State of Oregon
DEQ Department of Environmental Quality

2023 Oregon Disposed Solid Waste Characterization and Composition

Part of the 2023 Oregon Waste and Recycling Composition Studies

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Document information

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Abbreviations used in this document

FSW = Food serviceware

MSW = Municipal solid waste

PKG = Packaging

PWP = Printing and writing paper

Executive summary

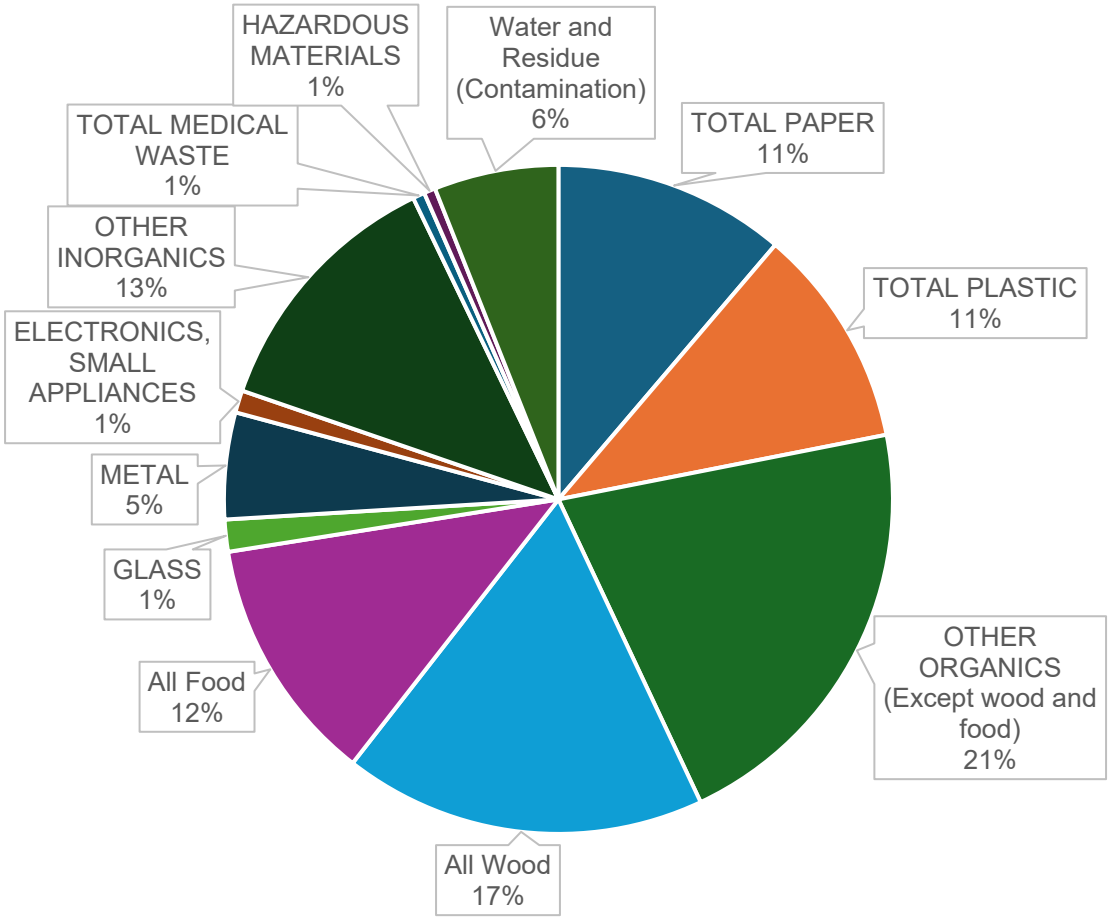
The disposed solid waste characterization and composition study is one of three related waste composition studies conducted by the Oregon Department of Environmental Quality in 2023, with the other two being the composition of the inbound commingled recycling and the composition of the outbound commingled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

The disposed waste study had three main goals:

- To collect information on the quantity and composition of solid waste materials disposed in Oregon, meeting the Oregon law ORS 459A.035 requirement for Oregon DEQ to conduct a waste composition study at least every 6 years.
- To determine how the composition of disposed solid waste has changed since previous studies.
- To inform programs and policies that address material disposal, recovery, production, and consumption.

Key findings of the study include:

Figure ES 1. Composition of solid waste disposed in Oregon in 2023.



- Organic (carbon containing) materials (non-paper) is the largest material category and makes up more than half of the materials disposed in Oregon.
    - Wood (17%), increased since 2016
    - Food (12%), decreased since 2016
    - Other organics, not including wood or food (21%)
- Other inorganics is the next largest material category at 13% of the state's disposed materials. Rock, dirt and pet litter are the largest portion of this category, followed by gypsum wallboard. The relative amount of other inorganics disposed did not change significantly since the previous study.
- Paper is the next largest material category, contributing to 11% of the state's disposed materials. Packaging and food serviceware make up the largest portion of this category, followed by paper products, and then printing and writing paper. The relative amount of paper disposed did not change significantly since the previous study.
- Plastic makes up 11% of the disposed materials in Oregon, where rigid plastic products (excluding FSW) is the largest portion of this category, followed by plastic film, and then rigid plastic packaging and FSW. The relative amount of plastic disposed increased since the previous study.

Metro and Marion, Lane, and Deschutes Counties all participated in this study and purchased additional samples such that there were a sufficient number of samples to allow us to provide separate composition results for their jurisdictions. DEQ has posted reports for each jurisdiction on **DEQ's waste composition web page**. DEQ has also posted full detailed data for each waste substream for the state as a whole and in each jurisdiction and "Rest of Oregon" in a series of 7 large Excel spreadsheets also available on **DEQ's waste composition web page**.

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2023 Oregon Disposed Solid Waste Characterization and Composition Study

Background

Introduction

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

- Disposed Solid Waste Study: The composition of disposed waste received at transfer stations and landfills, and the subject of this document.
- 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.

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. The main purposes of this disposal composition study were as follows:

- To collect information on the quantity and composition of solid waste materials disposed in Oregon, meeting the Oregon law ORS 459A.035 requirement for Oregon DEQ to conduct a waste composition study at least every 6 years.
- To determine how the composition of disposed solid waste has changed since previous studies.
- To inform programs and policies that address material disposal, recovery, production, and consumption.

This report includes the following:

- Tons of solid waste generated in Oregon by source and type of disposal facility.
- Estimated composition of municipal solid waste based on a field waste composition study, with contamination correction estimates and confidence intervals.

- Comparisons of the results of this study to seven previous studies conducted by DEQ since 1992 (1992, 1998, 2000, 2002, 2005, 2009, 2016/17), and by Metro in the greater Portland area in 1993/94, each conducted using similar methodology to the field composition portion of this study, to identify temporal trends.
- Comparisons of the composition of municipal wastes disposed to the composition of materials recovered in Oregon for recycling, composting, or energy recovery, based on the Oregon Material Recovery Survey conducted and published by DEQ.

Types of waste included in this study

This report touches briefly on all types of disposed solid waste that is generated in Oregon, but the composition study itself looked only at the municipal and construction/demolition wastes that are specified in ORS 459A.010 (3) to be included in determining the recovery rate of solid waste to meet state and local recovery goals set in ORS 459A.010. Wastes included are all municipal wastes and construction and demolition waste excluding whole loads of inert materials such as concrete rubble. Wastes included in the study are referred to throughout the study as “counting wastes”. The following wastes are generally not included:

- Sewage sludge or septic tank and cesspool pumpings
- Waste disposed at an industrial waste disposal site
- Industrial process waste and agriculture wastes such as crop residue or wastes from major food processing operations
- Petroleum-contaminated soil
- Asbestos
- Ash from an energy recovery facility
- Uncontaminated dirt, brick, concrete, old dried asphalt, or other materials that could be disposed or used as clean fill at a location that does not require a solid waste disposal permit, if delivered as a whole load
- Regulated hazardous waste
- Household hazardous waste collected at a household hazardous waste facility or collection event

Some of these wastes could be included if delivered mixed with municipal waste or if delivered to a facility that does not separately report these wastes. Transfer stations that receive some of these wastes may simply mix them with all other wastes, in which case the landfill eventually receiving them may not have any record or information to report them as an excluded waste.

Quantity of Waste Disposed

In 2023, Oregon’s households, businesses, and manufacturers generated and disposed of the following wastes:

- 3,494,966 tons of municipal and counting solid waste (the wastes that are the subject of this study), of which:
    - 3,323,355 tons were landfilled in Oregon landfills, including:

        - 3,202,475 tons in 11 fully-regulated Subtitle D landfills
        - 35,405 tons in 14 small dry rural landfills
        - 68,166 tons in 3 demolition landfills
        - 17,309 tons in 1 tire monofill
    - 98,398 tons were burned in the Marion County Energy Recovery Facility (the only waste to energy facility at the time in Oregon, which closed at the end of 2024)
    - 73,213 tons were exported to out-of-state landfills for disposal
- 790,824 tons of industrial and other wastes generated in Oregon and landfilled in municipal and demolition landfills and energy recovery facilities, including 1,107 tons burned in the Marion County Energy Recovery Facility and 1,625 tons exported to an out-of-state landfill. These tons included:
    - 632,995 tons of industrial waste
    - 114,961 tons of sewage and septage sludge (most sewage sludge generated in Oregon is managed through water quality rather than solid waste facilities)
    - 21,959 tons of asbestos-containing wastes
    - 14,913 tons of contaminated cleanup material, not including materials used for alternate daily cover
    - 5,996 tons of rubble, rock, and asphalt
- 333,961 tons of materials generated in Oregon that qualify to be used as alternate daily cover at landfills in Oregon. This is mostly petroleum-contaminated soil, but also includes other specific materials that have been approved for use as alternate daily cover.
- 59,276 tons of industrial wastes, disposed in 10 industrial-waste landfills.

The tonnages reported above are based on reports submitted to DEQ by permitted landfills, Oregon's only waste-to-energy facility, and waste exporters in Oregon. A limited amount of septage sludge spread on land under DEQ solid waste permits is included, but agricultural wastes, treated sewage sludge, and paper mill sludge applied to land for beneficial purposes are not included.

Figure 1. Final disposal location of municipal and counting construction and demolition waste generated in Oregon and disposed in 2023.

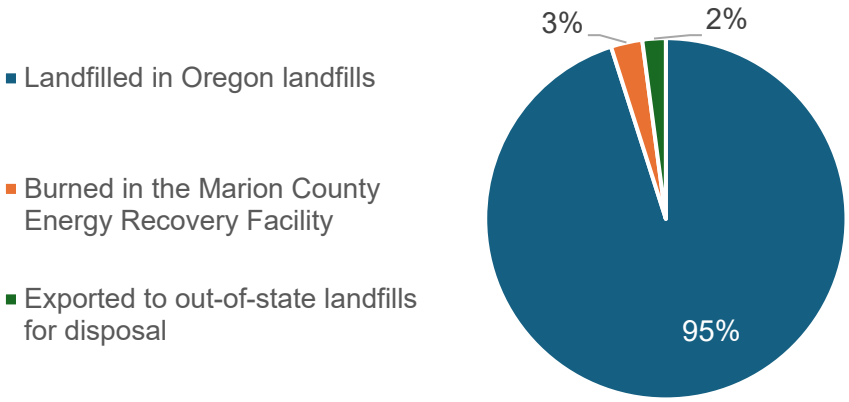


Figure 2 shows the quantity of Oregon-generated waste disposed in each of the four main categories above from 1993 through 2023. As shown below, the amount of waste disposed in municipal and construction/demolition landfills far exceeds the amount of waste disposed in industrial landfills. As of 2023, the amount of waste disposed in industrial landfills has decreased to only a fraction of what was disposed in earlier years. In particular, disposal of wood waste has hugely declined, partly due to less logging but also because companies found useful markets such as bark dust and compost for the materials that they used to landfill, or long before that, burn in wigwam burners.

