these costs can be covered by savings in contamination costs.
- Recycling and sustainability program managers and elected officials should consider embracing and implementing policies that communicate that it's a privilege to recycle—one that must be earned by residents who are willing to abide by the rules of the program.

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