

2023 Oregon Outbound Commingled Recycling Composition Study

Part of the 2023 Oregon Waste and Recycling
Composition Studies

May 4, 2026



Figure 1. Cascadia Consulting crew sorting an outbound recycling sample of mixed scrap paper. Photo by Peter Spendelow.

Document information

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Abbreviations used in this document

CRPF = Commingled Recycling Processing Facility

“Commingled OK” = Material that in 2023 was acceptable to be included in commingled recycling in the Metro area and some other parts of the state

USCL = Uniform Statewide Collection List: The list of materials that are acceptable in commingled recycling in all of Oregon starting July 1, 2025

Executive summary

The outbound recycling study is one of three related waste composition studies conducted by the Oregon Department of Environmental Quality in 2023, with the other two being the composition of waste disposed from Oregon and the composition of the inbound commingled recycling.

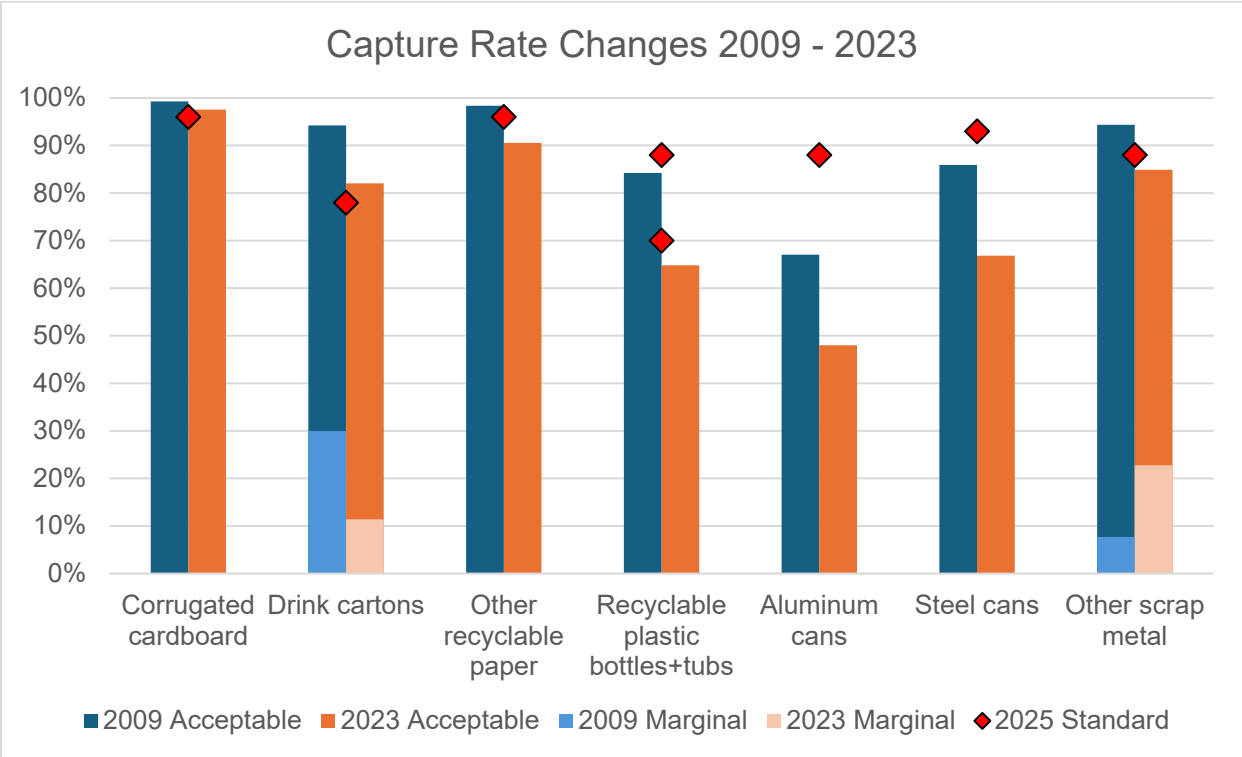
The outbound recycling study had two main goals:

- To collect information on the quantity of different materials and contaminants leaving Oregon commingled recycling processing facilities after processing, and
- To determine the processing facilities’ effectiveness in separating different materials and sending each recyclable material to its proper market, and each non-recyclable contaminant to disposal.

Key findings of the study include:

- Facilities are not currently meeting the capture rate standards for plastic and metal containers in our new rules. Capture rates have decreased across all categories from 2009 to 2023. While most aluminum beverage cans are collected through the bottle bill, less than half of cans collected in comingled recycling were captured for recycling in 2023.

Figure ES 1. Capture Rate Changes 2009-2023



- Improved sorting will be required because some materials do not currently meet the 5% contamination standard. Aluminum (6.26%), mixed scrap paper (12.68%), and steel (tinned) cans (5.05%) do not meet the 5% contamination standard. Contamination of outbound commodities has significantly increased, and capture rates have decreased for most materials. Rigid plastic and containers (combined) may exceed contamination standards depending on the end market's ability to use the material.

Figure ES 2. Contamination in Outbound Commodities

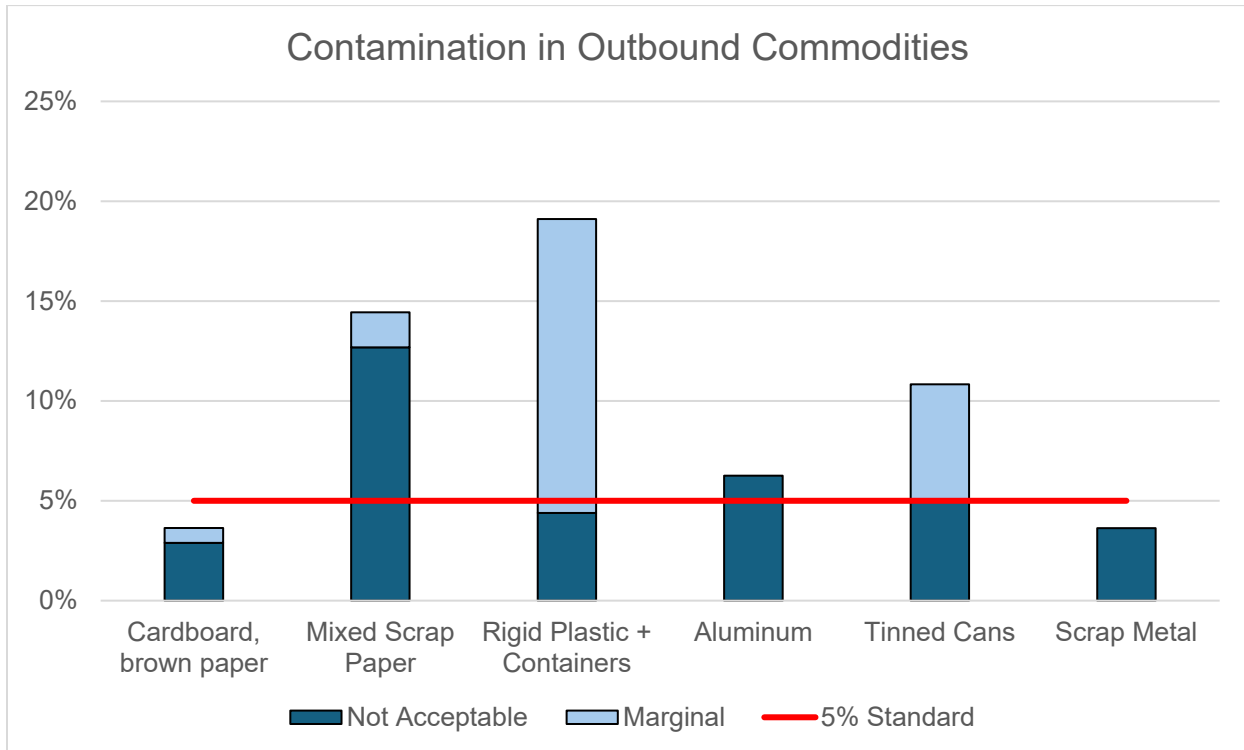


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2023 Oregon Outbound Commingled Recycling Composition Study

Background

Introduction

In 2023, the Oregon Department of Environmental Quality conducted composition studies of three different waste and recycling streams:

- Disposal Site Study: The composition of disposed waste received at transfer stations and landfills.
- Inbound Commingled Recycling Study: The composition of commingled recycling loads collected directly from recycling route trucks and other sources arriving at commingled recycling processing and reload facilities.
- Outbound Commingled Recycling Study: The composition of the commodities and waste streams produced by commingled recycling processing facilities, and the subject of this document.