Figure 2. Oregon-generated waste disposal 1993-2023

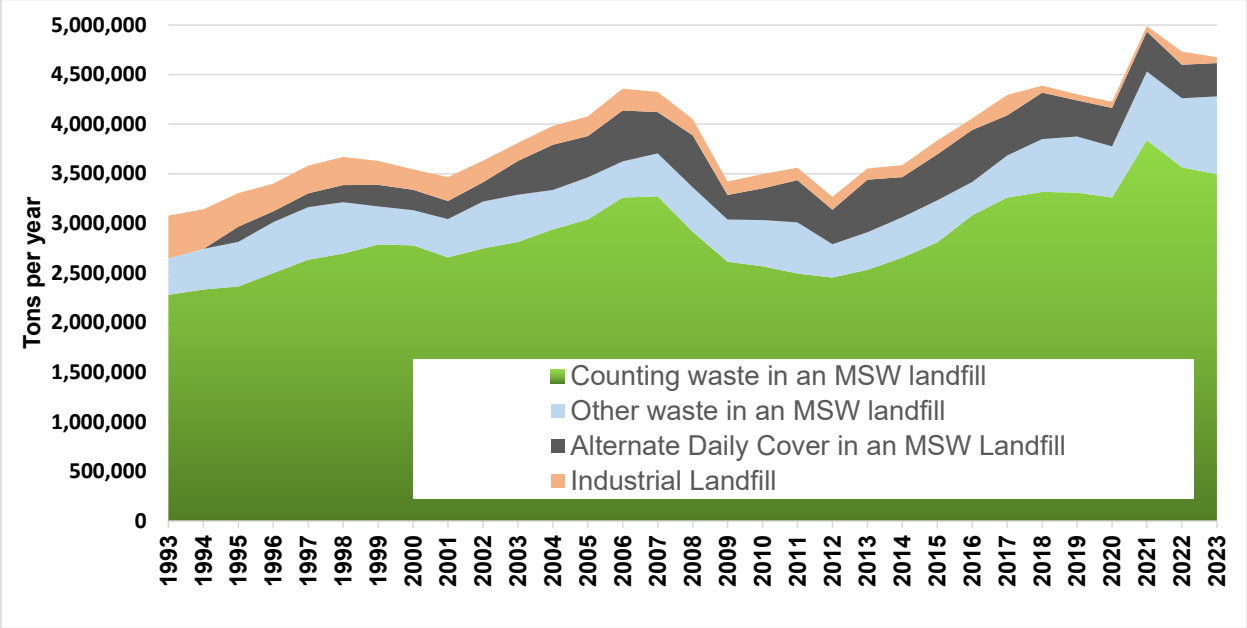


Table 1. Industrial Landfill Disposal 1995 vs 2023 by self-reported material type

Material	1995	2023
Wood	86,036	4,492
Paper and Pulp	71,108	10,923
Sawdust - Wet	2,836	0
Ash	36,787	25,315
CD - Construction/Demolition	6,707	22
Sludge/Wet Wastes - Industrial	60,037	11,624
Sludge	12,240	0
CCM - Contaminated Cleanup Material	437	0
ASB - Asbestos	1	0
Asphalt	13,841	6,174
Soils	39,562	101
Other (specify in comment)	8,485	624
total	338,075	59,276

Table 1 shows the tons of each type of waste reported as disposed by 39 operating industrial landfills in 1995, compared to just 10 reporting disposal in 2023.

Oregon exports relatively little solid waste out-of-state, but is a major importer of municipal solid waste as well as petroleum-contaminated soil that is used as alternate daily cover at the landfill. In 2023, Oregon imported 3,366,381 tons of solid waste but exported only 74,838 tons, as shown in Table 2. Imported wastes are not included in the Oregon waste composition studies.

Table 2. Imports and Exports of Solid Waste in 2023 (short tons)

	Oregon including exports	Oregon exports only	Out-Of-State Imports
MSW + Industrial Solid Wastes	4,248,918	74,838	2,848,611
Tires	34,610	0	45,797
Asbestos	21,959	0	7,114
Contaminated Cleanup Material	14,913	0	3,915
Alternative Daily Cover Qualified	333,961	0	460,944
Total	**4,654,361**	**74,838**	**3,366,381**

Methodology – Disposed Solid Waste Study

DEQ has been conducting similar disposed waste composition studies since 1992. All three 2023 studies were designed by DEQ using methodology similar to methodology used in those past studies with some tweaks to aspects such as the definition of material categories and some additional data gathering to provide more useful information for implementing the Recycling Modernization Act. Field work for the disposal site study was carried out by Sky Valley Associates with assistance from Cascadia Consulting as a subcontractor and Stina in identifying unmarked plastic resins.

Data for the waste composition study was derived from sampling and characterization of municipal solid waste carried out by Sky Valley Associates, reports submitted by permitted disposal sites, and transaction information from disposal sites and garbage haulers throughout the State. Sampling methodology was developed jointly by DEQ, Sky Valley Associates, and previous contractors. Analysis of waste composition and quantification data was carried out by DEQ. DEQ prepared this final report.

Disposed solid waste study design

For the 2023 Oregon Disposed Waste Composition Study, three counties (Marion, Lane, and Deschutes) plus Metro (the regional government of the greater Portland area) each took up DEQ's offer to provide waste composition results for their jurisdictions and pay for some additional samples if the local governments also paid for additional samples in order to meet a minimum of 150 samples. "Rest of Oregon" made up the fifth jurisdiction category of the study. DEQ conducted separate analysis of data in each of these five jurisdiction categories, and then compiled them all to produce the statewide composition

The study was conducted as follows:

- For each of the jurisdiction categories, DEQ developed a sampling plan to collect samples representative of all of the disposal in that jurisdiction.
- Within each geographic area, waste samples were selected from up to eight "waste substreams":
    - Residential route garbage trucks. At least 90% of the waste on the truck is from single-family or multifamily residences.
    - Commercial route garbage trucks. At least 90% of the waste on the truck is from businesses.
    - Mixed route garbage trucks. Contains a mixture of residential and commercial wastes. Frequently the residential waste in this substream is mainly from apartments or other multifamily residences, since apartments often have large garbage containers that are serviced by the commercial route trucks.
    - Compacting drop boxes. Commonly used by individual grocery stores, malls, or other retail operations.
    - Loose drop boxes. Commonly used for construction and demolition and for "yard-cleaning" activities.
    - Self-haul. Any wastes hauled directly to the transfer station or landfill by the person or business that generated the waste.
    - Mixed Solid Waste Processing Facility (MSWPF) residual wastes. These are the wastes left over for disposal after recoverable materials such as scrap metal, cardboard, and wood have been salvaged at the facility.
    - Special Purpose Landfills. The only special purpose landfill in Oregon that was analyzed separately was the Browns Island Landfill in Marion County. Samples were also collected at two other special purpose landfills (Delta Sand and Gravel in Lane County and the Klamath Falls Demolition Landfill), but there was an insufficient number of samples for these two landfills to warrant analyzing them separately so they were included with the self-haul wastes for analysis.
- The number of samples of each substream selected to be captured and sorted depends on 3 factors:
    - The tons of waste disposed in that substream per year.
    - The variability of waste in that substream. The more variable the samples, the more samples would be required to increase the overall precision of the jurisdiction’s composition results. Route trucks had relatively little variability between samples as each sample contained wastes from multiple households or businesses, averaging things out. In contrast, self-haul loads and loose drop box loads came from individual households or businesses, and were highly variable. Loads might be picked that were almost all wood or carpet or old furniture or mixed remodeling debris.
    - The expense of sorting each type of sample. Route truck loads and samples of residue from mixed solid waste processing facilities were time-consuming to sort and thus more expensive than loads from self-haul vehicles and loose drop boxes, so

more samples of self-haul and drop box waste could be sorted for the same amount of money, increasing the overall precision of the jurisdictions composition results.

Samples of waste averaged 200 pounds or more. A crew of four to six from Sky Valley Associates and Cascadia Consulting would collect and sort the designated samples into the 152 material categories listed in Appendix A, record the weight of each sample, and provide those data to DEQ. Overall, 987 samples were collected as a regular part of the study, plus 50 additional transfer station samples requested and paid for by Marion County, plus five additional samples as part of a special project with Washington County that was not part of the overall study. Samples were collected from 55 facilities statewide, including transfer stations, landfills, mixed solid waste processing facilities, and a waste-to-energy facility. Sampling was done eight times throughout the year in the Metro area, and quarterly in the other four jurisdictions.

The disposed waste composition study is made up of separate composition results for 66 separate substream/jurisdiction/season combinations of waste shown in Table 3, where each substream is designated by three factors:

- Load source
- Season (Cold = October to March, Warm = April to September)
- Jurisdiction

Table 3. Number of samples sorted for each substream of waste

Load source	Season	Metro	Marion	Lane	Deschutes	Rest	Total
Residential route truck	Cold	30	15	10	11	14	80
Residential route truck	Warm	36	12	7	14	18	87
Mixed route truck	Cold	20	6	6	4	5	41
Mixed route truck	Warm	18	6	8	3	3	38
Commercial route truck	Cold	15	3	3	6	3	30
Commercial route truck	Warm	12	5	4	6	5	32
Compacting dropbox	Cold	25	4	4	3	5	41
Compacting dropbox	Warm	24	5	3	3	7	42
Loose dropbox	Cold	24	7	10	11	14	66
Loose dropbox	Warm	26	5	11	11	20	73
Self-haul	Cold	34	0	35	33	34	136
Self-haul	Warm	43	0	38	46	48	175
Mixed waste processing facility	Cold	26	27	5	n/a	0	58
Mixed waste processing facility	Warm	27	34	6	n/a	0	67
Special purpose landfill	Cold	n/a	8	0*	n/a	0*	8
Special purpose landfill	Warm	n/a	13	0*	n/a	0*	13
Transfer station **	Cold	n/a	24	n/a	n/a	n/a	24
Transfer station **	Warm	n/a	26	n/a	n/a	n/a	26
Total	**Both**	**360**	**200**	**150**	**151**	**176**	**1037**

*Samples for special purpose landfills in Lane and Klamath County were combined with self-haul samples

** The transfer station samples for Marion County were done at Marion County's request and represent self-haul waste taken to the two transfer stations operated by Marion County. They

were not included in the study except as a proxy for Marion County self-haul waste going directly to the Coffin Butte landfill. The reason they were not included in the study is that all transfer station loads are taken to the Marion Resource Recovery facility, where recyclable material such as metals and cardboard are removed and recycled, and the rest sent off to landfill. We collected samples directly from the sorted residue to be shipped off to landfill so we would not count recyclables as being disposed that were actually subsequently recovered.

DEQ used the data provided by Sky Valley to calculate the composition of each of the separate substreams. Multiplying the percentage composition for each substream by the total tons disposed in that substream gives the tons of each of the 152 material categories disposed in that substream. Adding these tons together for all the substreams in a jurisdiction then gives the total composition for that jurisdiction, and adding the tons for each jurisdiction together gives the total composition for the state of Oregon as a whole. Appendix B: Tons disposed for each jurisdiction/substream/season gives DEQ's estimates of the tonnage of each of the substreams in each jurisdiction. More details on the study methodology are included in Appendix C: Methodology.

Contamination Corrections

Materials as sorted and measured in the field at transfer stations and landfills are often highly contaminated. Frequently, food waste and other wet or sticky materials adhere to or have become absorbed in other wastes, and rain water might also have soaked into the waste. This cross-contamination of material often takes place after the material has been discarded – in open dumpsters or when the wastes are compacted together in compacting garbage trucks or drop boxes. As such, the field sample data may not give a good picture of how much material is being disposed of that, if kept clean and dry, could have been recycled. Contamination is especially present in absorbent materials such as paper towels and cardboard and in thin, light materials such as aluminum foil and film plastic. In some cases, these materials can lose an average of as much as 50% when cleaned and dried. On the other hand, materials such as food waste could actually increase based on adding back to the food waste category the food residue scraped out of containers or adhering to other materials.

In DEQ's six past studies since 1998, DEQ has conducted separate contamination analysis to come up with estimates of how much of each material was disposed if clean and dry, as opposed to the "dirty, wet" weight of materials as measured in the field. This involved randomly selecting about 40 of the field-sorted samples and having the crew bag up each sorted material after the sort was done. The bags were then taken back to a facility where the sample material could be gone through in detail, contaminants separated out and weighed, adhering residue washed off, and then air-dried. Naturally wet materials such as food waste and yard debris had contaminants removed and weighed, but were not air-dried since they are naturally wet. For rigid plastic containers (and for all rigid plastics (in 2016), as many as 148 field samples were selected for contamination analysis so we could additionally obtain information on the separate plastic resins being disposed.

