

**MAKING A
GREAT
PLACE**



**Single-family Recycling and
Waste Composition Studies
2014-15**

July 2015

About Metro

Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy, and sustainable transportation and living choices for people and businesses in the region. Voters have asked Metro to help with the challenges and opportunities that affect the 25 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to providing services, operating venues and making decisions about how the region grows. Metro works with communities to support a resilient economy, keep nature close by and respond to a changing climate. Together we're making a great place, now and for generations to come.

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TABLE OF CONTENTS

Section 1: Introduction 4

Section 2: Curbside Recycling Program Performance Study 4

Section 3: Contaminants in Recycling Study 16

Section 4: Study Conclusions 22

Acknowledgements 23

Appendices

Appendix A: Detailed Methodology 24

Appendix B: Material Category Definitions 29

Appendix C: Curbside Recycling Program Performance Statistical Analysis 31

Appendix D: Contaminants in Recycling Statistical Analysis 54

The evolution of recycling in our region

Recycling saves energy, reduces air and water pollution, reduces greenhouse gases, and conserves natural resources.

Curbside collection of recyclables makes recycling convenient. This service has been a key element of the Metro region's recycling programs since 1983, when the Oregon Opportunity to Recycle Act required communities throughout the state to provide curbside collection.

Within the region, weekly recycling collection is the service standard for single-family households. However, some communities have moved to every-other-week collection of mixed recyclables and monthly collection of glass.

Recycling makes it possible to use materials that would otherwise go to the landfill to make thousands of products. A successful recycling system depends on the quality of material collected at the curb. A key goal of these studies was to help ensure that the region continue to generate the best and most marketable recyclable materials through its collection programs, while also providing accessible and cost-effective service to the public.



SECTION 1: INTRODUCTION

In March 2015, Metro completed two studies to inform assessments of the performance of the region's single-family household recycling programs. More than 300,000 pounds of household garbage and recycling were collected and sorted over a seven-month period. This report presents the results of the two studies.

Study 1: Curbside recycling program performance

This study looked at the amount of curbside recyclables in garbage carts and compared the performance of less frequent recycling collection programs to weekly collection programs.

Study 2: Contaminants in recycling

This study looked at the amount of contaminants that were in recycling carts and compared the performance of less frequent garbage collection to weekly collection.

SECTION 2: CURBSIDE RECYCLING PROGRAM PERFORMANCE

Overview

This study evaluated the amount of curbside recyclables in garbage carts and compared the performance of different recycling collection programs across the region. More than 240,000 pounds of garbage was collected and sorted to provide data on weekly recycling and less frequent recycling collection programs. Metro designed the study to determine if there are statistically significant differences between types of collection programs, while providing representative results for individual jurisdictions.

Study Questions

- 1) What amount and type of curbside-acceptable recyclables are being thrown away as garbage?
 - 2) Do weekly and less frequent recycling collection programs perform at an equivalent level?
-

Background

Metro and local governments share responsibility for implementing the Regional Solid Waste Management Plan (RSWMP). A component of this plan is the Regional Service Standard (RSS), which establishes recycling service levels and education requirements for businesses and households in the region. The primary purpose of the standard is to ensure a comprehensive and consistent level of recycling service throughout the region. The standard for households is weekly collection of all standard recyclable materials.¹ Metro is responsible for monitoring the implementation of the standard and overall performance of residential curbside recycling programs. Local governments are required to certify that their recycling service levels are consistent with the Regional Service Standard or apply for an approval of an alternative program.

The alternative program allows a jurisdiction to adopt a program that differs from weekly collection, but achieves the same level of performance. Currently, a local government seeking alternative program approval must implement a study or pilot program to demonstrate how the program will achieve the same level of performance as the regional standard. Metro has found implementation of the alternative program challenging for a number of reasons, including the complexities and costs of conducting individual jurisdiction studies. To date, five jurisdictions have been approved for alternative programs.

Table 1. Approved Alternative Recycling Collection Programs

	Commingled Recyclables	Glass
Regional Standard	Weekly	Weekly
City of Tigard	Weekly	Monthly
Unincorporated Washington County	Every-other-week	Every-other-week
City of Hillsboro	Every-other-week	Every-other-week
City of Sherwood	Every-other-week	Monthly
City of Durham	Every-other-week	Monthly

¹ These are: (1) commingled newspaper, magazines, catalogs, phone books, corrugated cardboard, scrap paper, milk cartons, plastic bottles/tubs/plant pots/buckets, aluminum/tin/steel cans, small scrap metal; (2) glass bottles and jars in a separate bin; (3) yard debris in a separate cart; and (4) used motor oil in separate plastic bottles.

In response to these challenges, Metro initiated a project to measure the amount of recyclables in garbage loads with the intent of identifying whether there are any statistically significant performance differences between jurisdictions with weekly collection and those with less frequent collection.

Metro will use the study results, along with other information, to determine whether amendments to the Regional Service Standard should be considered to address recycling collection service frequency and reducing the amount of recyclables in the garbage.

Methodology

Number of Samples

A total of 860 samples were collected as a part of the Recycling Program Performance study. Using standard deviation to project the required sample size, Metro and its consulting statistician determined that 97 samples per jurisdiction were needed to calculate the aggregate regional performance of weekly collection programs and of less frequent collection programs. This sample size also allowed for the calculation of jurisdiction-specific performance. Additional information on the study design is in Appendix A.

Sample Selection

For each jurisdiction, Metro randomly selected residential addresses that served as the basis for identifying the truck-loads included in the sampling. For weekly collection service, Metro sampled from five jurisdictions that represented 90 percent of the households in the region with that service level: Portland, Beaverton, Gresham, Lake Oswego and unincorporated Clackamas County. For less frequent service, Metro sampled from jurisdictions that represented 98 percent of the households with that service level: Hillsboro, Sherwood, Tigard, and unincorporated Washington County. The City of Durham was excluded from the study due to sampling challenges associated with the low number of single-family households located within the city.

Collection haulers provided the route information for each of the randomly selected residential addresses and were also asked to confirm the two following criteria:

- 1) No more than five percent multifamily or commercial customers on the route.
- 2) No loads from households outside the identified jurisdiction.