Purpose

Oregon law ORS 459A.035 requires Oregon DEQ to conduct a waste composition study at least every 6 years and allows flexibility in what is included in the study. Prior to the 2023 study, the last full waste composition study was conducted in 2016/2017 and looked at the composition of disposed waste. The studies before that, in 2009/2010, were similar to the 2023 study in that they included the composition of collected commingled recycling and the commodities and waste streams produced by the processing facilities as well as the composition of disposed waste. The 2009/2010 studies are available on the [DEQ Waste Composition Study webpage](#). DEQ was originally planning on conducting only a disposal composition study in 2023, but with passage of the Recycling Modernization Act ([Senate Bill 582, 2021 session](#)), DEQ needed data on the composition of commingled recycling to determine such factors as the level of contamination in the collected material and the percentage of both the recyclable material and the contaminants that are covered products under the Recycling Modernization Act. The main purposes of this outbound recycling composition study were as follows:

- Composition: To determine the composition of each outgoing commodity and residue stream sorted from commingled recyclables.
- Contamination: To determine the amount of contaminating material present in each of the commodity streams being sent to recycling end markets after being sorted out at Oregon commingled recycling processing facilities.
- Capture rate: To determine the processing facilities' effectiveness in separating different materials and sending each recyclable material to its proper market, and each non-recyclable contaminant to disposal.

Contamination in outbound recycling is any material that is not acceptable in that commodity type. Contamination in outbound commodity samples may include materials that would otherwise be acceptable recyclable materials with other commodities, or materials that are not acceptable with any commodities. Contamination in the outbound study is categorized more narrowly than in the inbound recycling study, because it is measured against the acceptable materials for each commodity, not against the statewide acceptable materials list for the whole recycling system. For example, mixed scrap paper bales included curb-acceptable plastic bottles and tubs, which are considered contamination in the mixed scrap paper bales, even though they are accepted in the recycling system. Plastic bottles and tubs are acceptable in the rigid plastic and containers commodity categories.

Capture rate for a material is the percentage of that material that ends up in an appropriate outbound commodity, divided by the total amount of that material entering the facility in the commingled recycling stream. For example, if 100 tons of PET plastic bottles enter a facility in the commingled recycling stream, and 70 of those tons end up in PET bales sold to a plastic reclaimer, but 20 tons end up in paper bales and 10 tons end up in a disposed residue stream, then the capture rate for PET bottles would be 70 percent.

Background on recycling collection in Oregon

Since passage of the Recycling Opportunity Act in 1983 and its implementation in 1986, many Oregon cities with populations larger than 4,000 have had on-route collection provided to their residents. Originally materials were collected separately, but between 1995 and 2010, almost all programs switched to collecting most materials commingled together – usually in large roll carts. Recyclers receiving materials from these collection companies then had to develop systems to sort out the materials into individual commodities for sale to end markets. Unlike programs in the rest of the country though, almost all Oregon programs collect glass separately on-route or at depots rather than commingled, as broken glass shards contaminate other materials and can cause significant problems in processing facilities and at paper mills. Over the years, the areas served by these on-route collection programs have expanded, as smaller cities and unincorporated areas have piggy-backed on the programs established in the larger cities. Currently, a little more than 80 percent of Oregon’s population lives in areas where on-route recycling collection is provided, although some people living in multifamily housing or who do not have garbage services may not be provided with recycling collection. In most areas, on-route recycling is provided to commercial businesses too.

In 2023, most commingled materials from Oregon were processed and sorted at the following nine commingled recycling processing facilities that were operational in Oregon during the time of this study.

- Far West – Hillsboro and Portland
- Pioneer Recycling
- Westrock
- Garten Services
- International Paper

- Environmental Fibers International (mainly sorted out paper and contaminants, and shipped containers to other facilities to sort)
- EcoSort (sorted out cardboard – shipped the rest to other facilities to sort)
- KB Recycling (mainly sorted out cardboard – shipped the rest to other facilities to sort)

Samples were collected and sorted from all these locations except for KB Recycling. Facilities processing a very small amount of material or those processing Oregon material out of state were also not included in the study, but the study did include more than 94 percent of the commingled material collected in Oregon. Facilities sorted and marketed materials from across the state, and not just material generated in communities near the facilities.

Methodology – Outbound commingled recycling study

Work on the outbound recycling study was carried out by Cascadia Consulting as a subcontractor to Sky Valley Associates. The main steps of the outbound commingled recycling study were as follows:

- Cascadia Consulting and DEQ met with staff at each of the eight facilities that took part in the study to determine what commodities and residual streams that facility produced, approximate quantities of each, how many samples would be collected for each commodity and residue stream, and how representative samples from each commodity could be obtained for sorting.
- Samples were collected and sorted from each participating facility twice, with the visits being 6 months apart, collecting and sorting about half of the samples each visit. It would generally take the crew two to three days to collect and sort the ~27 samples to be sorted at each facility during each visit.
- Each sampling session was pre-announced so that the facility would be able to prepare a space for the crew to sort on-site. Although from a sample integrity standpoint it would have been better to have the sampling be unannounced, the study was non-regulatory and facilities were participating entirely voluntarily, as there was no requirement for facilities to participate. From a practical standpoint the sampling and sorting had to be done at the facility itself. We believed that there was no reason why a facility would want to influence the results by, say, bringing on more sorters or running the belts slower to achieve greater efficiency while the crew was there. The study was being done in order to collect baseline data on overall sorting efficiency at Oregon's commingled recycling processing facilities in order to inform the development of standard for contamination rates for outgoing commodities and capture rates for materials under the Recycling Modernization Act, rather than evaluation of individual facilities. Facilities had no incentive to "clean up" their recycling during the sampling period if this might end up requiring them to achieve more stringent standards for contamination and capture rate when rules were adopted under the Act.
- The number of samples we collected at each facility depended on the specific quantities they were sorting, but for the facilities doing full sorts, they averaged 55 samples each, broken down on average approximately as follows:

- 7 cardboard samples
 - 17 samples of mixed paper
 - 16 samples of containers and scrap metal, with usually 2 samples for each specific container or resin type
 - 13 samples of residue (all residue types combined)
 - Some additional samples of materials such as film plastic and glass if sorted out for recovery. If not sorted for recovery, these two materials would be in the residue samples
- Sampling purposefully concentrated on the commodities and residue streams that were expected to have the highest contamination levels. All facilities doing a full sort of materials were negatively sorting for mixed paper, which means they were pulling other recyclables and contaminants out of the mixed paper stream as the paper traveled down the sort line. If the sorters missed any containers or residue, that material would end up in the paper bales. Positive sort material such as is used for most container commodities generally had less contamination. Many of the positively sorted commodities are produced in much smaller quantities than mixed paper.
 - Sample sizes were different for each type of sample as follows:
 - Cardboard and mixed paper samples were approximately 200 pounds each, except shredded paper samples, which were a minimum 15 pounds each.
 - Samples of plastic and metal containers were generally a minimum of 100 pounds each
 - Hand-pulled residue and other streams of large non-recyclable materials were generally a minimum of 200 pounds.
 - Samples of screen fines and crushed glass samples were generally a minimum of 15 pounds. Some specific samples of residue that are only produced in small quantities were a minimum of 100 pounds.
 - Samples for each commodity were collected generally right before they would be baled for shipment to market. Samples of residue were collected directly at the point where they were sorted out.
 - Each sample was sorted into 47 different material categories, and the weights of each category for that sample were recorded into a Microsoft Access database provided by DEQ. Definitions for each category are provided in Appendix A of this report.
 - Altogether, the Cascadia Consulting crew sorted 375 samples. Table 1 shows the total number of samples captured of each type.
 - At the end of each sampling period, Cascadia Consulting would send the data to DEQ. DEQ was responsible for all of the data analysis provided in this report.

Every facility that DEQ approached to participate in the study agreed to do so, and they all played a major role in carrying out this study. This included allowing the crew to come on-site to collect and/or sort the samples and use their equipment to help the crew capture each sample.



Figure 2. Cascadia Consulting crew sorting a mixed paper load at Garten Services.