When processing the contamination analysis samples, some of the contaminants cannot be directly weighed, including:

- Water from rain or from wet materials such as food waste that had been absorbed into materials but then evaporated on air-drying, and
- Residue of materials that were washed out of containers or bags as part of the cleaning after other contaminants had been scraped off and weighed.

This created a new material category called “water and residue” in the contamination-corrected data, which was the difference between the sum of the “clean, dry” weights of materials and the original sample as sorted in the field. Much of this may have come from food waste or rainwater, but how much came from each source is unknown.

The contamination analysis sample procedure is expensive, and so for the 2023 study DEQ made a decision to only do contamination analysis and resin identification for the rigid plastics in 180 of the field samples, and would instead use the contamination correction analysis from past studies to estimate the “clean, dry” weight of each material dispose. Contamination analysis data were used from the 2000, 2002, 2005, 2009, and 2016 studies to come up with the contamination correction factors for all other materials besides rigid plastics. For rigid plastics, DEQ combined data from the current 2023 study with data from the previous studies to calculate the correction factors. When combining the contamination data from the various previous studies, the data from each year was weighted by 3 factors:

- How recent the study was. Factors for the 2016 study were weighted more heavily than earlier studies going back to 2000.
- How many of the contamination analysis samples that material appeared in for that year. Of the 40 samples subject to contamination analysis each year, some individual materials might have only appeared in a few samples.
- How similar the material category was in past studies compared to the current study. Some category definitions have shifted over the years, or materials that in the past were lumped together in one material category may have been split into multiple categories in later years. DEQ provided subjective weighting factors depending on if a category definition remained the same in all studies or was modified in some way in later studies.

As an example, calculating the correction factor for rigid plastic containers used data from all studies from 2000 to the present weighted as follows:

- 31.3% from 2023 study data
- 22.4% from 2016 study data
- 15.9% from 2009 study data
- 12.7% from 2005 study data
- 9.8% from 2002 study data
- 8.0% from 2000 study data.

A full description of the methodology for analyzing the data and determining contamination correction factors is found in Appendix C of the Oregon Solid Waste Characterization and Composition Study of 2002.

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. Based on standard statistical methods, the size of sampling errors can be estimated, and this was done for disposed solid waste. Most tables in this study show the 90% confidence interval for each material based on the sorting results and random sampling error. Besides normal sampling error, however, there are other potential sources of error, including the following:

1. Self-sorting of material in sample piles, where small heavy items like glass tend to drift down to the bottom of a pile and light materials like plastic bottles tend to float to the top, may have led to samples not representing the full composition of the pile. If the facility operator scooped up a sample from the middle of the pile, that scoop might miss much of the glass which had sunk to the bottom of the pile. Also, as the vehicle is crossing the facility with the samples over to where the sorters are, the glass continues to sift down in the scoop. If only part of the scoop is needed for the sample, the glass might remain in the bottom of the scoop and not end up in the sample.
2. Sorting into incorrect/inconsistent categories. A crew of five often would often have as many as 12-14 samples to sort in a day, split between disposal site samples and inbound recycling samples. This requires each sorter to sort very fast, spending little time on each item. Occasionally an item they are sorting could be dropped or blown into the wrong sorting container. Also, fast judgement is required when sorting quickly, and sometimes it is not quickly obvious which category an item should be sorted into.

Results

As of the date of this publication, full results of 2023 disposal composition are published on the Oregon waste composition webpage in a series of seven Excel files giving results for each of the following jurisdictions or set of jurisdictions:

- Statewide results 2023
- Metro Tri-County area 2023
- Marion County 2023
- Lane County 2023
- Deschutes County 2023
- All of Oregon except the Metro area and Marion, Lane, and Deschutes Counties 2023
- All of Oregon except the Metro area 2023

Each file has an explanation tab discussing the structure of the file, followed by tabs containing:

- The composition for the jurisdiction or jurisdictions as a whole.
- The composition of each separate substream.

- The cold season and warn season compositions combining the substream samples for each season.

When looking at the substream data, bear in mind that some substreams may have relatively few samples, resulting in fairly broad confidence intervals.

Except for the counties or Metro area that participated, DEQ did not have sufficient samples to make it worthwhile to provide separate analysis. Those counties could use either the statewide results, the downstate (all but Metro) results, or the “Rest of Oregon” results, depending on which you feel would closest represent the solid waste disposal in your jurisdiction, bearing in mind that the statewide results have the most samples and thus the highest precision, but the Metro area garbage generation may be different from the generation of garbage in your jurisdiction.

For persons wishing to compare Oregon’s results to composition results in another state or country, DEQ recommends using the field results rather than the contamination-corrected results, as few if any studies in other jurisdictions have attempted to provide contamination corrections.

In addition to the results just from this study, these results can be combined with data from Oregon’s material recovery survey conducted annually since 1992 and from past Oregon waste composition studies to demonstrate how the generation and material recovery tonnages have changed over time. Some factors to consider in doing so include:

- Although the material recovery survey is done annually, the waste composition studies were conducted only every two to three years through 2005 and less frequently since then. The disposal tonnages in the graphs are interpolated, which smooths out changes that happened in specific years, such as when China discontinued importing most recyclable materials in 2018, leading to a sharp uptick in disposal of some recyclables in Oregon that year.
- There are certain municipal wastes generated that are not captured in either the annual material recovery survey or in waste composition studies. Some of these include:
    - Material that is littered and not picked up.
    - Material that is home composted.
    - Material such as food waste which is sent down the sewer or into a septic system by way of a sink grinder.
    - Material burned in burn barrels or fireplaces. Earlier work by DEQ showed that this might be significant in the most rural parts of the state.
- In late 2020, a series of devastating wildfires resulted in approximately 400,000 extra tons of disaster debris disposed mainly in 2021. It would not be appropriate to apply the waste composition results of our studies to the fire debris, and so the graphs and tables below exclude the fire debris from disposal, considering it to be a one-time event.
- The waste composition study provides much more detail regarding material categories than is true for the material recovery survey. For example, the waste composition study separates out 17 different material categories for paper, whereas the material recovery survey only has two categories, which are:
    - Corrugated cardboard

- All other paper fiber

Results: Paper

Table 4 gives the overall composition of different types of paper in Oregon's disposed solid waste stream in 2023, both as percentages of the total waste stream and with the estimated total tons of paper disposed that year.

Table 4.Statewide Composition of Paper Categories, with 90% sampling confidence intervals

Material	Field Results	Contamination Corrected	Clean, Dry Tons
TOTAL PAPER	**14.49% (13.84–15.19%)**	**11.23% (10.09–12.40%)**	**403,221 (362,042–444,945)**
Printing, Packaging, and FSW Paper Total	**10.59% (10.03–11.18%)**	**8.79% (7.80–9.75%)**	**315,373 (280,015–349,908)**
Packaging and FSW Paper	**8.32% (7.86–8.77%)**	**6.76% (5.89–7.59%)**	**242,784 (211,588–272,348)**
Cardboard/brown bags	4.39% (4.05–4.74%)	3.60% (2.98–4.17%)	129,396 (107,140–149,740)
Low-grade packaging+fsw paper	1.73% (1.59–1.86%)	1.35% (1.13–1.57%)	48,287 (40,494–56,352)
Polycoats +bleached drink boxes	**1.20% (1.11–1.28%)**	**0.94% (0.76–1.16%)**	**33,563 (27,362–41,637)**
Milk cartons/Drink boxes	**0.12% (0.11–0.14%)**	**0.10% (0.08–0.14%)**	**3,524 (2,786–4,933)**
Gable Top Beverage	0.07% (0.05–0.08%)	0.05% (0.04–0.06%)	1,763 (1,439–2,281)
Aseptic Drinks	0.06% (0.05–0.06%)	0.05% (0.03–0.09%)	1,761 (1,122–3,057)
Polycoat-freezer-cups-plates	1.08% (1.00–1.15%)	0.84% (0.67–1.05%)	30,038 (24,183–37,523)
Nonrecyclable Packaging Paper	**1.00% (0.82–1.21%)**	**0.88% (0.68–1.11%)**	**31,539 (24,454–39,986)**
Compost. paper pkg, pwp, fsw	0.06% (0.05–0.07%)	0.05% (0.04–0.07%)	1,938 (1,578–2,344)
Waxed corrugated cardboard	0.17% (0.12–0.24%)	0.14% (0.07–0.24%)	4,993 (2,618–8,692)
Noncompost. Nonrecyc. Paper pkg, pwp, fsw	0.77% (0.59–0.96%)	0.69% (0.52–0.89%)	24,607 (18,555–32,019)
Printing and Writing Paper	**2.28% (1.99–2.59%)**	**2.02% (1.72–2.35%)**	**72,589 (61,721–84,351)**
Hi-grade paper	0.38% (0.29–0.49%)	0.38% (0.29–0.49%)	13,776 (10,281–17,442)
Shredded paper	0.14% (0.09–0.20%)	0.12% (0.07–0.17%)	4,251 (2,561–6,152)
Newspaper	0.16% (0.12–0.21%)	0.13% (0.09–0.17%)	4,709 (3,314–6,262)

Material	Field Results	Contamination Corrected	Clean, Dry Tons
Magazines	0.31% (0.22–0.43%)	0.29% (0.19–0.43%)	10,551 (6,658–15,388)
Low-grade recyclable writing paper	1.16% (1.02–1.32%)	0.98% (0.81–1.18%)	35,012 (29,221–42,374)
Hardcover books	0.11% (0.06–0.17%)	0.12% (0.06–0.19%)	4,289 (2,187–6,974)
Paper Products	**3.89% (3.55–4.28%)**	**2.45% (2.09–2.86%)**	**87,848 (75,182–102,799)**
Low-grade recyclable paper products	0.27% (0.17–0.39%)	0.21% (0.13–0.32%)	7,585 (4,693–11,345)
Compostable paper product	2.95% (2.74–3.15%)	1.63% (1.43–1.83%)	58,618 (51,436–65,834)
Noncompost. Nonrecyclable. paper products	0.68% (0.41–1.02%)	0.60% (0.36–0.93%)	21,645 (12,849–33,508)
Low-grade paper combined	*3.53% (3.27–3.82%)*	*2.87% (2.52–3.25%)*	*102,948 (90,395–116,666)*
Non-recyclable paper combined	*5.70% (5.33–6.13%)*	*3.95% (3.47–4.55%)*	*141,840 (124,441–163,160)*
All recyclable paper	*8.79% (8.25–9.34%)*	*7.28% (6.40–8.12%)*	*261,381 (229,888–291,612)*
FSW = Food Serviceware PKG = Packaging PWP = Printing and Writing Paper			

Combining data from the annual material recovery survey and the nine waste composition studies since 1993 shows how the generation rate and recovery rate of paper has changed over the last 30 years. Because in the last two decades most grades of paper other than cardboard have been recycled commingled, recovery rate and generation data are only available for paper as a whole (Figure 3), cardboard (Figure 4) and all other recyclable paper (Figure 5). These figures show recovery and disposal per person per year rather than in absolute tons.