If the route failed to meet both criteria, an alternate route was selected.



Samples getting weighed after being sorted.



For some jurisdictions, cross-jurisdictional mixing posed challenges to collecting samples that met the specifications. In these circumstances, an alternative sampling method was used that included a weighted approach where haulers identified eligible routes and the most recent truck weights for those routes. The required number of samples was then distributed across the routes based on the truck weights from the previous week.

Since it was common for more than one household to be randomly selected from a particular route, up to three samples were allowed per truck. Haulers dumped their loads in an elongated pile and the contractor used a 16 cell grid (eight sections, two layers) superimposed over the dumped material. Random numbers were generated and then the contractor took a sample weighing a minimum of 250 pounds from the designated cell. If more than one sample was taken from a truck, the samples were spaced out from the front, middle and back of the truck.

Material Categories

The samples were sorted into the individual material categories listed in Table 1. Metro included the additional materials to inform future program planning.

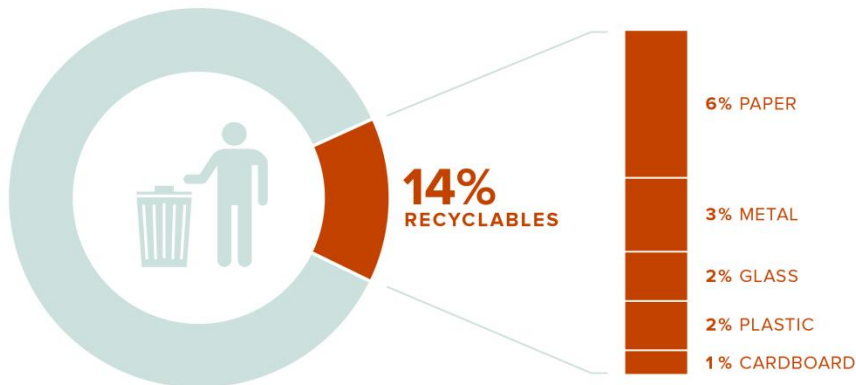
The material definitions used were consistent with the Oregon Department of Environmental Quality’s waste composition studies and can be found in Appendix B.

Table 2. Recyclables in Garbage Material Categories
Acceptable curbside recyclables:
<ol style="list-style-type: none"> 1) Cardboard 2) Paper 3) Plastic 4) Metal 5) Glass
Additional materials:
<ol style="list-style-type: none"> 6) Yard Debris 7) Food 8) Compostable material (non-food) 9) Household hazardous waste 10) Oregon E-Cycles electronics 11) Waste

Regional Performance

Overall, the study showed 14 percent of what's in a typical garbage cart in the region are materials that could have been put in curbside recycling carts. This percentage, shown in the graphic below, was calculated by combining the results from the 860 garbage samples and includes both weekly and less frequent recycling programs. Paper makes up the largest portion of recyclables thrown away as garbage.

Figure 1: Recyclables in the garbage cart: Metro region



Performance by Program Type

The data was further analyzed by program type and by jurisdiction to compare different collection program frequencies. Figures 2,3 and 4 show the data results by jurisdiction. Figure 5 shows the data aggregated by program type.

The study looked at the quantity of recyclables in garbage as a percentage of the samples collected and sorted as part of this study. It did not consider the total weight of garbage or recyclables set out by any single household. Jurisdictional comparisons on a household basis cannot be made because the average weight of garbage in household carts may vary from jurisdiction to jurisdiction. In other words, if jurisdiction A's average garbage cart weight is 30 pounds and jurisdiction B's is 20 pounds, then jurisdiction A's residents are putting more recyclables in their garbage even if the percentage is the same as jurisdiction B's.

It is important to note that the City of Portland changed to every-other-week (EOW) garbage collection in 2011. Since this program change, the city reports that garbage collected from households has dropped by over a third. This indicates Portland households now put less garbage in their garbage cans than they previously did and there may be fewer recyclables in their garbage now, compared to the pre-2011 time period.

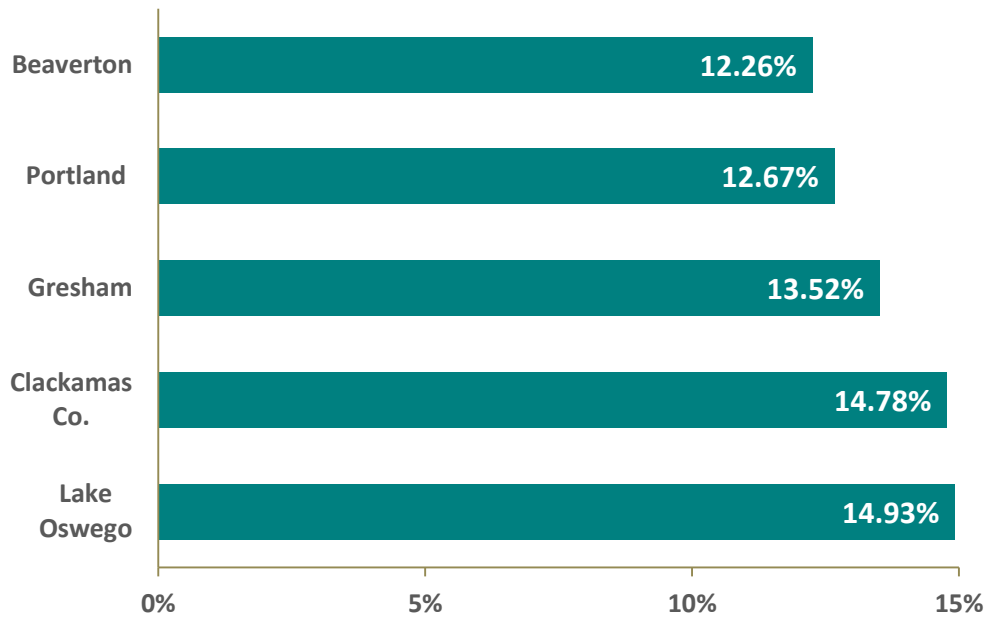
Recyclables Disposed

The study indicated that every year Metro-area residents throw away 36,000 tons of acceptable curbside recyclables.