Commodities produced in 2023 were generally the same as commodities produced when we conducted the 2009/2010 study with one large exception. In 2009, almost all mixed paper was being sorted into a newsprint grade that excluded brown fiber and boxboard, but with the sharp decline of newsprint production over the past decades, that grade of paper has almost disappeared. Instead, facilities are now producing mixed paper grades to be used for packaging paper that would allow brown fiber to be included in that grade.



Figure 3. Outbound recycling samples on a tarp outdoors, with sorting crew and containers in the background. It was atypical to sort samples outdoors, but occurred occasionally due to indoor space limitations.

Table 1. Number of samples collected from each commodity and residue stream.

Commodity	Samples
Cardboard, brown paper	60
Mixed Scrap Paper	118
Rigid Plastic + Containers	48
Aluminum	10
Tinned Cans	11
Scrap Metal	15
Glass	5
Garbage	89
Film	2
Commingled: to other processor	17
Total	375

Categorizing the acceptability of each material in each commodity

To determine the contamination rate of each commodity and the capture rate for each material, DEQ had to first designate what materials are acceptable in each commodity stream, and what materials would be considered contaminants in that commodity. For each specific commodity produced by a commingled recycling processing facility, DEQ classified each of the 47 materials into 3 categories, as follows:

1. **Acceptable:** the material is appropriate in that commodity. These are the materials that the purchaser of the commodity is desiring to obtain, such as cardboard being purchased by a cardboard paper mill.
2. **Marginal:** the material is not necessarily wanted but does not significantly lower the value of the commodity. This is the equivalent of an “outthrow” in the Recycling Materials Association [ISRI specifications](#). An example is freezer boxes containing wet-strength paper in a mixed paper bale. Some paper mills may be able to recover valuable fiber from those bales, but for others, the paper will not pulp sufficiently to be of value.
3. **Not Acceptable:** the material is always considered to be a contaminant in that commodity, equivalent to “prohibited” in the [ISRI specifications](#).

Materials that are not supposed to be in the commingled stream were classified as “Acceptable” in the residue stream even if there is a market for that material, such as clean recyclable polyethylene film plastic. We also classified the material as “Acceptable” if it was sorted out and marketed in an appropriate grade, such as recyclable plastic film bales. Any material that is listed on the 2023 Metro commingled acceptable materials list was listed as “Not Acceptable” when it appeared in a residue, film, or glass commodity or waste stream. However, it should be noted that some recyclable materials might legitimately be sorted out into the residue stream by the processors if that material is highly contaminated, such as a piece of cardboard drenched in oil or a plastic bottle full of liquid.

The [Outbound Commingled Recycling Composition Study Results data file](#) includes a table called “AcceptableMaterialPerCommodity”, which shows how DEQ classified each material as “Acceptable” (1), “Marginal” (2) or “Not Acceptable” (3) in each commodity.

Results

Contamination Rate of Commodities

Table 2 is a summary of the average composition of six commodities or sets of commodities sorted out and sold by commingled recycling processing facilities, plus residue disposed and also a small amount of film and glass that separated out and sold in spite of the fact that it was not supposed to be included in the commingled recycling in the first place. A complete table listing all 47 materials separately is published in the [Outbound Commingled Recycling Composition Study Results data file](#).

Table 2. Summary: Composition and Contamination Rate of Commodities

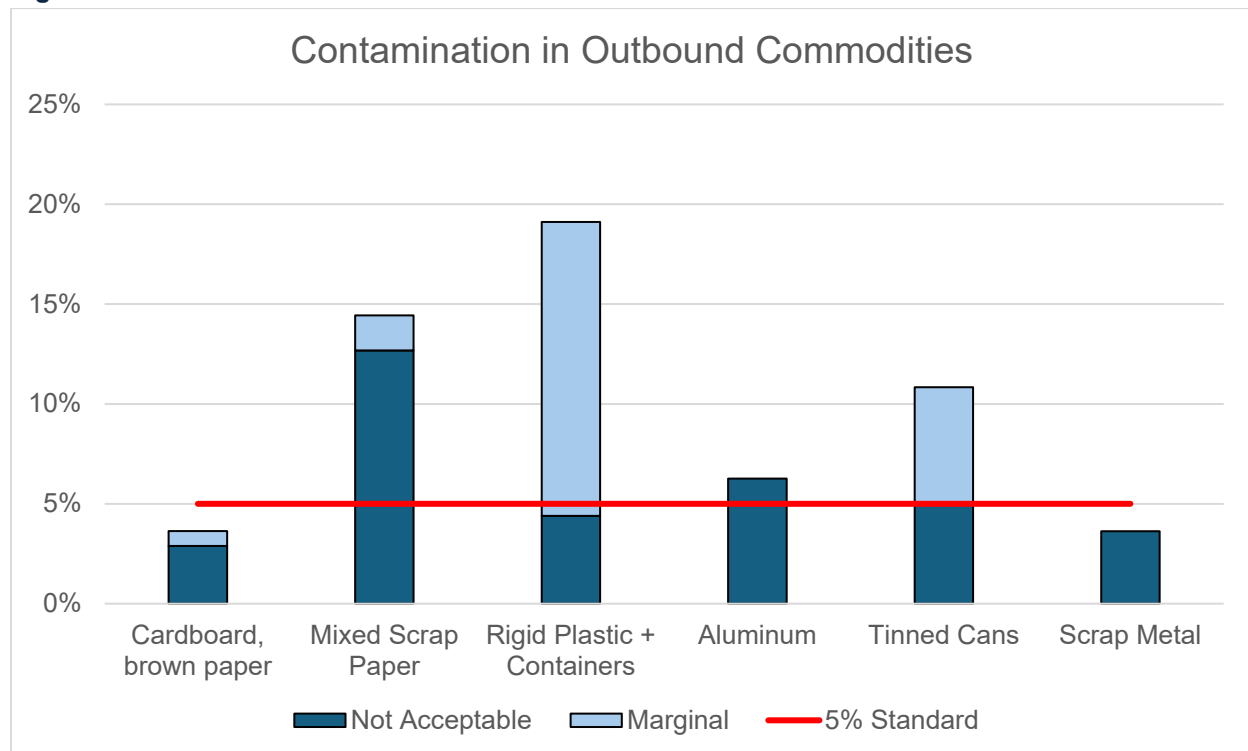
↓Material Commodity →	OK in commingle? (2023 list)	Corrugated Cardboard	Mixed scrap paper	Rigid plastic containers	Aluminum	Steel (tinned) cans	Other scrap metal	Garbage, Film, Glass
Corrugated cardboard/brown paper	Yes	83.58%	31.10%	0.48%	0.40%	0.53%	0.71%	8.67%
Hi-grade printing paper	Yes	3.44%	5.14%	0.13%	0.10%	0.16%	0.03%	2.57%
All drink boxes	Yes	0.13%	0.84%	0.47%	1.59%	0.09%	0.00%	0.45%
Other commingle-OK paper	Yes	9.35%	48.49%	1.12%	1.01%	1.14%	0.20%	17.77%
Paper not commingle OK	No	1.64%	3.84%	0.27%	0.12%	0.73%	0.03%	3.47%
Plastic Bottles	Yes	0.35%	2.25%	72.30%	1.04%	0.41%	0.12%	2.53%
Other commingle-OK plastic containers	Yes	0.02%	0.38%	5.32%	0.21%	0.15%	0.00%	0.31%
Film plastic	No	0.30%	0.99%	0.18%	0.26%	0.12%	0.13%	12.15%
Other plastic not commingle-OK	No	0.49%	2.08%	18.18%	0.45%	0.18%	0.77%	9.17%
Aluminum beverage cans	Yes	0.04%	0.41%	0.34%	84.55%	0.21%	0.04%	0.57%
Aluminum foil/pet cans	Yes	0.01%	0.17%	0.20%	8.87%	0.43%	0.49%	0.42%
Steel/Tinned cans	Yes	0.14%	1.22%	0.16%	0.62%	89.17%	2.61%	1.11%
All other scrap metal + aluminum	Partial*	0.08%	0.45%	0.17%	0.72%	6.11%	93.24%	1.94%
All Glass	No	0.01%	0.59%	0.06%	0.00%	0.03%	0.06%	8.27%
Other non-hazardous not commingled-OK	No	0.43%	2.03%	0.56%	0.08%	0.53%	0.96%	30.42%
Medical, batteries, other hazardous	No	0.00%	0.02%	0.04%	0.00%	0.03%	0.61%	0.18%
Total Acceptable		96.36%	85.56%	80.89%	93.74%	89.17%	96.37%	62.97%
Total Marginal		0.75%	1.75%	14.72%	0.00%	5.78%	0.00%	2.50%
Total Not Acceptable		2.89%	12.68%	4.39%	6.26%	5.05%	3.63%	34.53%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Total tons of each commodity/waste		120,299	112,720	10,710	850	4,386	2,851	37,891
Tons of "Not Acceptable"		3,477	14,297	470	53	222	103	13,085
Total paper	Partial	98.13%	89.41%	2.48%	3.22%	2.65%	0.97%	32.94%
Total plastic	Partial	1.16%	5.70%	95.98%	1.95%	0.86%	1.02%	24.16%
Total metal	Partial	0.27%	2.25%	0.87%	94.76%	95.91%	96.37%	4.04%
Total all other materials	No	0.44%	2.65%	0.67%	0.08%	0.58%	1.63%	38.86%
All commingle OK (2023 list)	Yes	97.12%	90.44%	80.70%	99.11%	98.39%	97.44%	036.35%
All not commingle-OK	No	2.88%	9.56%	19.30%	0.89%	1.61%	2.56%	63.65%