Figure 3. Recyclable paper recovery and disposal per capita 1993-2023

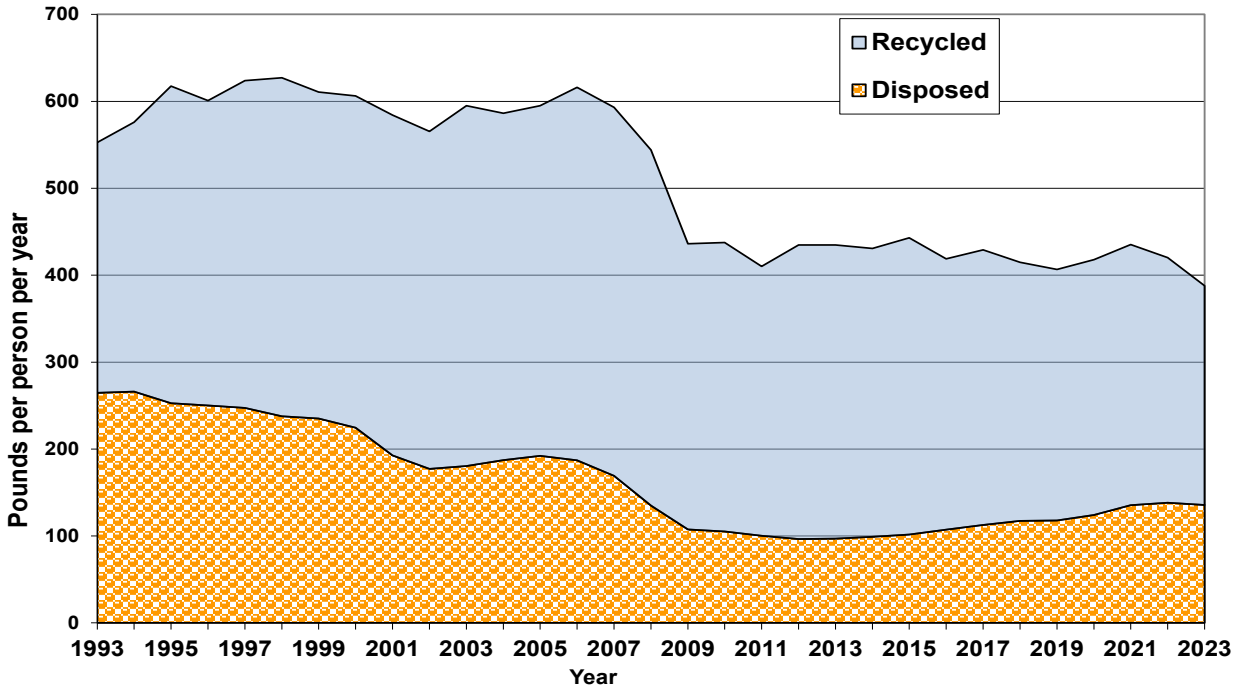


Figure 4. Cardboard Recovery and Disposal Per Capita 1993-2023

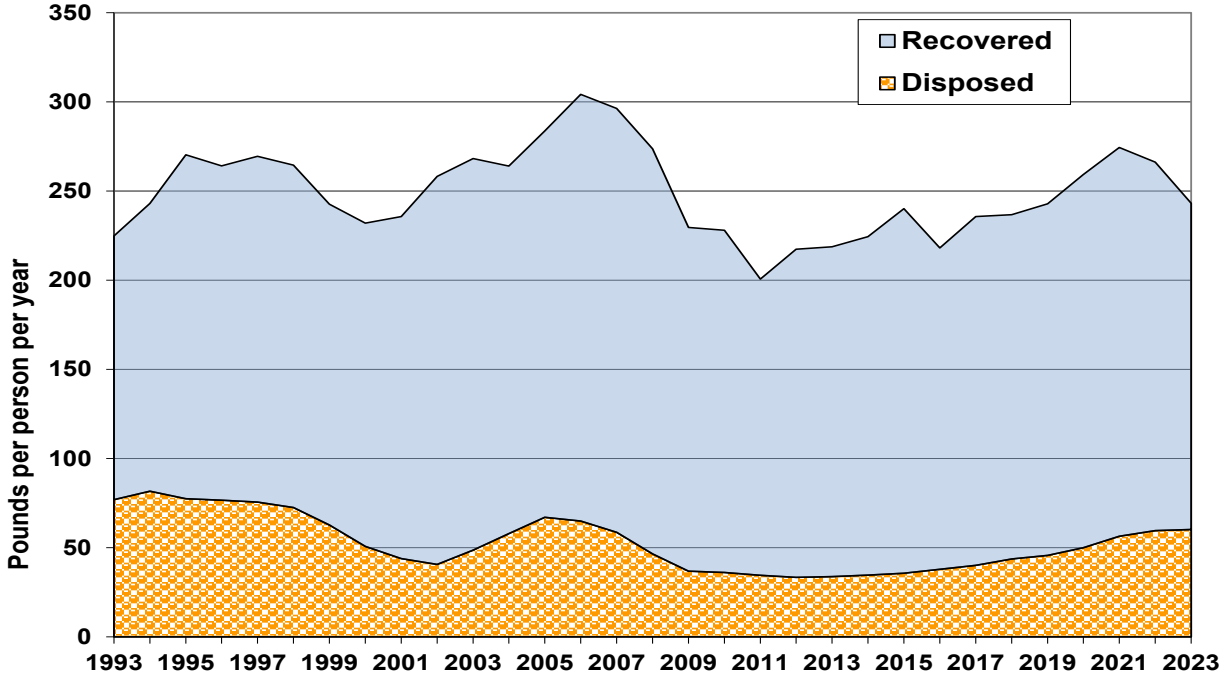


Figure 5. Other Recyclable Paper (excluding cardboard) Recovery and Disposal Per Capita

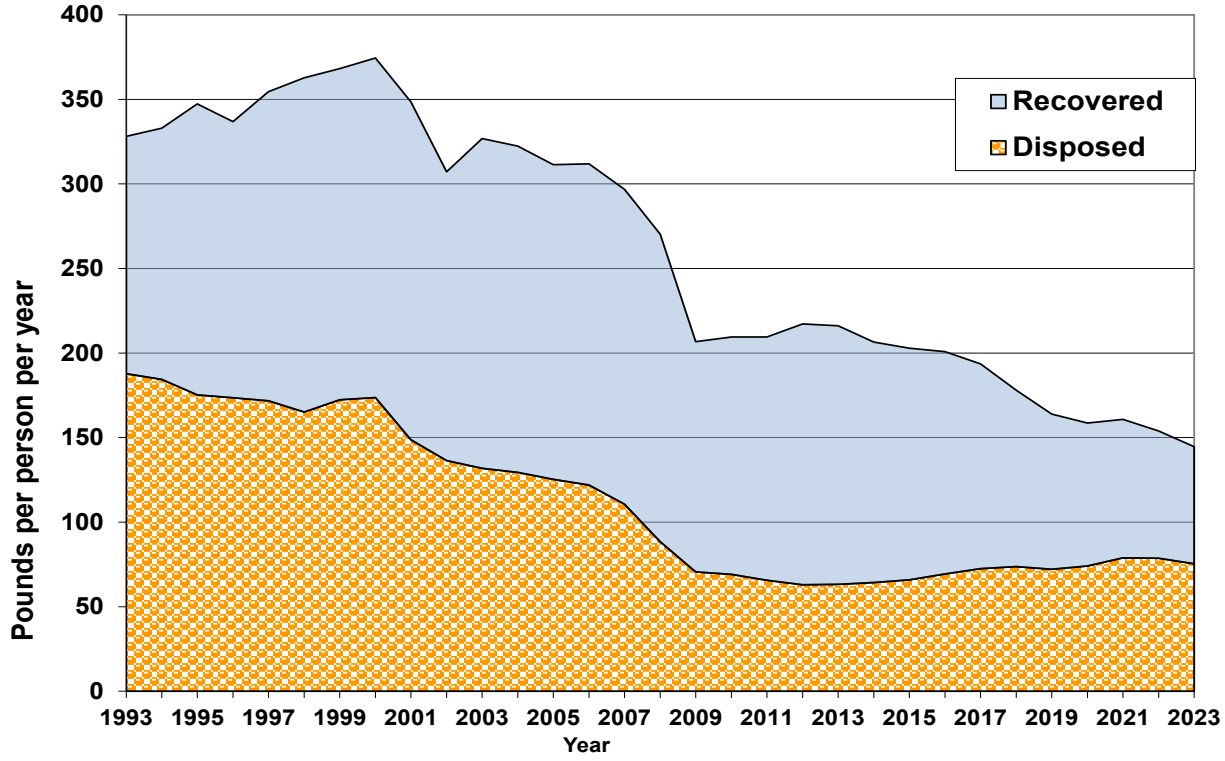


Figure 6. Recovery rates of cardboard and other recyclable paper: 1993-2023

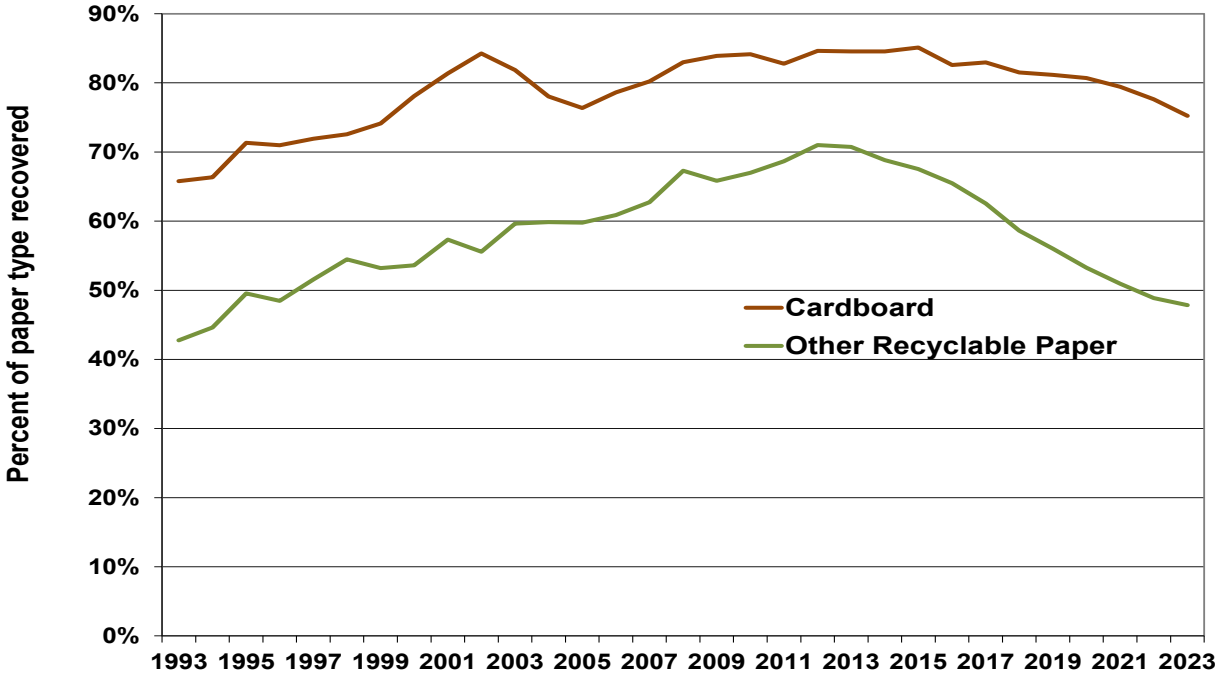


Figure 4 shows that over the long term, the generation of cardboard has not changed much, but there have been bigger shifts on a short-term basis. Cardboard generation dipped around the year 2000, climbed to a peak around 2007, and then fell sharply over the next few years, before climbing again starting about 2013. These changes correlate well with economic changes, as Oregon's economy was depressed at the beginning of the century and then had a major recession starting about 2008. The recycling rate for cardboard rose steadily from 1993 through about 2002 and then leveled off but has dipped in recent years.

Figure 5, on the other hand, shows a huge drop in other paper grades combined. The big drop around 2009 was probably driven by two factors:

- The impact of the 2008 recession, which would have reduced the generation of packaging paper as it did for cardboard, and
- A steep decline in the generation of printing and writing paper, as people and businesses moved more into electronic media and communication.

Newspapers, which once were thick with advertising, have been getting thinner and thinner over the last two decades. Oregon's largest newspaper, *The Oregonian*, dropped home delivery of papers from 7 days a week to 4 days a week in 2013, and in 2024 ceased producing newsstand versions of the Oregonian on Mondays, Tuesdays, and Thursdays as well, although it still publishes daily with an online version. Oregon's two large newspaper recycling mills also closed, with the Blue Heron mill closing in 2011 and the Smurfit mill in Newberg closing in 2015.

Similar to cardboard, the recycling rate for all other grades of paper combined rose steadily in the early ears of the material recovery survey but kept on rising until it peaked in 2012. Since then, the recycling rate for these other grades of paper combined has been declining steadily.