The greenhouse gas emissions benefits of recycling these materials would be equivalent to taking 22,000 passenger vehicles off the road.

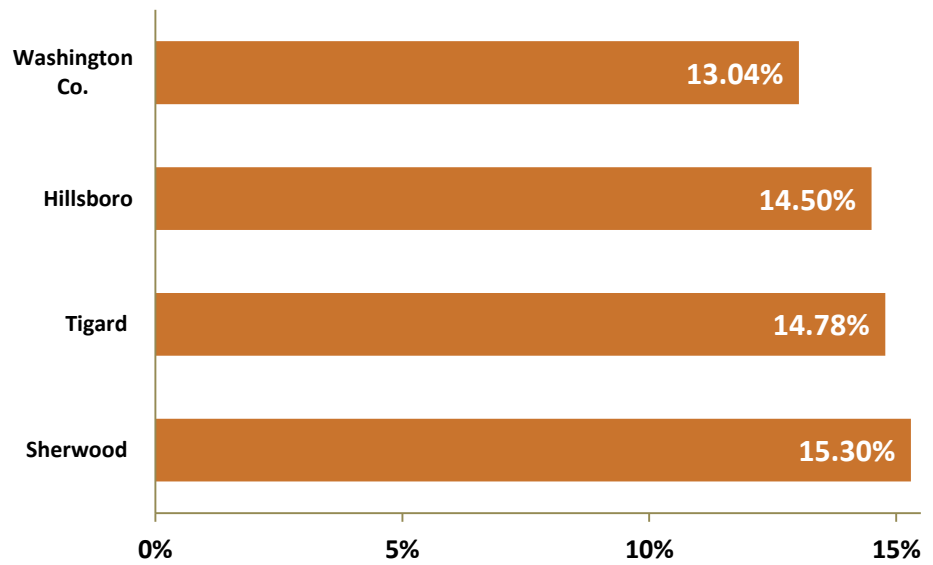
Percentage of Garbage that is Recyclables: Weekly recycling collection programs

Figure 2 shows the percentage of garbage that is recyclables for the jurisdictions with weekly service.



Percentage of Garbage: Alternative programs with less frequent collection

Figure 3 shows the percentage of garbage that is recyclables for the jurisdictions with less than weekly service.



Percentage of Garbage that is Recyclables: All recycling programs

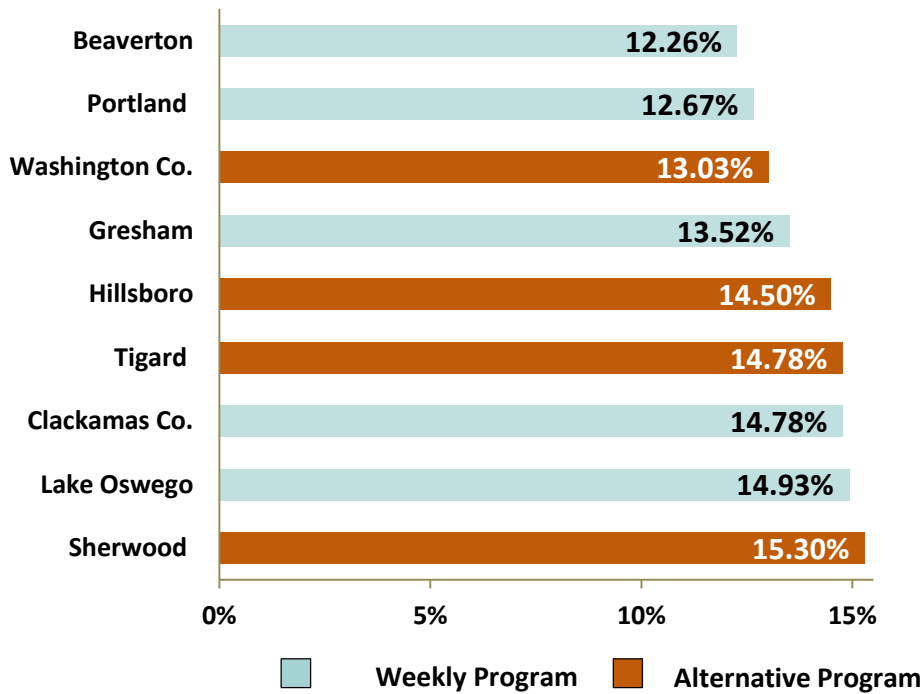


Figure 4 shows jurisdictions with weekly and less frequent collection in sequential order by percentage of garbage that is recyclable.

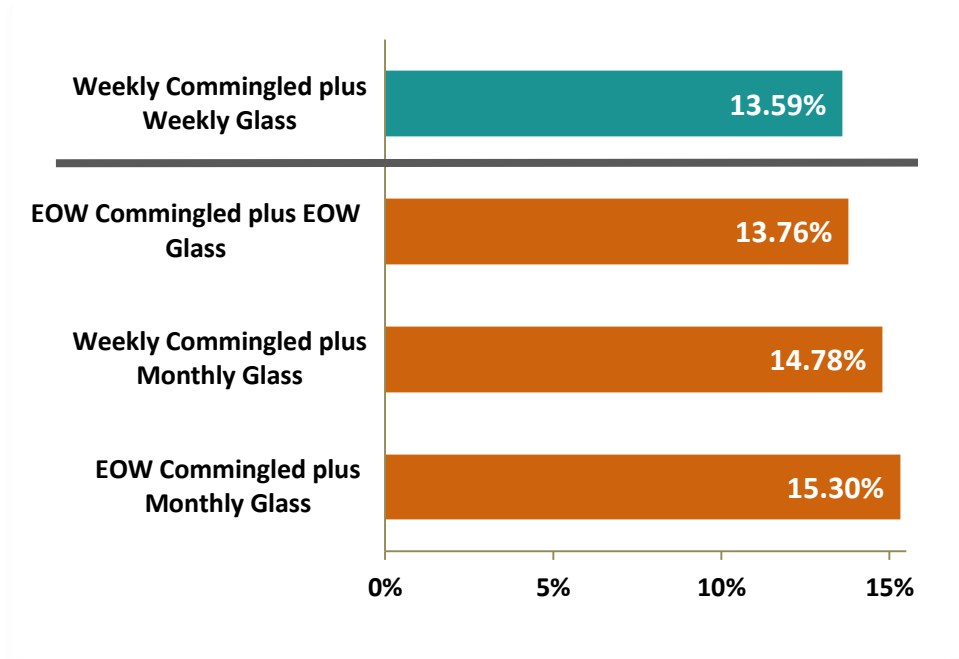
The following table breaks down the percentage of curbside recyclables in the garbage by material.