The commodity listed as “Rigid plastic containers” in Table 2 is really a set of plastic commodities, including the following:

- Polyethylene terephthalate (PET– resin code #1)
- Natural (unpigmented) high-density polyethylene (HDPE – resin code #2)
- Colored high-density polyethylene (HDPE – resin code #2)
- Polypropylene (PP – resin code #5)
- Mixtures of resins sent to a plastics recycler for further recycling (#1-#7 or #3-#7 bales)
- Mixed bulky rigid plastics

The classification of plastics as being acceptable or not acceptable was lenient for most plastics, as we were not sorting the plastics into separate resin categories, with a partial exception of deposit plastic bottles since these are almost exclusively PET. Thus, rigid plastic containers were generally scored as being acceptable if they at least made it into a plastic bale, even if the wrong resin. In future work under the Recycling Modernization Act, we do expect to sort plastic by resin and will list as either “marginal” or “not acceptable” plastics resins that are in the wrong commodity. For example, in the future, PVC plastic in a PET bale would be considered “not acceptable” as it seriously impacts the PET recycling, but polypropylene in a colored HDPE bale might be considered “marginal” since some end-users can use compatibilizers to utilize small amounts of PP in HDPE products.

Figure 4. Contamination in Outbound Commodities



As expected, mixed scrap paper had the highest level on non-acceptable materials, since mixed scrap paper is generally produced by a negative sort. Any contaminant that fails to be removed by hand or machinery end up in the mixed scrap paper bales. Oregon Administrative Rules 340-096-0300 (3)(b) adopted under the Recycling Modernization Act (2021 SB 582) will require that

every commodity produced by commingled recycling processing facilities must have on average less than five percent contamination after implementation in mid-2025. None of the processing facilities that produce mixed scrap paper bales met the 5 percent maximum contamination standard. Of the six commodity categories listed in Table 2, only cardboard and scrap metal clearly met that criteria on average. Plastics and tinned cans marginally or nearly met the standard. Surprisingly, aluminum failed to meet the standard. One reason is that several processors have installed eddy-current separators to separate out aluminum items, but it also separates many of the aseptic containers into the aluminum commodity since the aseptic containers have a layer of aluminum build into them. All commingled processing facilities will need to improve their sorting in order to meet the contamination rate standard required by rules.

Capture rates of materials

Capture rate is the percentage of a recyclable material that is properly sorted out into the correct commodity stream so it can be recycled into a new product. Low capture rates mean a loss of resources – good material that people properly prepare and put in their recycling container that ended up being disposed. When aluminum cans or plastic bottles end up in paper bales, the paper mill will screen them out easily, but by that point they are so damaged that they just get disposed. Both aluminum and plastic are resource-intensive to produce from virgin material but use much less energy and produce less greenhouse gas or other forms of pollution when made from recycled aluminum or plastic.

Table 3 is a summary table showing the ultimate fate of each material (including contaminants) received by the commingled recycling processing facilities. A complete table listing all 47 materials separately is published in the Outbound Commingled Recycling Composition Study Results data file. To better understand Table 3, here is how to interpret the numbers using drink boxes (aseptic and gable-top beverage containers) as an example. Of all the drink boxes entering the CRPF, 11.39% ended up in cardboard bales, where they might be considered an outthrow, and so are classified as “marginal.” The bulk of the drink boxes (70.64%) ended up in mixed scrap paper bales. In this table these are listed as “acceptable”, although whether they are actually pulped up and incorporated in a new paper product may depend on the type of pulper used at the paper mill. However, 17.96% of all the drink boxes entering the facility ended up in plastic, aluminum, or tinned can bales or in the garbage – places where they clearly don’t belong, and so these are listed as “Not Acceptable.” In some cases, it would be legitimate to sort a drink box into the garbage if the box was highly contaminated with other materials, but many of the drink boxes in the residue stream were in good condition for recycling.

The actual capture rate for a material at a facility depends not only on what commodity that material ends up in, but also whether that commodity is sold to an end-user that will actually use that material. Generally, any material that is categorized as “acceptable” in a commodity will count towards the capture rate, and non-acceptable materials will not, but marginal materials may or may not count towards the capture rate depending on whether or not the purchaser can actually use that material. For example, a cardboard mill with a strong pulper may be able to pulp up and use all the fiber from a drink box, in which case those drink boxes would be included in the capture rate. However, there are cases where even if listed as “acceptable” in Table 3, a material may not actually be captured depending on the capabilities of the purchaser.

For example, newsprint mills generally have low-energy pulpers since newsprint and magazine fibers generally need little energy (mechanical agitation) to get pulped. A gable-top milk carton, composed of wet-strength paper, will not pulp up in a newsprint pulper, so any milk cartons sold to a newsprint mill would not be included in the capture rate for drink boxes at the CRPF.

Table 3. Capture rate: Where each material entering the commingled recycling processing facilities ends up. Rows total to 100%

↓Material Commodity →	Corrugated Cardboard	Mixed scrap paper	Rigid plastic containers	Aluminum	Steel (tinned) cans	Other scrap metal	Garbage, Film, Glass	Acceptable outgoing commodity or waste	Marginal outgoing commodity or waste	Not acceptable outgoing commodity or waste
Corrugated cardboard/brown paper	72.34%	25.23%	0.04%	0.00%	0.02%	0.01%	2.36%	97.56%	0.00%	2.44%
Hi-grade printing paper	37.87%	53.00%	0.12%	0.01%	0.06%	0.01%	8.93%	90.87%	0.00%	9.13%
All drink boxes	11.39%	70.64%	3.81%	1.02%	0.30%	0.00%	12.84%	70.64%	11.39%	17.96%
Other commingle-OK paper	15.45%	75.05%	0.16%	0.01%	0.07%	0.01%	9.25%	90.50%	0.00%	9.50%
Paper not commingle-OK	25.70%	56.36%	0.38%	0.01%	0.42%	0.01%	17.12%	17.03%	31.42%	51.55%
Plastic Bottles	3.55%	21.72%	66.27%	0.08%	0.16%	0.03%	8.20%	66.24%	0.03%	33.73%
Other commingle-OK plastic	1.82%	37.32%	49.77%	0.16%	0.56%	0.00%	10.37%	49.77%	0.00%	50.23%
Film plastic	5.95%	18.27%	0.32%	0.04%	0.09%	0.06%	75.29%	75.25%	0.03%	24.71%
Other plastic not commingle-OK	7.08%	27.94%	23.19%	0.05%	0.09%	0.26%	41.39%	44.95%	19.38%	35.67%
Aluminum beverage cans	3.52%	30.99%	2.44%	47.93%	0.61%	0.07%	14.42%	48.01%	0.00%	51.99%
Aluminum foil/pet cans	2.82%	38.57%	4.24%	15.31%	3.85%	2.81%	32.40%	18.12%	32.38%	49.50%
Steel/Tinned cans	2.74%	23.00%	0.29%	0.09%	65.59%	1.25%	7.06%	66.84%	0.00%	33.16%
All other scrap metal + aluminum	2.13%	11.80%	0.44%	0.14%	6.25%	62.06%	17.17%	62.13%	22.77%	15.10%
All Glass	0.35%	17.52%	0.18%	0.00%	0.03%	0.04%	81.89%	65.18%	16.70%	18.12%
Other non-haz. not commingled-OK	3.58%	15.86%	0.42%	0.00%	0.16%	0.19%	79.78%	78.91%	0.87%	20.22%
Medical, batteries, other hazardous	0.34%	19.11%	3.62%	0.00%	1.04%	15.67%	60.22%	58.27%	1.95%	39.78%
All commingle OK (2023 list)	46.90%	40.92%	3.47%	0.34%	1.73%	1.12%	5.53%	91.57%	0.52%	7.91%
All not commingle-OK	8.54%	26.56%	5.09%	0.02%	0.17%	0.18%	59.44%	58.26%	11.85%	29.88%