Although we do not have recovery or generation rates for individual grades of paper except cardboard, we do have disposal information for certain grades of paper that have been consistently defined since 1993. Table 5 shows that newspaper has almost completely disappeared from the waste stream, and magazines and office paper are also greatly reduced from where they were three decades ago, but cardboard has remained high, going up and down with the changes in the economy as discussed above.

Table 5. Per capita disposal of select grades of paper in pounds per person per year: 1993 to 2023 composition studies

Year	Newspaper	Magazines	Hi-Grade Paper	Cardboard
1993	36.8	31.3	38.1	77.0
1995	32.5	22.6	28.6	77.5
1998	29.1	19.8	24.2	72.5
2000	38.9	23.6	27.9	50.8
2002	25.2	19.3	25.8	40.7
2005	24.3	13.1	20.5	67.0
2009	9.8	7.9	11.9	36.9
2016	6.2	8.3	14.0	38.0
2023	2.2	4.9	8.4	60.2

Plastic

Plastics discussed here include the items that most people think of when they think of plastics (like packaging, rigid products, and film), but does not include the following plastics that are in different product categories:

- Textiles
- Computers and other electronics
- Items that most people think of as rubber, such as tires
- Mattresses and futons, although polyurethane foam used in furniture cushions is included here
- Paint and similar coatings
- Glues and adhesives

Table 6 gives the overall composition of different types of plastic in Oregon's disposed solid waste stream in 2023, both as percentages of the total wastestream and with the estimated total tons of plastic disposed that year.

Table 6. Composition of plastics disposal in Oregon 2023, with 90% sampling confidence intervals.

Material	Field Results	Contamination Corrected	Clean Tons
TOTAL PLASTIC	**13.04% (12.43–13.70%)**	**10.67% (9.91–11.45%)**	**382,959 (355,732–410,916)**
Rigid Plastic Packaging and FSW	**3.13% (2.96–3.32%)**	**2.65% (2.47–2.84%)**	**95,082 (88,694–101,907)**
Rigid Plastic Containers (RPCs)	**2.03% (1.91–2.17%)**	**1.58% (1.45–1.72%)**	**56,884 (52,080–61,580)**
All Plastic Deposit Bottles	**0.14% (0.12–0.15%)**	**0.11% (0.09–0.12%)**	**3,881 (3,367–4,400)**
Plastic deposit beer/soft drink	0.03% (0.02–0.03%)	0.02% (0.02–0.03%)	830 (697–962)
Plastic deposit water	0.06% (0.05–0.06%)	0.04% (0.04–0.05%)	1,600 (1,380–1,849)
All other plastic deposit beverage	0.05% (0.04–0.06%)	0.04% (0.03–0.05%)	1,451 (1,193–1,751)
No-deposit plastic beverage bottles	0.15% (0.13–0.17%)	0.12% (0.10–0.14%)	4,285 (3,680–4,976)
Other plastic bottles 8 oz to 5 gallons	0.41% (0.37–0.45%)	0.33% (0.29–0.37%)	11,793 (10,338–13,418)
>2-5 Gal. Buckets/flower pots	0.31% (0.24–0.39%)	0.24% (0.18–0.31%)	8,681 (6,415–11,008)
Curb-OK plastic tubs, pails 8 oz to 2 gal	0.08% (0.07–0.09%)	0.06% (0.05–0.07%)	2,240 (1,909–2,589)

Material	Field Results	Contamination Corrected	Clean Tons
Not curb-OK plastic tubs, pails 8 oz to 2 gal	0.94% (0.88–1.00%)	0.72% (0.66–0.79%)	26,004 (23,692–28,383)
Other Rigid Plastic Packaging, FSW	**1.10% (1.00–1.22%)**	**1.06% (0.95–1.20%)**	**38,198 (34,101–43,170)**
Very large plastic bev. bottles > 5 gal	0.00% (0.00–0.00%)	0.00% (0.00–0.00%)	24 (0–69)
Very small plastic bev. bottles 6 oz to < 8 oz	0.01% (0.00–0.01%)	0.01% (0.00–0.01%)	188 (142–245)
Small tubs 6+oz but <8 oz	0.02% (0.01–0.02%)	0.02% (0.01–0.02%)	584 (451–750)
Bulky rigid plastic packaging	0.18% (0.11–0.28%)	0.17% (0.10–0.26%)	6,218 (3,498–9,168)
Block foam packaging	0.30% (0.26–0.34%)	0.29% (0.26–0.36%)	10,580 (9,164–12,786)
Other rigid plastic packaging	0.47% (0.42–0.53%)	0.45% (0.38–0.53%)	16,246 (13,656–19,189)
Rigid plastic FSW excl RPC, cups	0.12% (0.11–0.13%)	0.12% (0.10–0.14%)	4,133 (3,438–4,916)
Rigid mixed plastic/matl PKG+FSW	0.01% (0.00–0.01%)	0.01% (0.00–0.01%)	225 (106–361)
Rigid Plastic Products Excluding FSW	**4.51% (4.02–5.04%)**	**4.42% (3.85–5.05%)**	**158,494 (138,213–181,117)**
Bulky rigid plastic products	1.61% (1.24–2.03%)	1.51% (1.13–1.92%)	54,090 (40,668–68,854)
Other rigid plastic products not FSW	1.47% (1.28–1.69%)	1.45% (1.24–1.73%)	52,009 (44,494–62,054)
Mixed Plastic/Materials rigid products	1.43% (1.20–1.65%)	1.46% (1.14–1.80%)	52,395 (40,974–64,445)
Plastic Film	**5.40% (5.08–5.73%)**	**3.60% (3.09–4.16%)**	**129,383 (110,762–149,152)**
Plastic film packaging and FSW	**4.60% (4.32–4.91%)**	**3.09% (2.62–3.60%)**	**111,014 (93,912–129,295)**
Plastic grocery/merchandise bags	0.16% (0.15–0.18%)	0.12% (0.07–0.17%)	4,154 (2,471–6,123)
Plastic other recyc. polyethylene film PKG+FSW	1.33% (1.16–1.52%)	1.15% (0.85–1.45%)	41,262 (30,587–52,088)
Plastic beverage pouches	0.01% (0.01–0.02%)	0.01% (0.01–0.01%)	257 (184–351)
Garbage bags	1.16% (1.09–1.23%)	0.63% (0.49–0.80%)	22,504 (17,593–28,726)
Plastic other nonrecyclable film PKG+FSW	1.94% (1.79–2.10%)	1.19% (1.05–1.37%)	42,836 (37,538–49,044)

Material	Field Results	Contamination Corrected	Clean Tons
Plastic Film Products	**0.80% (0.66–0.97%)**	**0.51% (0.42–0.64%)**	**18,369 (14,923–22,855)**
Plastic recyclable polyethylene film products	0.08% (0.04–0.12%)	0.07% (0.04–0.11%)	2,507 (1,258–4,076)
Plastic film- other nonrecyc. film products	0.72% (0.59–0.88%)	0.44% (0.35–0.55%)	15,862 (12,509–19,857)
Recyclable polyethlene film	*1.57% (1.40–1.77%)*	*1.34% (0.98–1.70%)*	*47,923 (35,235–60,890)*
Nonrecyclable plastic film	*3.84% (3.61–4.07%)*	*2.27% (2.04–2.57%)*	*81,460 (73,064–92,385)*
Plastic beverage containers	*0.29% (0.26–0.32%)*	*0.23% (0.20–0.26%)*	*8,377 (7,320–9,450)*
All recyclable plastic	*2.68% (2.47–2.91%)*	*2.22% (1.86–2.59%)*	*79,598 (66,623–92,970)*
All curbside plastic bottles	*0.70% (0.64–0.77%)*	*0.56% (0.50–0.63%)*	*20,146 (17,860–22,584)*
All curbside plastic tubs	*0.41% (0.33–0.49%)*	*0.32% (0.26–0.39%)*	*11,505 (9,256–13,922)*
Plastic acceptable at the curb	*1.11% (1.02–1.22%)*	*0.88% (0.79–0.97%)*	*31,651 (28,211–34,917)*
Plastic Packaging and FSW	*7.74% (7.36–8.12%)*	*5.74% (5.23–6.31%)*	*206,095 (187,828–226,629)*
Plastic Products excluding FSW	*5.31% (4.78–5.87%)*	*4.93% (4.35–5.56%)*	*176,863 (156,185–199,757)*

Changes in Plastics Disposal, Recovery, and Generation Over Time

Figure 7 through Figure 11 show the per capita recovery and disposal of all plastic, rigid plastic containers, other rigid plastic, and film plastic and then the recycling rate for each type and all types of plastic combined. The recovery data are based on Oregon's annual Material Recovery Survey, which has only 4 categories for different types of plastics:

- Rigid plastic containers, as defined in Oregon Revised Statutes 459A.650
- Other rigid plastic
- Polyurethane foam
- Film plastic

In Figure 9 and Figure 11, polyurethane foam is included in with "other rigid plastic" and polyurethane foam carpet pad is also included in both the disposal and recovery tonnage.

Because there is so much interest and activity regarding plastics disposal and recovery, following Figure 11 is extensive discussion about how different legislation, programs, and other

factors have affected the recovery and disposal of plastics as shown in Figure 7 through Figure 11.