Jurisdiction	Paper	Cardboard	Plastics	Metal	Glass	Total
Beaverton	4.84%	1.09%	1.59%	2.65%	2.09%	12.26%
Portland	4.66%	2.06%	1.68%	2.88%	1.38%	12.67%
Gresham	5.78%	1.22%	1.82%	2.96%	1.75%	13.52%
Washington Co.	5.18%	1.19%	1.95%	2.70%	2.01%	13.04%
Hillsboro	6.00%	1.14%	2.08%	2.88%	2.41%	14.50%
Tigard	5.51%	1.20%	2.62%	2.86%	2.60%	14.78%
Clackamas Co.	5.64%	1.43%	2.34%	3.13%	2.25%	14.78%
Lake Oswego	6.09%	1.49%	1.63%	3.59%	2.14%	14.93%
Sherwood	6.14%	1.12%	2.46%	3.21%	2.37%	15.30%

Table 3 shows material composition for recyclables in garbage by jurisdiction.

Percentage of Garbage that is Recyclables: Aggregated data by program type

Figure 5 shows the data aggregated by program type. Less frequent programs include every-other-week (EOW) and monthly collection.



The average for programs with weekly collection is 13.59 percent. Aggregated averages for the less frequent collection programs range from 13.76 percent to 15.30 percent. The study found no statistically significant difference between the regional standard program (weekly collection of commingled and of glass) and the programs that collected commingled recycling and glass every other week. The study did find that, on average, programs that collected glass monthly had significantly higher percentages of recyclables in the garbage than did the programs that followed the regional standard of weekly collection.

KEY FINDINGS: RECYCLABLES IN GARBAGE

1.0 There was no statistical difference in the aggregate comparison of weekly recycling collection to every-other-week collection.

2.0 There were statistical differences in the aggregate comparison of weekly recycling collection to programs that include monthly glass collection.



Organics pulled from samples of garbage.

Results for Other Materials

Overview

The study incorporated additional material categories, including organics, household hazardous waste and electronics, to help inform future program planning. These materials were not part of the evaluation of recycling collection frequency.

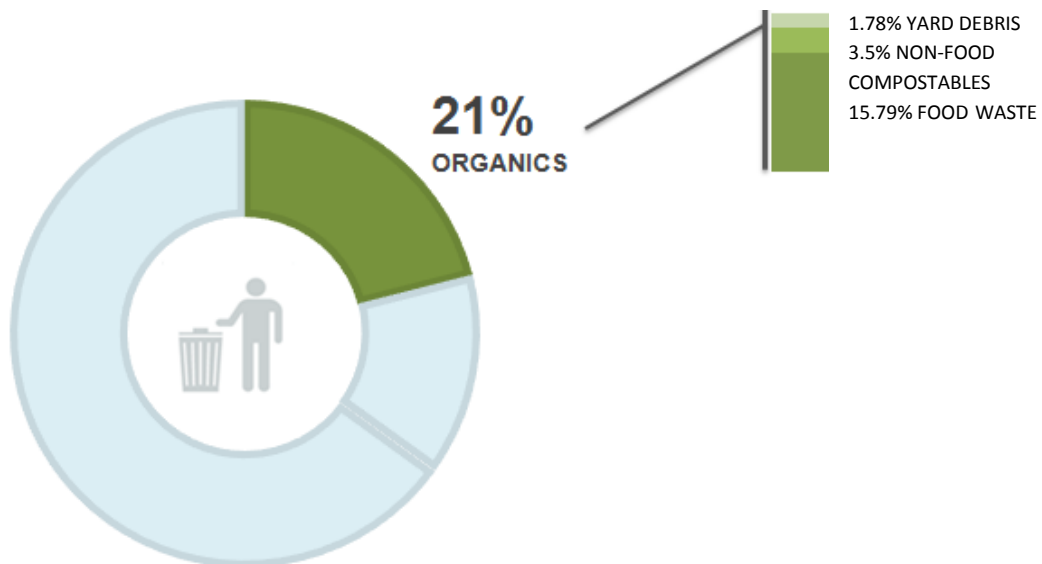
Organics

All Metro-area programs collect yard debris separately for composting, which reduces the amount of organics thrown away in the garbage. The City of Portland also collects food waste and non-food compostables, such as pizza boxes and napkins.

The study found that organics represented 21 percent of the material in garbage carts region-wide and that this material is primarily food waste

Figure 6: Percentage of Garbage: Organics by material

Figure 6 shows the regional average of garbage that is organics.