Table 4. Comparing the standards for capture rates that, as of 2025, CRPFs are required to achieve, to actual capture rates from this study

Material from capture rate rule table*	Standard 7/1/2025	Standard 1/1/2028	Closest matching waste composition category	Acceptable	Marginal	Not acceptable	Meets 2025 standard
Cardboard & kraft paper	96%	97%	Corrugated cardboard/brown paper	97.56%	0.00%	2.44%	Pass
Drink cartons (aseptics + gable tops)	78%	88%	All drink cartons	70.64%	11.39%	17.96%	Marginal
Printing and writing paper + other paper packaging	96%	97%	Hi-grade + Other paper acceptable in commingled	90.55%	0.00%	9.45%	Fail
PET bottles	85%	93%	Plastic deposit bottles	59.89%	0.22%	39.89%	Fail
HDPE bottles	88%	95%	Other plastic bottles, jars	67.11%	0.00%	32.89%	Fail
HDPE and PP tubs and pails up to 2 gallons excluding flower pots	85%	93%	Commingled-acceptable plastic tubs and pails	49.77%	0.00%	50.23%	Fail
HDPE and PP tubs and pails 2 to 5 gallons excluding flower pots	83%	93%	Commingled-acceptable plastic tubs and pails	49.77%	0.00%	50.23%	Fail
HDPE + PP flower pots up to 2 gallons	70%	89%	Commingled-acceptable plastic tubs and pails	49.77%	0.00%	50.23%	Fail
HDPE + PP flower pots 2 to 5 gallons	85%	92%	Commingled-acceptable plastic tubs and pails	49.77%	0.00%	50.23%	Fail
Aluminum cans	88%	94%	All aluminum cans	48.01%	0.00%	51.99%	Fail
Steel ("tinned") cans	93%	98%	All steel cans	66.84%	0.00%	33.16%	Fail
Other scrap metal	88%	98%	All other scrap metal	62.13%	22.77%	15.10%	Fail

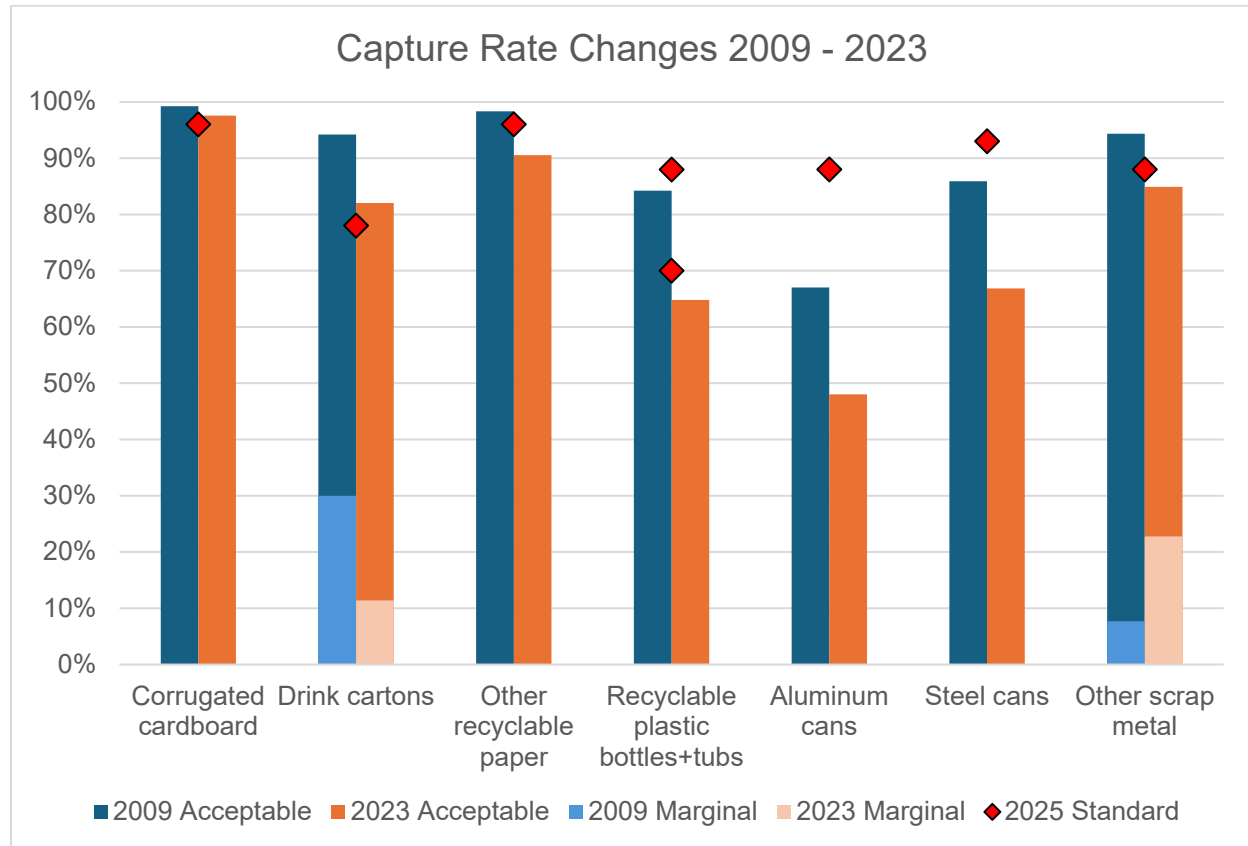
* As of 2026, [the capture rate rule table is available here](#).

Comparing capture rates to adopted standards for CRPFs

This study was developed in 2022 and implemented in 2023, long before the standards for capture rates at commingled recycling processing facilities were adopted in rule in November 2024. The capture rate and contamination rate standards can be found in [Oregon Administrative Rule 34-096-0300](#), and as of 2026, this rule contains a link to the [table of capture rates that CRPFs are required to meet](#). For paper and metals, the material categories we used matched well with the specific materials for which DEQ adopted capture rate standards in rules. For plastics, however, the capture rate standards had much more details than the categories used in this study. For example, the adopted capture rate standards split out plastic flowerpots from other rigid plastic tubs and containers, since the flowerpots are more difficult to identify and sort using mechanical sorting. Flowerpots are often black, making it difficult to use optical sorting equipment to properly sort them by resin.

Table 4 shows the adopted capture rate performance standards adopted in rule compared to the individual materials in this study that most closely match the materials in the capture rate performance standards. As can be seen, corrugated cardboard is the only material that clearly meets the adopted performance standard for 2025. Drink boxes can meet the 2025 performance standards, but only if the CRPF sells their mixed scrap paper to a paper mill that can recover the fiber from the drink boxes. Many paper mills cannot do so, as discussed above.

Figure 5. 2025 Capture Rate Performance Standards Compared to 2009-2023 Measured Capture Rates



Comparing 2023 and 2009 study results

DEQ conducted a very similar study to the current study in 2009/2010, titled [Composition of Commingled Recyclables Before and After Processing](#). The methodology was similar in the two studies with the following exceptions:

- In 2009, paper from commingled recycling was generally sorted into 3 categories: with the two largest being a cardboard grade and a grade sold as a type of newsprint, although it contained lots of other newsprint-compatible grades such as junk mail and magazines. There was a relatively small amount sold as a mixed scrap paper grade, and that often included the paper other than cardboard that was not suitable for making newsprint. In 2023, the old newsprint grade was no longer in use, and paper other than cardboard was sold by the CRPFs as mixed scrap paper.
- In 2009, material was sorted into just 17 categories, of which 11 were for materials that are acceptable in commingled recycling and only 6 categories were for contaminating materials not on the acceptance list for commingled recycling. In the current 2023 study, there were 15 categories for material that is acceptable in commingled recycling, four categories of scrap metal which is acceptable in commingled recycling if less than 10 pounds and 18 inches long, and 28 categories of contaminants. This allowed for more precise regarding certain

contaminants as being either “marginal” or “not acceptable” depending on which commodity they are in.