Figure 7. All plastic recovery and disposal per capita 1993 - 2023

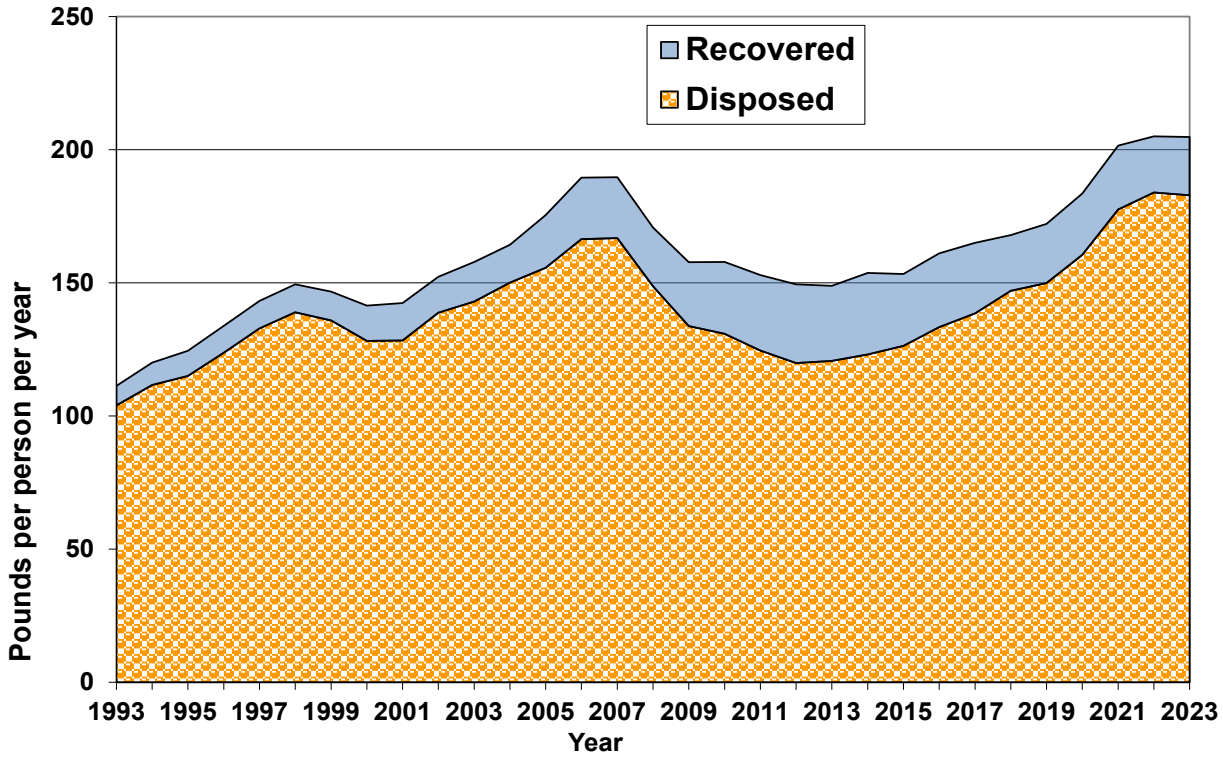


Figure 8. Rigid plastic container per capita recovery and disposal 1993 to 2023

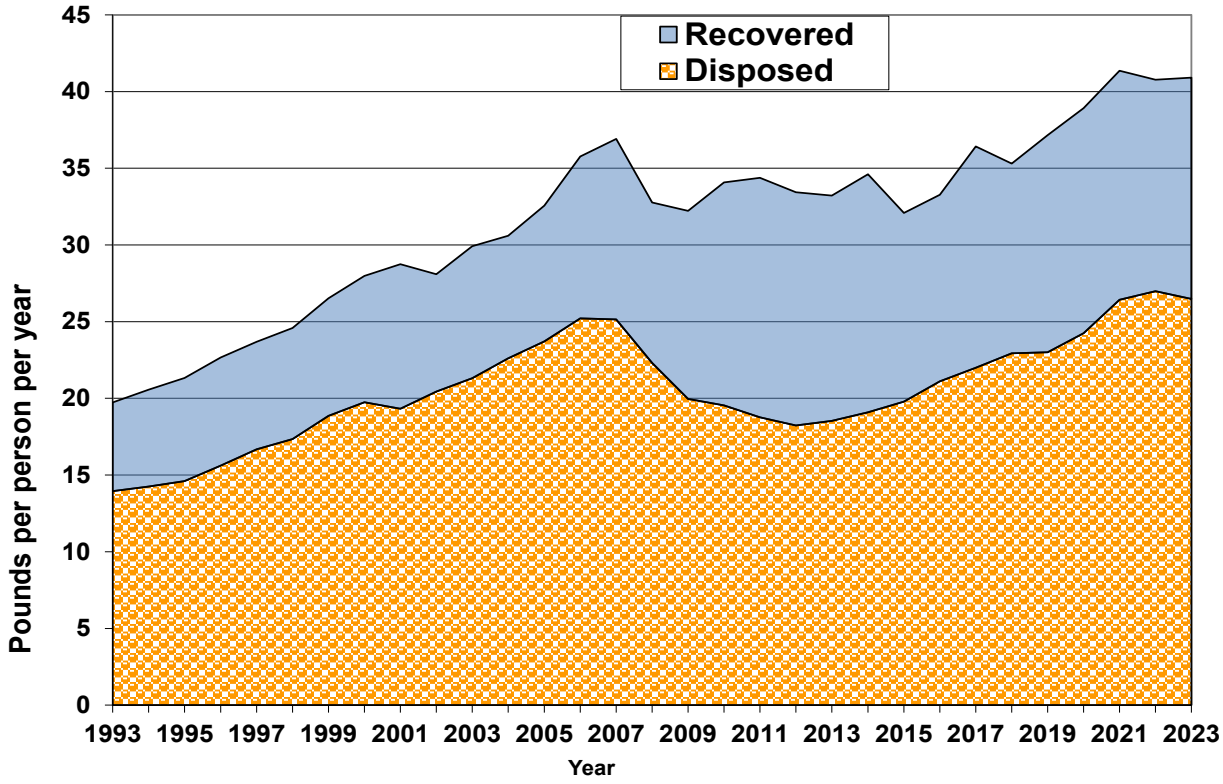


Figure 9. Other rigid plastic per capita recovery and disposal 1993-2023

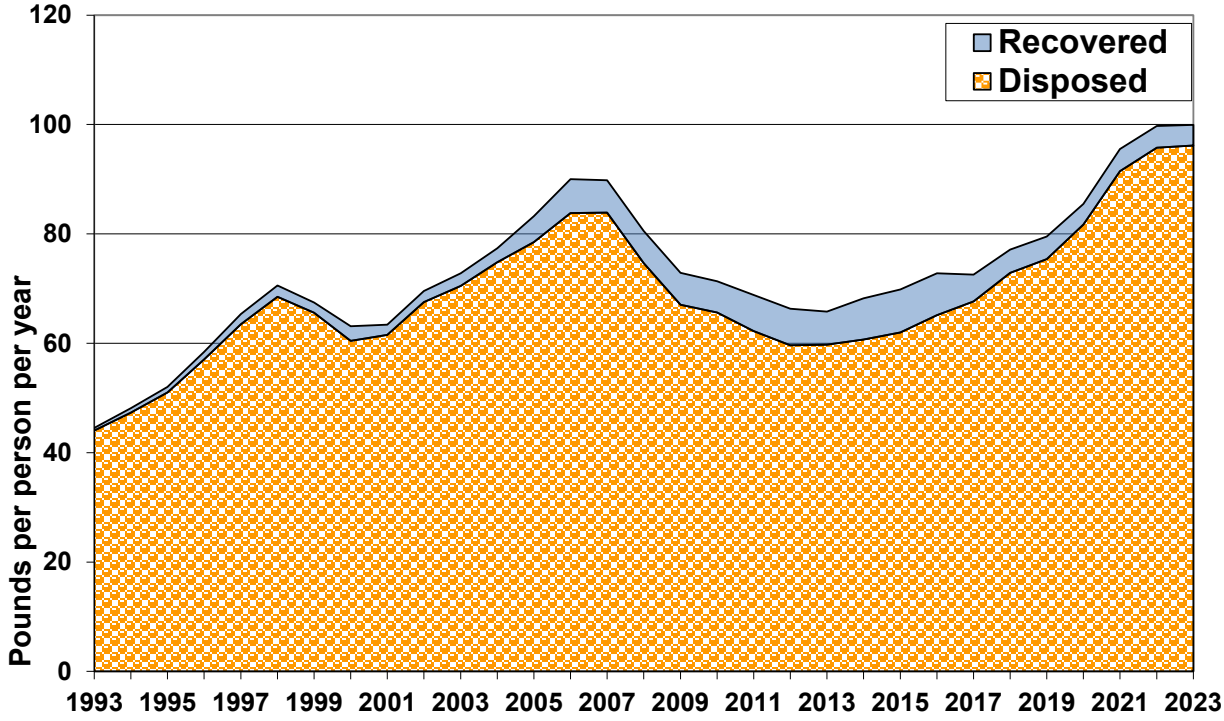


Figure 10. Film plastic per capita recovery and disposal 1993-2023

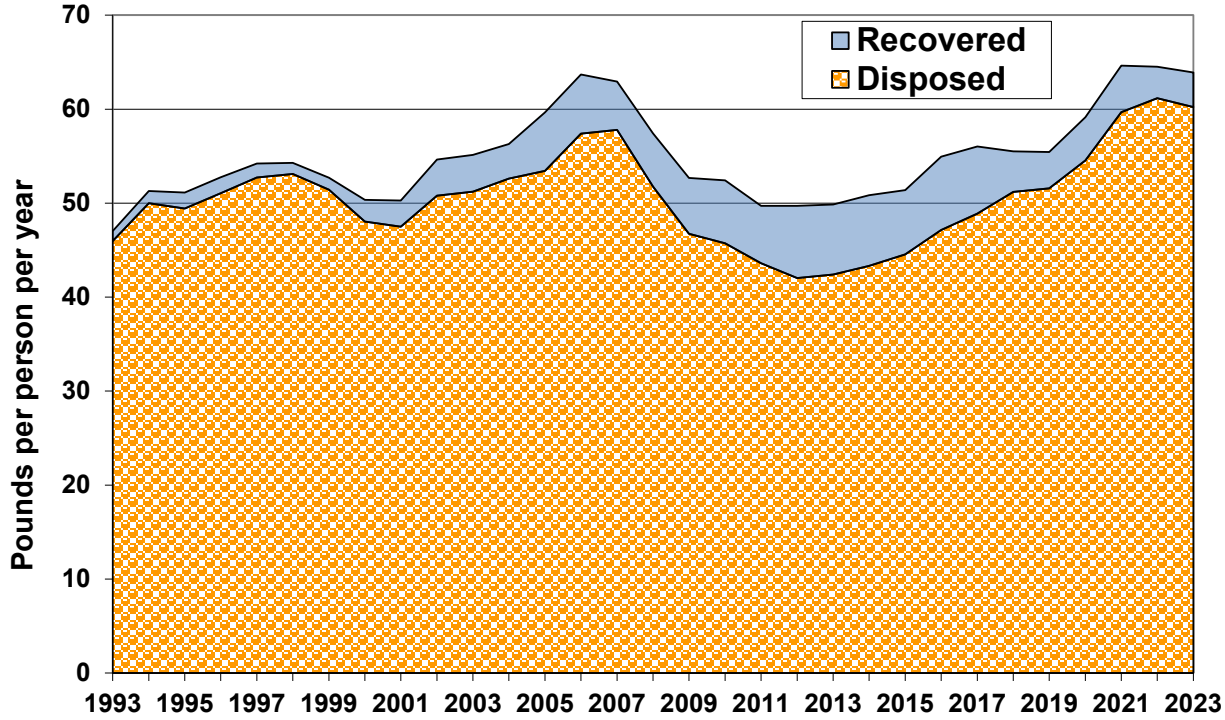
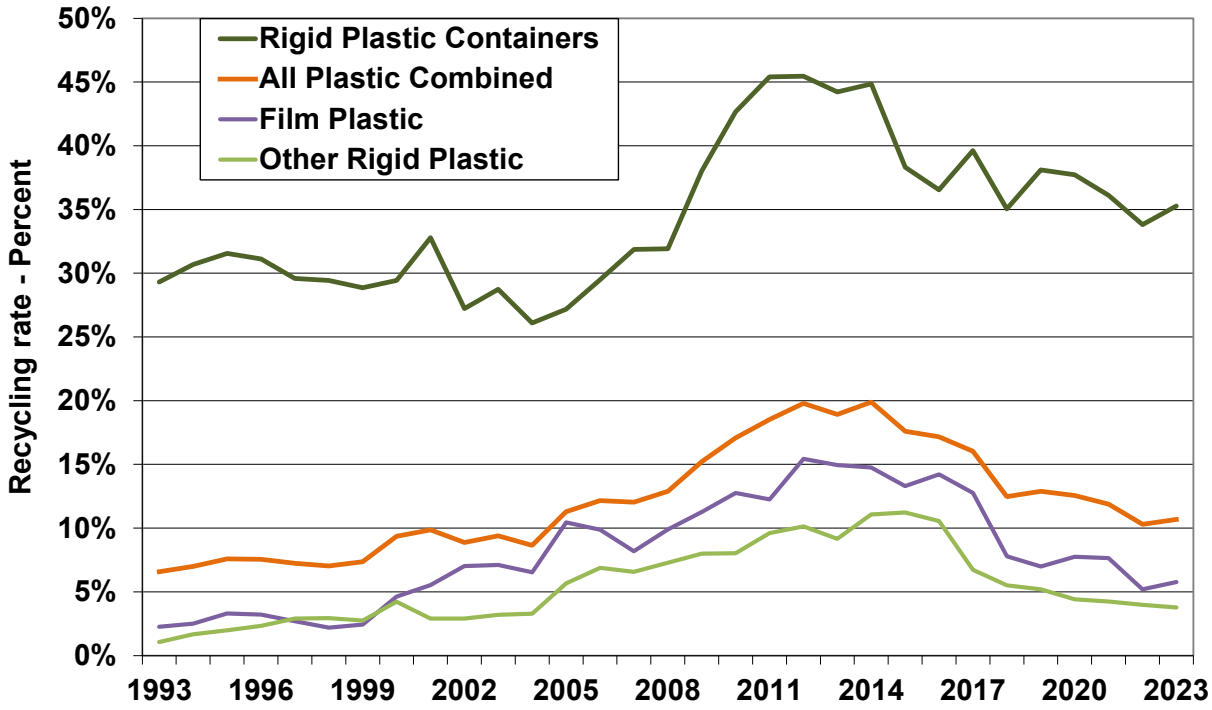