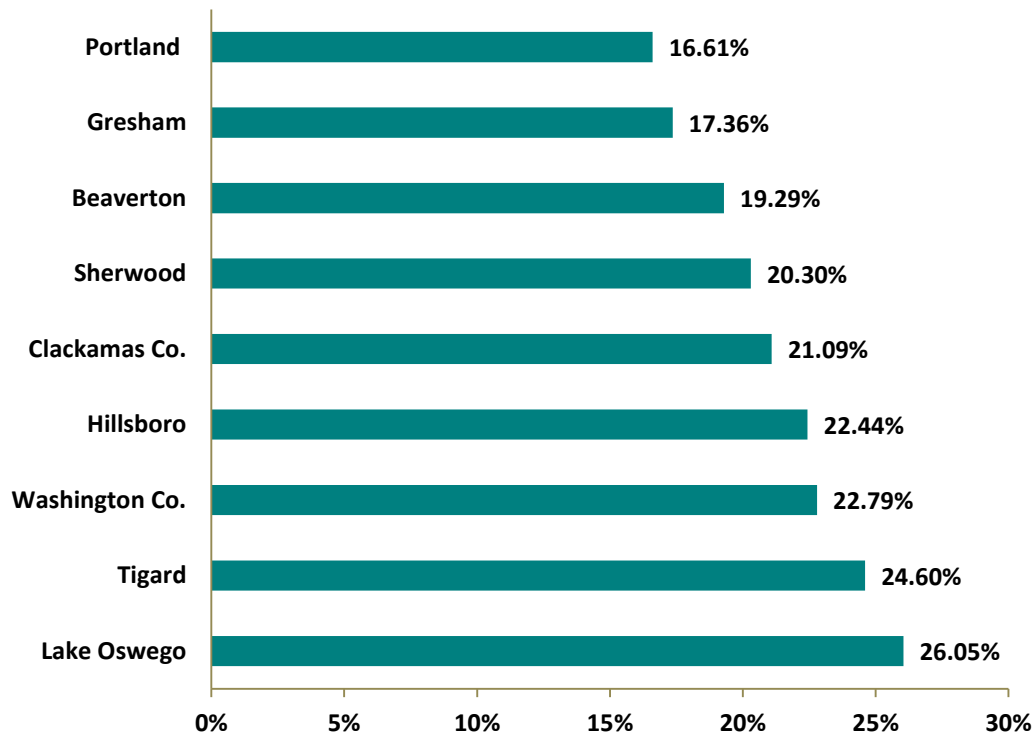


Figure 7 shows the percentage of garbage that is organics by jurisdiction.

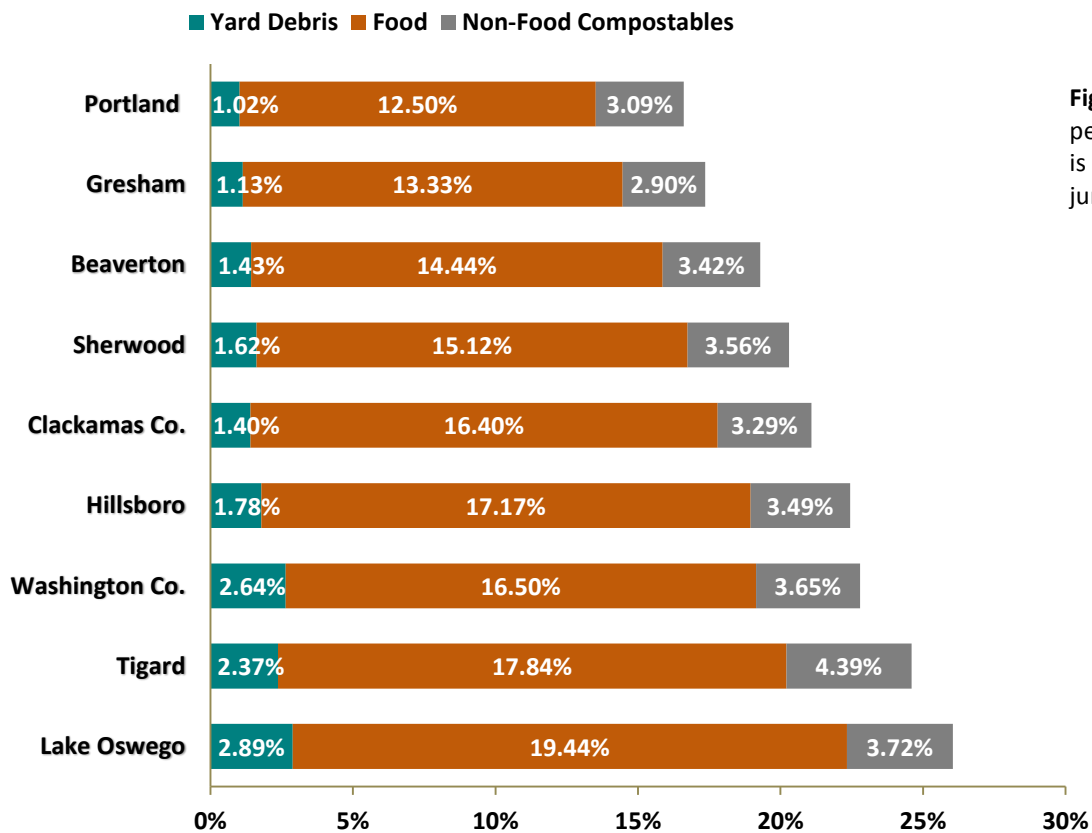


Figure 8 shows the percentage of garbage that is organics by material by jurisdiction.

Household Hazardous Waste

The study found that household hazardous waste represented 0.4 percent of the material in garbage carts region-wide. Metro staff conducted further analysis by sorting the material into additional categories.



Figure 9 shows the percentage of garbage that is household hazardous waste by jurisdiction.

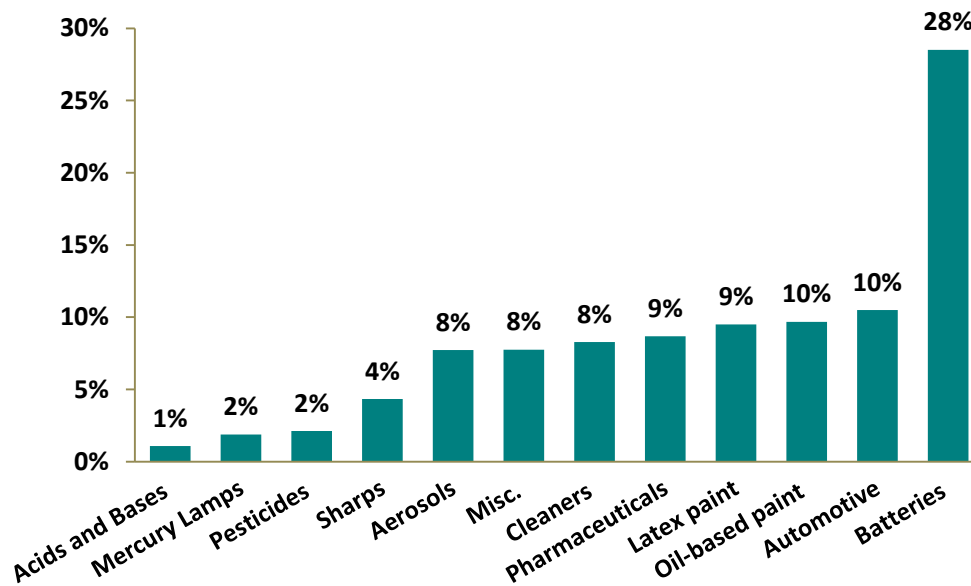


Figure 10 shows household hazardous waste by material type for the region as a whole.