Table 5 compares how much of each material ends up in an acceptable commodity, a marginal commodity or waste stream, or in a commodity or waste stream where it clearly does not belong. Some of the material categories from the current study have been combined to closely match the material categories from the 2009 study. Also, the 2009 categorization of materials as acceptable or not in a commodity has been changed in a few cases to better match the way materials are categorized in the current study. One example is that since commingled recycling processing facilities are generally no longer sorting and selling grades as old newsprint, but are instead selling it as mixed scrap paper, the categorization of other materials in newspaper has been shifted to match how mixed scrap paper is classified in the current study.

Table 5. Comparing 2009 and 2023 capture rates

	2023 Acceptable	2023 Marginal	2023 Not Acceptable	2009 Acceptable	2009 Marginal	2009 Not Acceptable
Corrugated cardboard	97.56%	0.00%	2.44%	99.25%	0.00%	0.75%
Gable Top Beverage Cartons	72.31%	14.10%	13.58%	64.76%	29.99%	5.25%
Aseptic Beverage Cartons	66.74%	5.06%	28.20%	59.77%	29.90%	10.33%
Other paper acceptable commingled	90.55%	0.00%	9.45%	98.34%	0.00%	1.66%
Plastic bottles+tubs OK commingled	64.76%	0.04%	35.21%	84.22%	0.00%	15.78%
Aluminum beverage cans	48.01%	0.00%	51.99%	67.02%	0.00%	32.98%
Aluminum foil/pet cans	18.12%	32.38%	49.50%	33.98%	16.97%	49.05%
Steel/tinned cans	66.84%	0.00%	33.16%	85.89%	0.00%	14.11%
Other scrap metal& aluminum	62.13%	22.77%	15.10%	86.64%	0.05%	13.31%
Glass	80.15%	1.73%	18.12%	98.59%	0.00%	1.41%
Non-recyclable paper	17.03%	35.40%	47.56%	24.53%	69.70%	5.77%
Film plastic	75.25%	0.00%	24.74%	75.86%	0.00%	24.14%
Other plastic not OK commingled	44.95%	18.72%	36.33%	30.78%	38.20%	31.03%
hazardous materials	58.27%	0.00%	41.73%	45.87%	0.00%	54.13%
other nonrecyclables	78.91%	0.00%	21.09%	83.50%	0.00%	16.50%

One thing that is clear from Table 5 is that sorting quality has declined substantially in 2023 as compared to 2009. For all of the materials that are on the list as being OK in commingled recycling, the percentage ending up being a non-acceptable contaminant in the commodity where it ended up is much higher in the current study as compared to 2009, as seen in the columns labeled “2023 Not Acceptable” and “2009 Not Acceptable” and shaded yellow in Table 5. This is particularly evident for aluminum beverage cans, where slightly more than half the cans ended up missorted in 2023, and for plastic bottles and tubs, where more than one-third were missorted.

Sources of error

Like polls, waste composition studies are sampling studies, and thus subject to random "sampling" error. Sampling error is reduced in proportion to the square root of the number of samples collected. Sampling was concentrated in the commodities and waste streams expected to have the most missorted material. As can be seen in Table 2, in the row labelled "Tons of 'Not Acceptable,'" missorted material was mostly found in the mixed scrap paper, where we had 118 samples, and in the garbage, where we had 89 samples. For the different container categories, there were approximately 10 samples of each, but these were not commodities that contained much missorted material. Instead, it was these plastic, aluminum, and steel containers that were often missorted into the wrong commodity or waste stream not appropriate for the container types, such as mixed scrap paper bales.

Besides normal sampling errors, there were other sources of error such as crew mistakes in sorting or weighing sample materials. However, probably the biggest source of error was uncertainty regarding the size of different waste streams at the facilities. Processors have multiple places in their sort line and equipment where waste is separated for disposal. These streams include screen fines from different screening processes, waste separated on the floor of the facility, and waste that is hand-pulled in different areas of the sorting process. Although DEQ needed information on the relative size of each of these waste streams, the processors might only have records on the total amount of waste sent to disposal. In these cases, DEQ developed estimates for the amount and type of waste produced at each part of the process where we grabbed samples for sorting.

One indication of the potential size of errors can be gained by comparing the estimates of the tonnage of each material within the commingled stream based on the inbound recycling composition study with the tonnage estimates of each material in the outbound commodities and wastes developed through mass balance calculations in this outbound study. The two should be fairly similar but not identical for the following reasons:

- Differences in on-site tonnage of materials in inventory at the beginning and end of the year will make the incoming tons not match with the outgoing tons
- The outbound tonnage was based on just the 8 facilities that were sampled as part of this study, whereas the inbound study was based on all collected commingled material.
- Material might dry out if sitting for a while before being processed and marketed, which would change the outbound tonnage relative to the inbound tonnage. Conversely, material might become wetter if sprays of water are used to keep dust down.
- Liquids in an incoming load might drain away on dumping.
- Completely different crews were used in the inbound and the outbound recycling composition study. This could lead to differences in how individual items were classified. For example, junk mail is directed to be sorted into the category "low grade printing and writing paper" in the inbound recycling study, and that category is part of the "Newspaper, junk mail, other curbside acceptable paper that is a covered material" category. (abbreviated in Table 6 as "Other commingle-OK paper"). However, junk mail often contains substantial amounts of white ledger paper. In incoming loads, that material can often be recognized as junk mail, but in outbound recycling, there may not be the cues that help identify it as junk mail such as knowing the material came from residences, and so it might be sorted into the "hi-grade paper" category.

Table 6. Summary: Comparing tonnage estimates for each material from this study and the inbound recycling study

	Inbound study tons	Outbound study tons	Outbound adjusted to match inbound total
Total all paper	232,937	231,749	233,521
Total all plastic	25,504	27,338	27,547
Total all metal	11,892	12,238	12,332
Total all other materials	21,589	18,382	18,522
Total	291,922	289,707	291,922
Total acceptable in commingled	248,923	249,132	251,037
Total not acceptable in commingled	43,000	40,575	40,886
Corrugated cardboard/brown paper	148,535	138,984	140,047
Hi-grade printing paper	5,897	10,924	11,008
All drink boxes	1,413	1,332	1,343
Other commingle-OK paper	67,888	72,821	73,378
Paper not commingle OK	9,205	7,686	7,745
Plastic Bottles	11,273	11,685	11,775
Other commingle-OK plastic containers	2,025	1,145	1,154
Film plastic	3,416	6,113	6,160
Other plastic not commingle-OK	8,790	8,395	8,459
Aluminum beverage cans	1,277	1,500	1,511
Aluminum foil/pet cans	544	493	496
Steel/Tinned cans	6,307	5,963	6,009
All other scrap metal + aluminum	3,764	4,283	4,316
All Glass	5,935	3,825	3,854
Other non-hazardous not commingled-OK	15,495	14,445	14,555
Medical, batteries, other hazardous	159	112	113

Table 6 compares estimates of the total tonnage of each commingled material based on results from the [inbound recycling study](#) as compared to this study of outbound recycling. Data for the inbound study are based here on combining different material categories from the statewide results for the inbound study (tab “01Statewide” in the [inbound recycling Excel results file](#)) to match the reduced number of categories in the outbound study. Table 6 is a summary, and a full listing comparing all 47 outbound material categories can be found in the [Outbound Commingled Recycling Composition Study Results data file](#). To make the numbers more comparable, the last column of Table 6 adjusts the outbound tonnage estimates up so that the total matches the total tonnage estimate derived from the inbound study, which includes all

commingled material and not just the commingled material coming from the 8 facilities participating in the outbound study.

Overall, the estimates for broad categories such as “all paper” were fairly close comparing the inbound and outbound estimates. Many individual materials such as steel cans and plastic bottles were also fairly close, but a few, including film plastic and plastic tubs and pails (“Other commingle-OK plastic containers”), were substantially different. We do not know why these categories were so different, but the relatively poor estimates from the facilities on how much of the incoming commingled material is disposed as residue was probably a contributing factor.