Figure 11. Recycling rate for 3 different forms of plastic 1993-2023

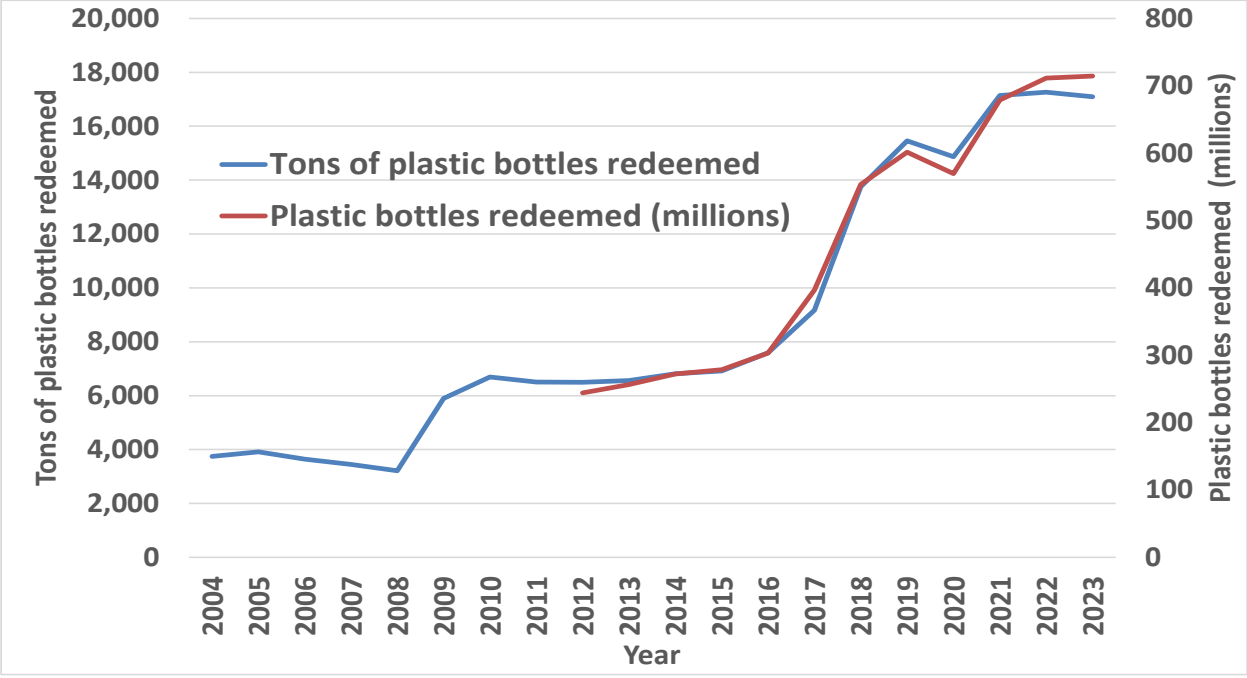


Background on Plastics Programs and Their Impacts

Legislation and other programs have strongly affected plastics recycling and disposal in Oregon. Some key programs and factors include:

- **Bottle Bill.** Although plastics were rarely used for packaging beverages when Oregon's Bottle Bill first passed in 1971, 824 million deposit plastic bottles were sold in Oregon in 2023, and 714 million plastic bottles were redeemed, according to data reported by beverage distributors to the Oregon Liquor and Cannabis Commission. This calculates as an 86.7% redemption rate. Based on DEQ's Oregon Material Recovery Survey, the 17,096 tons of plastic recycled under the Bottle Bill in 2023 is 36% of **all** Oregon plastic recycled in 2023. For plastic containers covered under the Bottle Bill, roughly 15 times more were redeemed for deposit than were recycled through the commingled recycling programs available to most households and businesses in Oregon. Prior to 2009, the Bottle Bill covered only beer and soft drinks, but with skyrocketing sale of water in bottles, these were added to the bottle bill effective January 1, 2009. This led to an increase in bottle bill recycling tonnage from 3,218 tons in 2008 to 5,898 tons in 2009 and 6,691 tons in 2010. Then the refund value of bottles and cans doubled to 10 cents on April 1 of 2017, and in January of 2018, juices, sports drinks, and many other beverages were covered under the 10-cent refund value requirement. These two changes plus increase sales of water led to increases in the tonnage recycled under the bottle bill from 7,586 tons in 2016 to 9,167 tons in 2017, 13,751 tons in 2018, and 15,456 tons in 2019 – more than double the tonnage of bottle bill plastic compared to the 2016 tonnage. These trends show clearly in Figure 12, which also shows the small decrease in redemptions in 2020 when the advent of COVID 19 resulted in stores being excused from accepting back containers for many months to help reduce the spread of the virus.

Figure 12. Plastic bottles redeemed under the Oregon Bottle Bill by count and tons



- **Recycling Opportunity Act (SB 405).** This law, passed in 1983 and implemented in 1986, required that garbage service customers in cities of 4,000 or more population must be provided with on-route (curbside) recycling service for all recyclable material, or an equivalent alternative recycling collection method. Disposal site also had to provide the opportunity to recycle. At that time, few programs included any plastic. However, subsequent legislation discussed next led to the addition of plastic bottles to most programs, and later, the Portland Metro programs and a number of other programs also added plastic tubs and pails to their collection lists. It is important to note that the only types of plastics that are acceptable in curbside collection programs throughout Oregon are most rigid plastic containers, with some containers such as thermoformed containers and trays with sidewalls high enough to hold 8 ounces not being acceptable in commingled recycling. No film plastic is acceptable in any Oregon commingled recycling program, and with the exception of small containers between 6 and 8 ounces, no other rigid plastics are acceptable. Of the approximately 383,000 tons of plastics disposed in 2023, only about 31,600 tons, or about 8.3% of the disposed plastic, could be recycled through curbside or other commingled recycling.
- **1991 Recycling Act and Rigid Plastic Container Law (SB 66).** This law made many changes to Oregon's solid waste and recycling requirements, including setting statewide and local recycling goals. This law also set the requirements that DEQ conduct periodic waste composition studies (such as this one) and conduct the annual material recovery survey of both public and private recycling programs.

  One other major requirement is that the law required manufactures or packagers using rigid plastic containers to make sure that their plastic container meets at least one of three criteria by 1995:

  - Be made with at least 25% recycled plastic content
  - Be made with plastic that is recycled in Oregon at a rate of 25% or more, or
  - Be a reusable container.

  The law also requires that local governments provide the opportunity to recycle rigid plastic containers in urban areas if a stable market exists that pays or exceeds 75% of the cost of collection.

  These new requirements led to an industry group, the Plastics Recycling Council (now American Chemistry Council), to step in and provide resources and funds to boost plastics recycling, including:

  - Paying for and building a new first-generation (then the state of the art) plastic bottle sorting facility at the non-profit recycler Garten Services, and
  - Providing a guaranteed floor price for plastic bottles recycled in Oregon for three years.

  As a result, most cities added plastic bottles to their recycling programs, due to the market assurance. As can be seen in Figure 11, the overall recycling rate for rigid plastic containers in Oregon has exceeded 25 percent from the first time it was measured through 2023, which means that plastic container manufacturers all meet the law's

requirements because they are made by plastics that in aggregate exceed the 25% recycling rate.

- **Moving to bins and then to roll-carts for on-route collection**. In the early years of curbside recycling in the 1980s, households set out their material in their own containers and each material was set out separately for collection, but participation was very low – at 10% of households participating or less in most cities. However, cities found that if they provided a 15-gallon bin for people to put their recyclables in, participation would immediately take a big leap up to about 60% or more. By the late 1990s though, collection service providers found that rather than operate a truck with separate bins for each material, it was far more efficient for them to commingle all the materials (except glass) together in their truck and deliver the material to a commingled recycling processing facility. With adding plastic bottles to the mix though, the volume of recyclables that households had for recycling was exceeding the volume of the 15-gallon bins that most programs were using at the time, so between 2000 and about 2010, most programs started offering large 60 or 90-gallon roll carts for people to put their recyclables in. This resulted in a significant increase in the amount of acceptable recyclables that people would set out on collection day. Along with adding water bottles to the bottle bill, this led to doubling the per capita recycling of rigid plastic containers between 1999 and 2011. It also allowed a lot more room for people to put other, non-acceptable materials in the bin, either due to a hope that perhaps the material would get recycled or simply because they ran out of room in their garbage bin and did not want to pay for a larger size garbage service.

- **China's ban on the importation of most recyclables**. Prior to 2017, China was by far the largest importer of plastics and other materials from around the world for recycling, as inexpensive labor for sorting and cleaning the plastics as well as inexpensive shipping costs gave them a pricing advantage over local recycling companies. However, this importation was causing significant problems in China, as the material being imported from around the world had significant levels of contaminants, and in many areas the solid waste management systems were not set up to deal with all of the contaminants arriving with the recycling. The Chinese government instituted strong importation standards and much more enforcement in 2013 in a program known as the Green Fence, and then in 2017 announced "National Sword" - a near total ban on the importation of plastics and many other recyclables which took effect at the beginning of 2018. This disappearance of the largest market for recyclable materials in 2018 led to major disruption and much lower prices for plastics and other recyclables, and in Oregon this resulted in the disposal of 16,425 tons of collected recyclable material from late 2017 to early 2019 – mainly commingled recycling from some of the more rural parts of the state, as collectors were having difficulty finding markets for their material and the material no longer met the definition then in statute for being "recyclable material." Although this is a significant tonnage, it is only about 3% of the total commingled recycling collected in that period. Approximately 800 tons of this commingled material was recyclable plastic. This impact was magnified since quite a few Oregon programs

discontinued collecting plastic tubs and pails at that time, and some programs discontinued collecting plastic altogether. Just as importantly, many businesses that were voluntarily recycling film plastic and other types of plastic that are not included in commingled recycling programs discontinued doing so, as markets for that material were severely diminished. The results of National Sword are most evident in Figure 11, where both film plastic and other rigid plastic showed strong drops around 2017-2018. The impact on the recycling of rigid plastic containers was also fairly strong, but was masked because 2018-2018 was when juices, sports drinks, and many other beverages were added to the bottle bill, and the refund value of the empty containers was doubled to 10 cents. The plastic bottles redeemed under the Bottle Bill are generally recycled at the ORPET facility in St. Helens, Oregon, and so were generally unaffected by China's recycling importation ban.

- **Oregon Recycling Modernization Act (SB 582)**. In 2021, the Oregon Legislature passed a major piece of legislation that requires producers of packaging, printing and writing paper, and food serviceware to play a significant role in reducing the environmental impact of these materials and also has some new requirements for recycling processors and local governments. Some requirements of the Act include:
    - A uniform list of materials that can be collected commingled throughout the state.
    - Funding by the producers to help programs implement new or improved collection programs that currently are not providing those collection services.
    - Funding of recycling transportation for programs that are more than 50 miles from a commingled recycling processing facility or responsible end market.
    - Establishment of depots to collect recyclable materials that are problematic in commingled recycling, such as plastic film and plastic lids and caps.
    - Fees paid by producers to commingled recycling processing facilities to stabilize pricing of recycling collection to collectors and to pay for the removal and disposal of covered product contaminants.
    - Funding of up to $3 per person per year for local governments to carry out education and promotion programs to reduce contamination in the commingled recycling stream.
    - Requirements that collected materials can only be shipped to end-users that qualify as being responsible end markets.
    - Commingled recycling processing facilities must meet performance standards limiting contamination in the recycled commodities that they sell and "capture rate" standards to make sure that the recyclable material they receive gets properly sorted into the appropriate outgoing commodity.

  The legislation set the implementation date for these requirements to begin rolling out starting on July 1, 2025, and so did not affect either disposal or recycling of plastic in 2023.

Glass

Oregon recycling programs differ from many programs in other states in that on-route (curbside) collection program collect glass separately instead of commingled with other materials. This provides a much cleaner glass recycling stream, a much higher yield rate for recycling glass back into glass products than would be true if the glass were commingled with other materials, and it also keeps the other materials much cleaner. Also, a significant portion of container glass is recycled through the Oregon Bottle Bill, which produces a very clean glass stream for recycling. It is almost entirely container glass that can be recycled. Few markets exist for post-consumer window glass, glassware, or other types of glass besides container glass.