Oregon E-Cycles Electronics

Since 2009, residents have had access to the Oregon E-Cycles program that provides free recycling of computers, monitors and televisions. The study showed that these electronics represented 0.29 percent of the material in garbage carts region-wide.



Figure 11 shows the percentage of garbage that is Oregon E-Cycles materials by jurisdiction.

SECTION 3: CONTAMINANTS IN RECYCLING STUDY

Overview

This study evaluated the amount of contaminants in recycling carts. These are items that are not recyclable curbside. The study compares different garbage collection program frequencies based on data from sampling more than 78,000 pounds of material in recycling carts from weekly and every-other-week garbage collection programs.

Background

In 2011, the City of Portland moved to every-other-week garbage collection, becoming the only jurisdiction in the region with less than weekly service. Although the Regional Service Standard does not address garbage collection, this study was undertaken as a result of concerns expressed by some participants in the regional recycling system about increased contamination accompanying less frequent garbage collection. The study compares contamination levels for the City of Portland program and the rest of the region.

Methodology

The same method used to determine the number of samples for the Recyclables in Garbage study was applied to the Contaminants in Recycling study design. Data from DEQ's 2004 Recycling Composition Study provided the standard deviation estimate planning value. Recycling contamination tends to have more variation than garbage, which increased the total number of samples per jurisdiction to 139 each, for a total of 278 samples. The samples were sorted into eleven material categories, with one for the total amount of acceptable curbside recyclables and also individual categories to measure major contaminants. The material categories are listed in the table below. For more information on the study design please see Appendix A.

Study Questions

- 1) What amount and type of contaminants are being put in recycling carts?
 - 2) Does every-other-week garbage collection correlate with higher levels of contamination?
-

Table 4: Material categories

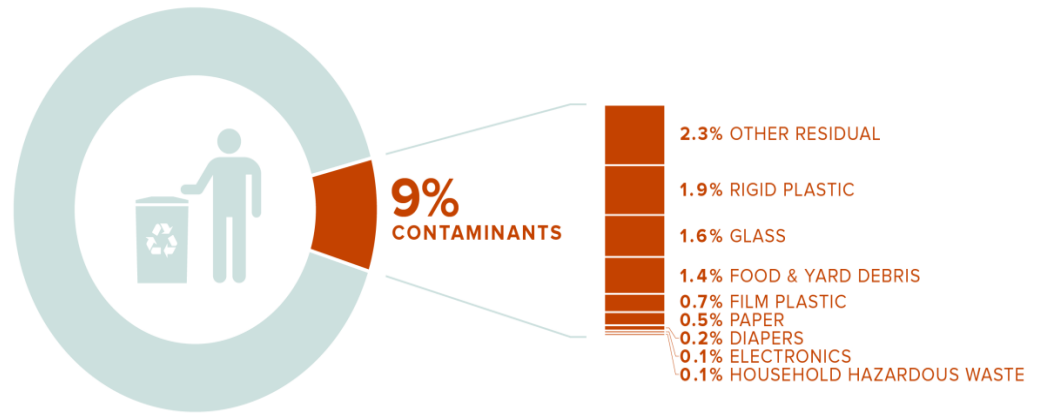
- 1) Acceptable standard recyclables
- 2) Glass containers (in the commingled cart)
- 3) Plastic bags and film
- 4) Unacceptable paper
- 5) Unacceptable rigid plastics
- 6) Yard debris and food waste
- 7) Diapers
- 8) Household hazardous waste
- 9) Oregon E-cycles electronics
- 10) Other residuals

The study indicates that the region throws more than 9,000 tons of contaminants in the recycling each year.

Regional Performance

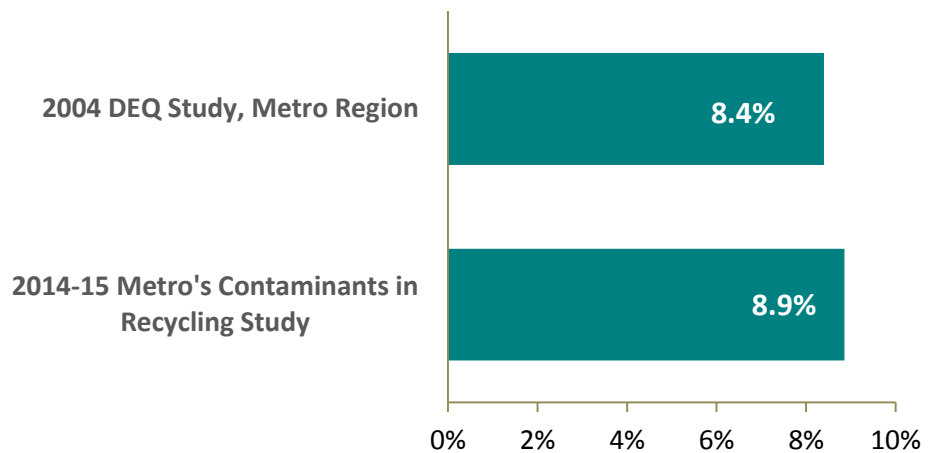
Using the study results, Metro calculated regional averages for the amount and types of contaminants in recycling carts from single-family residents. The study showed a regional average of 9 percent contamination in recycling carts.

Figure 12: Contaminants in the Recycling Cart: Metro region



The level of contamination has stayed relatively consistent over time, based on a comparison to a DEQ 2004 contamination study of roll carts.

Figure 13 compares percentage of contamination in recycling for the Metro-area from DEQ's 2004 study to Metro's 2014-15 study.