Discussion and conclusions

It is clear that a substantial amount of recyclable material set out for commingled collection is being lost by being improperly sorted at the commingled recycling processing facilities, as seen in Table 3, and that the amount of material being improperly sorted has increased greatly in 2023 when compared to results from a similar study in 2009 (Table 5). It is also clear that the existing commingled recycling processing facilities will need to make substantial improvements to their sorting equipment and procedures in order to meet the capture rate and contamination standards that they are required to meet as of July 1, 2025 based on rules adopted under the Recycling Modernization Act (Table 4). A contributing factor to the increased loss of material is the fact that the amount of contamination in the commingled recycling has also increased greatly in recent years, as demonstrated in our study of [inbound commingled recycling](#), but this is likely just a small contributing factor, and that facilities will need to do much more to achieve the standards even if the incoming stream was cleaner.

Acknowledgements

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- International Paper, Springfield - Travis StClair, Carey Parson, Dan Huss, Lester Beagley
- Pioneer Recycling, Clackamas – Greg Ryan, Ambar Chevez
- WestRock Recycling – Wayne Jackson, Jerry Hartley, Tonya Allison, Rock Faaopega
- EcoSort, Springfield – Aaron Donley, Brian White, Chris Kjar, Amanda Cone

The main contractor for the disposal site, inbound recycling, and outbound recycling was Sky Valley Associates under the leadership of Brad Anderson, but all of the field work for this outbound recycling study was conducted by Cascadia Consulting as a subcontractor to Sky Valley Associates. Individuals at Cascadia that helped develop the sampling plan at each facility and conducted the actual sorting of the commodity and residue samples included Brandy Do, Dieter Eckels, Omkar Aphale, Michael Acode, Nate Jensen, Khori Bjork, Jon Zintel, Keith Subal, Adam Allen, Brady Kerr, Marie Horan, Dan Murphy.

This report was written by Peter Spendelow and Daniel Redick, and Peter Spendelow conducted the data analysis.

Appendix

Appendix A: Outbound Recycling Material categories

Numbers in parentheses refer to material categories in the full disposal site material category list.

Paper

1. **Gable top beverage cartons (1).** Poly-coated bleached paperboard boxes that contain ready-to-drink beverages such as milk or orange juice. May include plastic pour spouts as part of the carton.
 - Excludes cream and half&half boxes (see Polycoat paper #7).
2. **Aseptic drink boxes (2).** Paper/foil/plastic laminate boxes used to package juice and other ready-to-drink beverages.
 - Excludes aseptic containers used to package non-beverages (see Polycoat paper #7).
3. **Corrugated Cardboard/Brown Paper (3,4).** Includes wine boxes with bag, unwaxed OCC, boxes shrink-wrapped in plastic, unbleached kraft (brown) paper bags, and pizza boxes.
4. **High-grade office/printing/writing paper (uncoated high grades) (6).** Printing, writing and computer papers, including mainly thermo-chemical pulps. Both virgin pulp substitutes and high-grade de-ink fibers are included. Also includes white ledger, colored ledger, computer printouts, computer tab cards, bond, copy machine, and carbonless paper. Includes white and pastel envelopes without windows, and high-grade reports wrapped in shrink-wrap packaging.
 - Excludes glossy coated paper such as magazines, pure groundwood publications such as catalogs, astro-brights and other unbleachable, and glue-bound publications (Other acceptable paper #5).
5. **Newspaper, junk mail, other curbside acceptable paper that is a covered material (7-13).** Includes things such as: printed ground-wood newsprint (minimally bleached fiber), glossy paper typically used in newspaper insert advertisements, magazines, envelopes (not high grade), construction paper, greeting cards, spiral-bound notebooks, and all shredded paper.
6. **Low-grade recyclable paper products (15).** Any other recyclable paper product that is not printing and writing paper, packaging paper, or food serviceware, such as kitty scratching boxes. Also includes the following paper items that are excluded from being covered materials under SB 582: paperback books and also recyclable cores and wraps for rolls of packaging sold by a mill to a packaging converter of food processor, if not excluded as an industrial waste.

7. **Polycoated paper, freezer boxes, cups & take-out containers (16).** Includes poly-coated cardboard, poly-coated bleached and unbleached paperboard used for ice cream, frozen TV dinners, and many other frozen food boxes. Includes multi-walled bags that are poly-coated or have a plastic layer (watch out for very thin polycoat layers). Includes non-drink box aseptic and gable-top packaging such as soup cartons, cream cartons, and goldfish. Includes all paper cups and plates take-out containers (and any other marginally recyclable food serviceware including paper straws) regardless of if they have a plastic layer. Woody bamboo plates go under wood packaging and food serviceware.
8. **Hard-covered books (17).** Books with hard covers. Excludes paperbacks.
9. **Non-recyclable paper packaging, food service ware, and printing/writing paper (5,19,21).** Includes waxed corrugated cardboard and compostable nonrecyclable paper packaging such as molded flowerpots. Also includes things such as: blueprint paper, juice and pringle cans, foil containing paper, paper food trays (microwave food), cigarette packaging, paper 3-ring binders, etc. All other papers that cannot be defined elsewhere. "RC paper"
10. **Non-recyclable paper products (18,20).** Includes tissue, paper towels, and napkins. Also includes playing cards, wallpaper, gameboards, photos, and PRODUCTS made from a mixture of paper materials.

Plastic

11. **Plastic Deposit Bottles (25-27).** Includes deposit beer, soft drinks, kombucha, and water bottles up to 3 liters. All other deposit beverage bottles that are over 4oz and under 1.5 liters such as some juice containers. No liquor, wine, dairy, or infant formula bottles are included.
12. **Other plastic bottles and jars (28-31).** Includes 8-oz to 5 gallons plastic beverage bottle *without* an Oregon deposit. Any beverage bottles that do not fit size requirements above. Also includes all non-beverage bottles such as food, vitamins, bath and laundry products, automotive bottles, etc.
13. **Other curb-acceptable rigid plastic containers (32, 33) and small tubs (35).** Includes large plastic buckets and flowerpots or other rigid plastic containers (non-bottle). Also includes small tubs such as yogurt containers that are 6-8oz.
14. **Other Rigid Plastic Containers not accepted at the curb (34).** Rigid plastic packages with a capacity of from eight ounces to five gallons. Includes cookie trays, trays with sidewalls that can contain at least 8 oz., clamshells, flowerpots <4" that are > 8 oz.
15. **Bulky other rigid plastic packaging (36).** Includes all-plastic large crates, totes, containers except bottles larger than 5 gallons, and pallets used for packaging. Also includes large non-decorative flowerpots used for sale of large plants if over 5 gallons in size. The minimum size for most bulky packaging is equivalent in volume to a 4-gallon bucket (for non-RPCs) or just greater than a 5-gallon bucket (for containers). **Also includes large lids for storage tubs and 5-gallon buckets**
 - Excludes all rigid plastic containers (categories 11-14). Excludes foam plastic (goes in block foam plastic).
16. **Block foam plastic packaging (37).** Block foam plastic regardless of resin, plus polystyrene (or other resin) foam coolers. Does not include packaging peanuts, or foam clamshells, food trays, or other food serviceware. Does not include foam plastic used as a marine float, or plastic foam insulation boards, toys, or other products.