Performance by Program Type

The study analyzed the sampling data to determine if every-other-week garbage collection correlated with higher contamination levels in the recycling. The results indicated a slight difference for the two service levels with the every-other-week garbage program with a lower percentage of contamination. However, the statistical test used to compare them did not detect a difference in the level of contamination. Therefore, every-other-week garbage collection did not correlate with higher overall contamination levels in recycling.

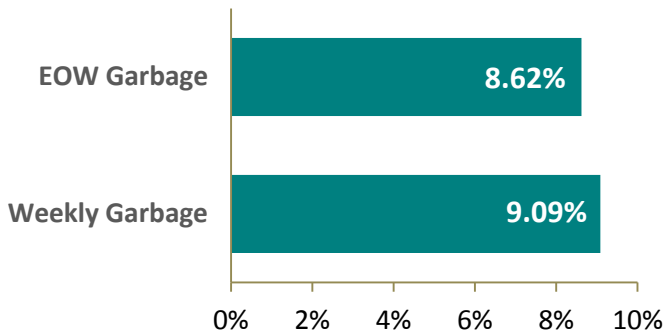


Figure 14 compares percentage of recyclables that is contaminants in recycling between weekly collection and Portland’s every-other-week (EOW) garbage collection program.

Even though there is no difference in the overall average of contamination, there are statistical differences between Portland’s every-other-week garbage collection program and the rest of the region’s weekly program for four materials: other residuals, diapers, glass and film plastic.

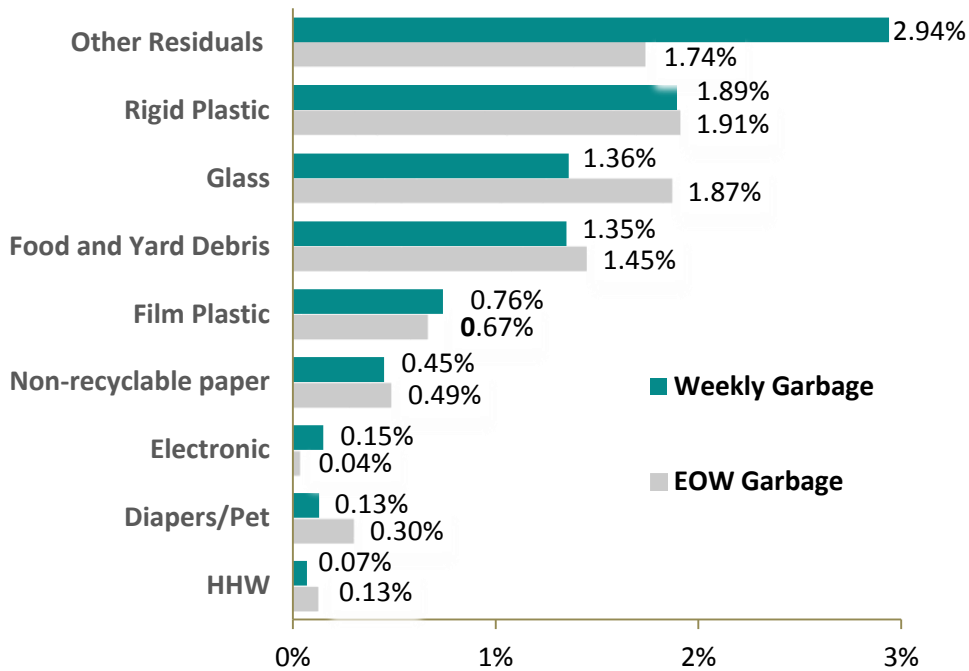
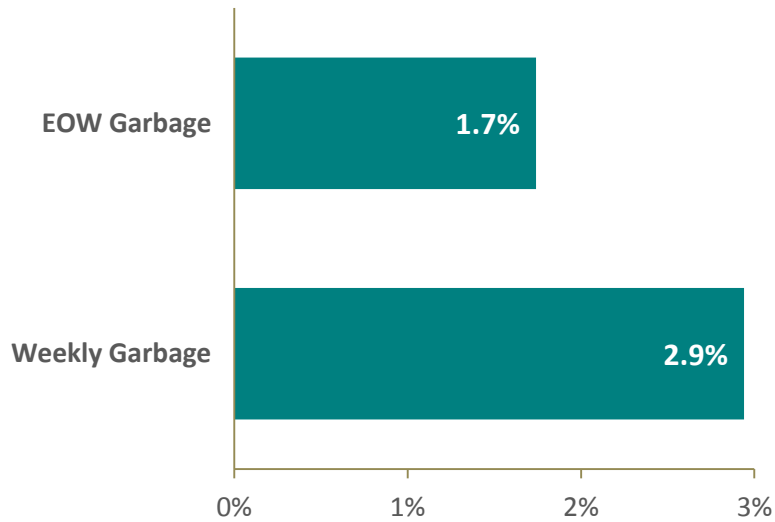


Figure 15 shows the material composition of the recycling contamination found in Portland every-other-week (EOW) samples compared to the regional samples with weekly garbage collection.

Other residuals

Regional samples had more of the materials categorized as “other residuals” in the recycling compared to the Portland samples. Materials common in this category were items such as carpet, clothing, wood, furniture pieces and non-recyclables glassware.

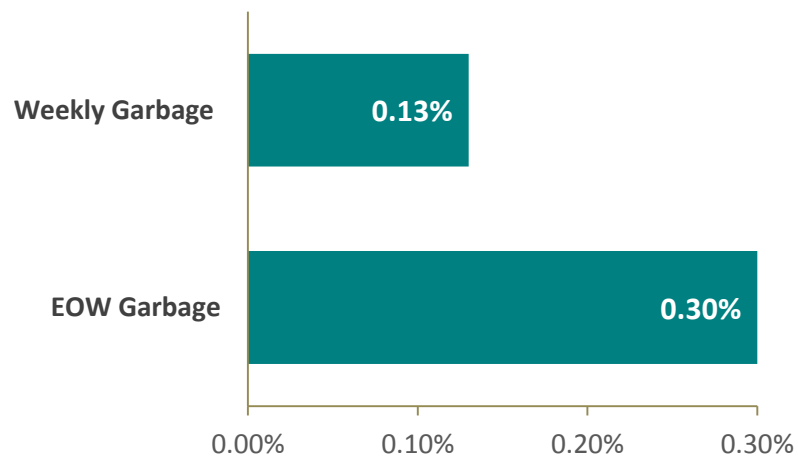
Figure 16 shows the percentage of recyclables that is other residuals in commingled recycling in programs with weekly collection and City of Portland’s every-other-week (EOW) garbage collection.



Diapers

Diapers were found in recycling carts across the region, with Portland’s samples showing more diapers than in non-Portland samples. Diapers pose health hazards for workers who collect and sort recyclables. They also soil paper and other materials, preventing them from being recycled. If the Metro region had as many diapers in the recycling as Portland, there would be an additional 178,000 pounds of diapers in the recycling per year.

Figure 17 shows percentage of recyclables that is diapers in programs with weekly collection compared to City of Portland’s every-other-week (EOW) garbage collection program.



Plastic film and shopping bags

Plastic film², including shopping bags that are not recyclable curbside, was found in recycling carts across the region. These plastics can jam up sorting machinery at recycling facilities, increasing the cost of converting recyclables into new products.

There was no statistical difference for Portland samples compared to the regional samples for non-shopping bag plastic film, such as produce bags and wrap. However, there was a difference for plastic shopping bags, with Portland samples having an average of five shopping bags per sample and regional samples having 17 bags per sample.

If the region as a whole had only 5 bags per sample, that would mean 7.2 million fewer shopping bags contaminating the recycling.

Table 5. Average weight (in pounds) and item count for film and shopping bags per commingled recyclables sample

	Other Film	Shopping Bags	Bag Count
Portland	1.83	0.11	5
Rest of region	1.80	0.33	17

Glass

Glass is intended to be collected curbside in a separate bin instead of in the recycling cart throughout the Metro region, but was found as a contaminant in the recycling cart in both programs. There was a statistically significant difference between the programs for the amount of glass in the recycling samples, with Portland having more glass compared to the rest of the region.

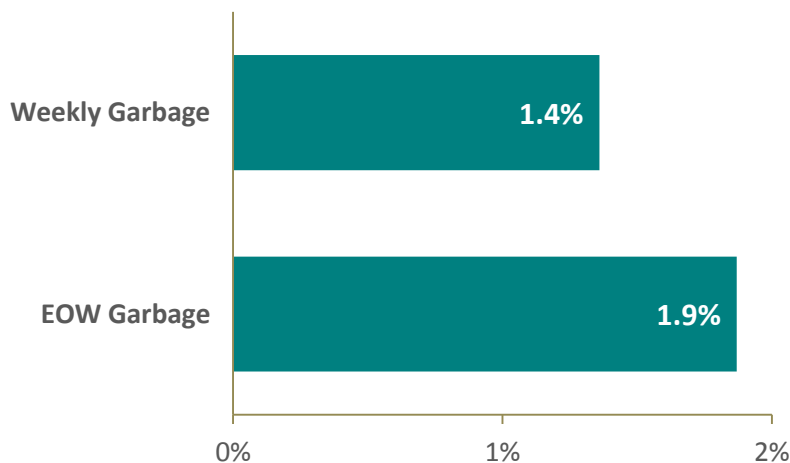


Figure 18 shows the percentage of commingled recyclables that is glass in programs with weekly collection compared to City of Portland’s every-other-week (EOW) garbage collection program.

²Plastic film includes plastic bags, tape, sheeting, and other non-rigid items.

The Oregon Bottle Bill requires every container of carbonated soft drink, beer and water sold in Oregon to be returnable, with refund value currently set at a nickel.

Oregon Bottle Bill Deposit Containers

The study also looked at the amount of deposit containers in each recycling sample. Table 4 shows the average weight of deposit containers for samples collected from Portland and the rest of the region. There was a statistical difference in the number of deposit containers with the Metro region having more deposit containers per sample.

Table 6. Average weight (in pounds) and count for deposit containers per commingled recyclables sample

	Weight	Deposit Container Count
Portland	2.03	45
Rest of region	2.44	52

Key Findings for Contaminants in Recycling:

- 1.0 Every-other-week garbage collection does not correlate with higher overall contamination levels in the recycling.
- 2.0 There are statistical differences for material-specific contamination between weekly and every-other-week garbage collection.

SECTION 4: SUMMARY OF CONCLUSIONS FROM THE TWO STUDIES

There is an opportunity to reduce the amount of recyclables in garbage carts.

The study showed that 14 percent of what's in garbage carts is material that could have been placed in curbside recycling carts. This percentage indicates that approximately 36,000 tons of curbside recyclables are disposed each year.

Every-other-week collection of commingled recyclables and glass did not show more recyclables in the garbage compared to weekly collection of these materials.

There was no statistical difference in the aggregate comparison of weekly recycling collection to every-other-week collection. However, there were more curbside recyclables in the garbage in communities with monthly glass recycling collection than in communities with weekly or every-other-week glass collection. In particular, the two jurisdictions with monthly glass recycling collection had more glass containers in the garbage than did any of the jurisdiction with more frequent glass collection.

Every-other-week garbage service did not show more overall contamination of recycling than weekly service.

There was no statistical difference in overall contamination in recycling carts when comparing weekly garbage collection to every-other-week collection. However, there were statistically significant differences identified for some specific materials.

There is an opportunity to reduce the amount of contamination in recycling carts.

The study showed a regional average of 9 percent contamination in recycling carts. This amounts to about 9,000 tons of contaminants placed in recycling carts annually. The level of contamination has remained constant over the last ten years. Diapers and plastic bags have been identified by many of the processing facilities as being particularly problematic. Diapers pose health hazards to workers at recycling facilities and prevent materials from being recycled. Plastic bags impair machinery, increasing processing costs for facilities.



Looking Ahead

Working together, Metro and its city and county partners will use these studies, along with other information, to answer the following questions:

- Should the region work on reducing the amount of recyclables in the garbage? If so, how do we best do that?
- Should the region work to reduce the amount and types of contamination found in recycling carts? If so, how do we best do that?
- Should less frequent recycling collection programs be a generally accepted practice in the region? How might this affect the entire system of collecting recyclables, yard debris, food scraps and garbage?

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CRC Vancouver	

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