- Foam dishware, food clamshells, food trays, and cups and foam peanuts go under 17 Rigid Plastic Food Serviceware
 - Foam housing insulation board, foam marine float, and foam toys or other products go under #19 other rigid plastic products regardless of size
- 17. Other rigid plastic packaging and food serviceware (38,41).** Includes expanded polystyrene peanuts and food trays (holding less than 8 oz or more than 5 gallons) but not block foam or foam coolers. Includes plastic lids and caps from plastic, glass, metal, or paper containers, and plastic containers such as yogurt cups or small juice cups that are less than 6 ounces in size. Also includes utensils, plastic cups and plates, straws, stirrers, and foam clam shells.
- 18. Bulky rigid plastic products (39).** Includes larger all-plastic items such as plastic garbage cans, toys, bins, baskets, lawn furniture, Minimum size about the equivalent of a 4-gallon bucket in size. Change from 2016: Includes plastic pallets but not plastic slip-sheets.
- Excludes fiberglass-containing plastic and foam plastics such as marine floats, house insulation board, foam toys and other plastic foam products (they go in #19 Other rigid plastic products, regardless of size).
- 19. Other rigid plastic products that are not food serviceware (40).** Plastic household items, small toys thermoset plastic products, and "fiberglass" (mainly plastic) boat parts, corrugated roofing, and similar products. Includes foam products such as foam cushions, marine floats, foam housing insulation boards, and plastic fiberglass such as is used in boat hulls, regardless of size.
- Excludes polyurethane carpet pad (#44 – other nonrecyclables)
- 20. Rigid Mixed plastics/materials packaging and food serviceware (42).** Packaging and food serviceware whose predominant material is plastic but is combined with other material. Examples include paint cans with metal rims and blister-packs that is mostly plastic but with firmly attached paper or foil.
- 21. Mixed plastics/materials products (43).** Plastic products that are not food serviceware whose predominant material is plastic, but is combined with other material, such as kitchen ware, toys, plastic pens, car parts with other components, floor tiles and coverings that have canvas, paper, or other types of backing material or significant non-plastic components, etc.
- 22. Recyclable plastic film packaging and bags (49,50).** Includes plastic shopping bags used to carry merchandise out of a store (single use and multi-use). Also includes newspaper bags, bread bags, product wrap (example: paper towels, diapers, etc.), zip locks, pallet wrap, dirt/soil bags, bubble wrap, tape, etc.
- 23. Recyclable film products (51).** Includes clear and white polyethylene sheeting, hay sleeves and silage bags.
- 24. Non-recyclable film packaging, food serviceware (48,53).** Includes read to drink beverage pouches. All other plastic bags and flexible plastic film including chip bags and other bags with a thin metallic layer, stand-up pouches, plastic twine and strapping, green bio bags, and other flexible plastic items used for packaging or as food serviceware. Also include any plastic bag other than grocery/merchandise bags or garbage bags that are used as a garbage bag.
- 25. Non-recyclable plastic film products (52,54).** Includes plastic garbage bags that were sold to be garbage bags. Also includes polypropylene woven tarps, black plastic sheeting, polypropylene baler twine, shower curtains, plastic used as ground cover.

Other organic waste

26. **All yard debris (61-65).** Includes grass clippings, leaves, weeds, small and large pruning's, and stumps.
27. **All wood (66-77).** Includes reusable dimensional lumber (painted and unpainted), solid sawn lumber, chemically treated lumber, wood pallets and crates, cedar shingles and shakes, wood furniture, pencils, coat hangers, etc. Also includes mixed wood/other material products.

Food

28. **All food (81-91).** Includes all food packaged or unpackaged such as: bread, donuts, meat, dairy, eggs, and fruits and vegetables. Also includes animal products such as bones, shells, gristle, and other animal products.

Carbon containing organics (“Other Organics”)

29. **Disposable diapers (92).** Disposable diapers, including fecal materials contained within. Cloth diapers are to be sorted under textiles.
30. **Textiles (93,94).** Includes all clothing, towels, curtains, and other material made of fabrics.
 - Excludes mixed textiles such as shoes, belts, and gloves. These go in #44.

Glass

31. **Deposit beverage container glass (111,112).** All glass bottles no matter the contents. Examples include beer, soft drinks, water, energy drinks, teas, and coffee. Wine bottles do not go in the category.
32. **Other glass bottles, jars curb-acceptable but not in commingled bin (113,114).** All wine, liquor, and milk bottles. Also includes glass jars, condiments, baby food, pickles, and other non-beverage glass bottles and jars.
33. **All other glass (16,117).** Includes window glass, incandescent light bulbs, glass plates and cups, mirrors and all glass not accepted by glass manufacturers.

Metals (and appliances)

34. **Deposit aluminum cans (120,121).** Includes all deposit can. Beer, soda, juice, water, tea, and coffee.
35. **Other aluminum beverage cans (122).** No Oregon deposits. Includes wine, liquor, milk, and milk substitutes, and any other beverage that does not have a refund value in Oregon.
36. **Aluminum foil, food trays (123).** Aluminum pet food cans, foil-formed trays/containers, and foil.
37. **Other aluminum (124,125).** Includes all other aluminum small or large. Examples include: cookware, furniture, siding, scrap metal, etc.
38. **Deposit steel/bimetal cans (126, 127).** Includes juice, tea, and other bimetal beverages with deposit. Also, can include some imported beer (rare).

- 39. Other steel/bimetal cans (128).** Wine, liquor, dairy or milk substitutes, or other beverages not covered under the bottle bill.
- 40. Other tinned cans. Empty aerosol cans (129, 136).** Predominantly steel cans (some with tin or enamel coatings) used to hold food, and non-food items. Also, includes empty aerosol cans.
- 41. Non-ferrous metal (130, 131).** All nonmagnetic metals. Anything made of copper, brass, bronze, lead, pewter, zinc, and stainless steel. This also includes insulated copper wiring and holiday lights.
- 42. Other ferrous metals, white goods, used oil filters (132-135).** All magnetic metals big or small. Examples include: steel bed frames, cast iron, scrap metal, stoves, washers, and other household appliances. Oil filters are also included.
- 43. Mixed ferrous/nonferrous and mixed metal/material (137-139).** Includes mixed metals items that mostly consist of metal. Examples include electric and small gas engines. Products with mixtures of metal and non-metal items, where the metal weight predominates but where the item would not be recyclable with scrap metal.

Non-recyclables/computers/small appliances/inorganics

- 44. Other non-recyclables (95-110, 141-167).**
- This includes things such as mixed textiles (shoes, belts, etc.) carpets and rugs, tires, rubber products, all shingles, pet food, sawdust, charcoal, cigarette butts, dryer lint, soaps, gels, dead animals, and ceiling tiles.
 - Also includes computer monitors, CPUs, printers, mice and keyboards, TVs, microwaves, LED lights, and small appliances (speakers, DVD players, stereos, clocks, fans, can openers, blenders, shop tools).
 - Also includes rock, soil, sand, pet litter, all gypsum wallboard, fiberglass insulation, ash, ceramics, china, and porcelain.
- 45. Medical Wastes including sharps (170, 171).** All Medical waste and sharps such as tubing, gauze, blood-containing, “trucker” bottles, needles, syringes, etc.

Hazardous materials

- 46. Batteries (172, 173).** This includes both lead-acid batteries and dry-cell batteries. Any vehicle batteries, alkaline, NiCad, lithium, and similar batteries. Also includes rechargeable items such as flashlights.
- 47. Other hazardous materials (174-188).**
- This includes latex paint, oil-based paint, motor oil, antifreeze, bleach, and other flammables (thinners, solvents, sealants, strippers, hair spray).
 - Pesticides/herbicides.
 - Any corrosive cleaners (drain cleaner, oven cleaner, pool chemicals).
 - Asbestos
 - All fluorescent lights, mercury containing items, live ammunition, and compressed gas cylinders.
 - This also includes all prescription and nonprescription drugs.
 - Any other unlabeled chemicals believed to be hazardous.

Technical note – in the underlying database used for data analysis, there is no outbound material #6, and what are listed here as materials #6 through #47 are included in the database as #7 through #48

Appendix B: Tables

In addition to the tables and figures in this report, the following tables are available on the Department of Environmental Quality waste composition study webpage in the [Outbound Commingled Recycling Composition Study Results data file](#).

Sheet	Descriptions
Explanation	Information to help understand the contents of each sheet
CommodityComposition	Composition of the various commodities and wastestreams produced by commingled recycling processing facilities (CRPFs) from the commingled materials they receive.
Disposition+CaptureRate	Where each material entering the CRPFs in the commingled recycling stream ends up, and what percentage ends up in commodities where they will be used versus the percentage that end up as contaminants in the wrong commodity or in the disposed residue.
Composition+DispositionInTons	The same information as both of the tables discussed above, except in tons rather than percentages.
AcceptableMaterialPerCommodity	How DEQ scored whether a particular material was "acceptable" in a commodity, "marginal" in a commodity, or "not acceptable" in a commodity.
CaptureRateRequirements	Standards for capture rates that commingled recycling processing facilities are required to meet for different commodities, as adopted by rule in 2024 under Oregon's Recycling Modernization Act.
InboundOutboundCompareTons	Compares the total tonnage of each material entering commingled recycling processing facilities as estimated in the inbound commingled recycling composition study with the total tonnage leaving the processing facilities in all commodities and waste streams as estimated in this outbound study.