Table 7. Composition of Oregon glass disposed in 2023, with 90% sampling confidence intervals

Material	Field Results	Contamination Corrected	Clean Tons
GLASS	**1.53% (1.38–1.70%)**	**1.55% (1.39–1.73%)**	**55,563 (49,727–62,274)**
Glass Containers	**0.91% (0.82–1.00%)**	**0.91% (0.82–1.04%)**	**32,825 (29,443–37,173)**
All deposit glass containers	**0.20% (0.16–0.23%)**	**0.20% (0.16–0.23%)**	**7,036 (5,864–8,385)**
Glass deposit beer, soft drinks, water	0.16% (0.13–0.20%)	0.16% (0.13–0.20%)	5,852 (4,744–7,094)
All other glass deposit (juice, etc.)	0.03% (0.03–0.04%)	0.03% (0.03–0.04%)	1,184 (903–1,499)
Glass Containers Excluding Deposit	**0.71% (0.64–0.80%)**	**0.72% (0.63–0.83%)**	**25,789 (22,733–29,694)**
Glass no deposit beverage	0.40% (0.34–0.48%)	0.40% (0.33–0.47%)	14,352 (12,021–17,039)
Other glass containers (bottles, jars)	0.31% (0.28–0.34%)	0.32% (0.27–0.39%)	11,437 (9,650–13,995)
Nonrecyclable Glass	**0.62% (0.50–0.74%)**	**0.63% (0.51–0.75%)**	**22,738 (18,352–27,098)**
Window glass	0.27% (0.18–0.37%)	0.27% (0.18–0.39%)	9,863 (6,312–13,821)
Other nonrecyclable glass	0.35% (0.29–0.41%)	0.36% (0.29–0.44%)	12,874 (10,468–15,646)
Glass Beverage bottles	*0.60% (0.53–0.68%)*	*0.60% (0.52–0.69%)*	*21,388 (18,833–24,609)*

Since 1995, glass generation has remained almost unchanged, buoyed by continued strong sales for of beverages such as beer and wine in glass. In recent years, however, beverage sales have been moving away from glass into more aluminum and plastic. According to data compiled by the Oregon Liquor and Cannabis Commission, the sales of deposit glass containers (mainly beer) fell by one-third, or more than 100 million containers, just from 2019 (its peak) to 2023. In that same period, metal deposit beverage containers increased by more than

250 million, and plastic by more than 100 million. The decline in glass sales can be clearly seen in the per-capita overall container glass generation shown in Figure 13 and the bottle bill glass redemption data in Figure 14. Figure 14 show redemption data both in tons, based on DEQ's annual Material Recovery Survey, and in containers redeemed, compiled by the OLCC based on reports from beverage distributors.

In a related move, Owens Illinois, operators of Oregon's sole glass container manufacturing facility since 1956, scaled back their facility to operating just one furnace in the early 2020s, completely idled the plant for a 6-month period in 2023 due to a lack of demand, and closed the facility permanently in August 2025. The plant had been a major user of recycled glass, making new glass containers with up to 80% recycled content. Owens still operates a smaller glass manufacturing plant in Kalama Washington, and they are operating their glass beneficiating plant, Glass to Glass, in Portland, accepting glass for recycling and then shipping the cleaned glass to other glass manufacturers in multiple states.

Figure 13. Container glass recovery and disposal per capita 1993-2023

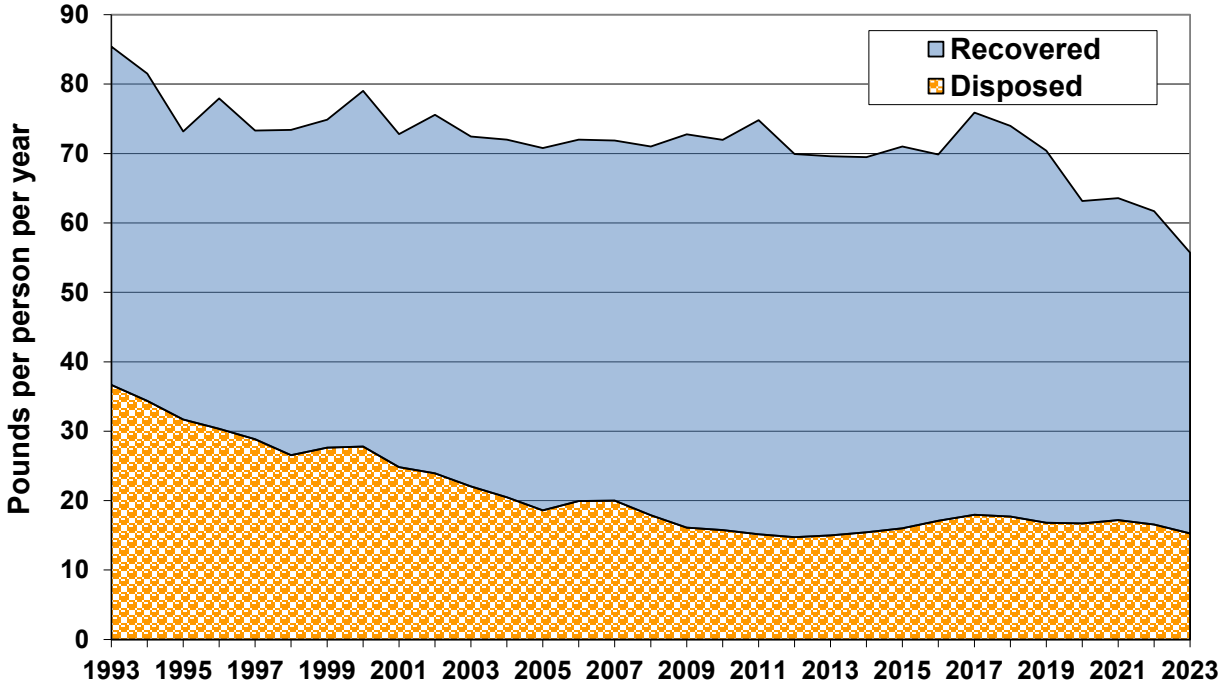
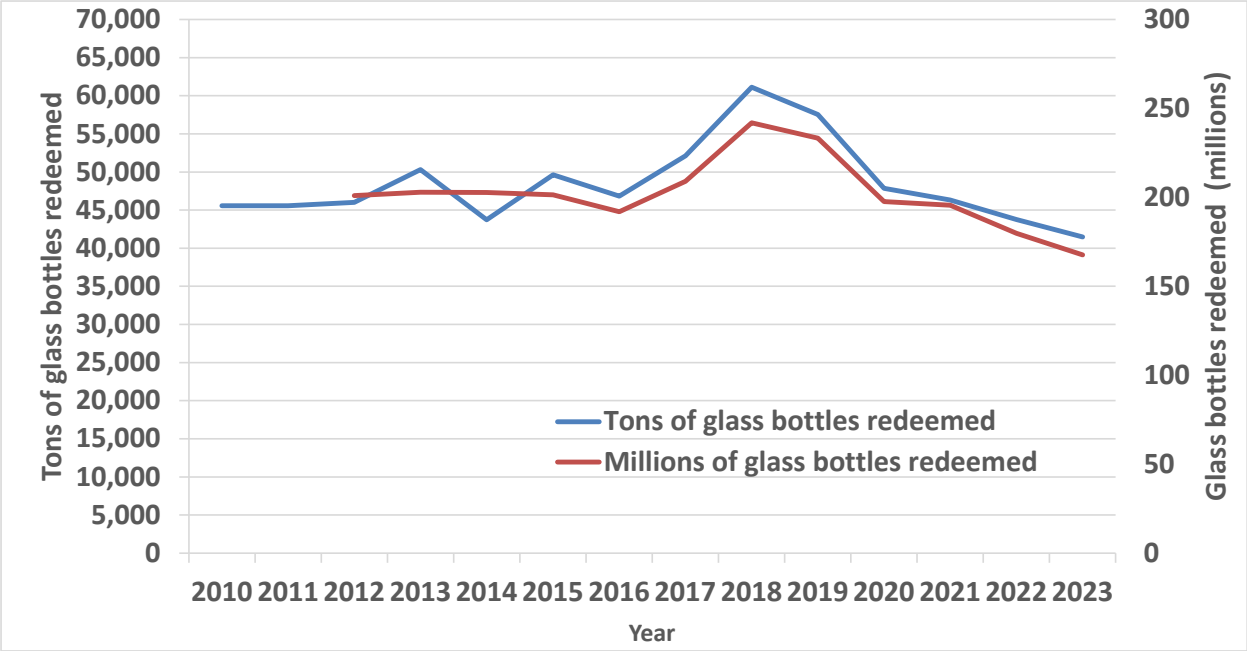


Figure 14. Glass recycling under the Oregon Bottle Bill: tons and redeemed bottle count



Aluminum

Aluminum is a highly impactful metal in terms of the energy needed to make aluminum metal from bauxite, its source ore, but making aluminum from recycled metal takes only a small fraction of the energy needed to make aluminum from bauxite ore. Recycling rates for aluminum are high, especially for beverage cans covered under Oregon's Bottle Bill. Table 8 shows the percentage of Oregon's waste that consists of different sources of aluminum, and the estimated total tons of each disposed in 2023. In most states that do not have deposit/redemption legislation, aluminum beverage cans often make up about one half of one percent of the municipal wastestream, but in Oregon that number is closer to one-tenth of one percent.

Figure 15 shows the disposal, recycling, and generation rate per-capita of aluminum in Oregon since 1993, but for aluminum and for other scrap metal, the recycling numbers may be incomplete and may vary in completeness from year to year. Under Oregon's recycling law, most recyclers are required to report their recycling tonnage to DEQ as part of the annual material recovery survey, but scrap metal dealers have a partial exemption and are not required to report on many of the scrap metal items they recycle, although they can do so voluntarily. Most do report, but the level of reporting can vary from year to year. Another issue is that for many of the collection service providers and other recyclers, they report much of their material as just being scrap metal, without identifying the type of metal, and so for recycling some of the larger aluminum items may just be reported as being scrap metal, or not reported at all.

Table 8. Composition of Oregon aluminum disposed in 2023, with 90% sampling confidence intervals

Material	Field Results	Contamination Corrected	Clean Tons
Aluminum	**0.42% (0.38–0.47%)**	**0.32% (0.26–0.38%)**	**11,370 (9,447–13,492)**
Aluminum Beverage Cans	**0.12% (0.11–0.14%)**	**0.11% (0.09–0.13%)**	**3,964 (3,385–4,675)**
Aluminum Deposit Beverage Cans	**0.12% (0.11–0.14%)**	**0.11% (0.09–0.13%)**	**3,950 (3,377–4,654)**
Deposit aluminum beer, soft drink, water	0.12% (0.10–0.14%)	0.11% (0.09–0.13%)	3,801 (3,227–4,494)
All other aluminum deposit (juice, etc.)	0.00% (0.00–0.01%)	0.00% (0.00–0.01%)	149 (117–181)
No deposit aluminum beverage cans	0.00% (0.00–0.00%)	0.00% (0.00–0.00%)	13 (6–22)
Foil + pet food type cans	0.19% (0.17–0.21%)	0.10% (0.07–0.12%)	3,595 (2,616–4,484)
Other Aluminum (not foil)	**0.11% (0.08–0.16%)**	**0.11% (0.07–0.15%)**	**3,811 (2,463–5,345)**
Other aluminum curbside OK	0.06% (0.03–0.10%)	0.06% (0.03–0.09%)	2,119 (1,109–3,285)
Large aluminum not curbside OK	0.05% (0.03–0.07%)	0.05% (0.03–0.07%)	1,692 (910–2,573)

In its annual material recovery survey, DEQ began tracking the tonnage of aluminum, glass, and plastic starting in 2002. These data are shown in Figure 16 from 2010 on, along with the number of redeemed metal containers (almost all aluminum) reported to the OLCC by beverage distributors starting in 2012 as required by law passed in 2011. As can be seen, there is a very close correlation between the tons reported to DEQ and the number of containers redeemed as reported to the OLCC. Going back to 2002, some 14,374 tons of aluminum beverage cans were recycled under the bottle bill. This number declined over the next 13 years, hitting a low of 10,019 tons in 2015, but took a big jump up in 2017 when the refund value of beverage containers doubled to 10 cents. It has continued rising since then as more beverages were added to the bottle bill in 2018 and as beverage packagers increase their use of aluminum cans over glass.

Figure 15. Aluminum recovery and disposal per capita 1993-2023

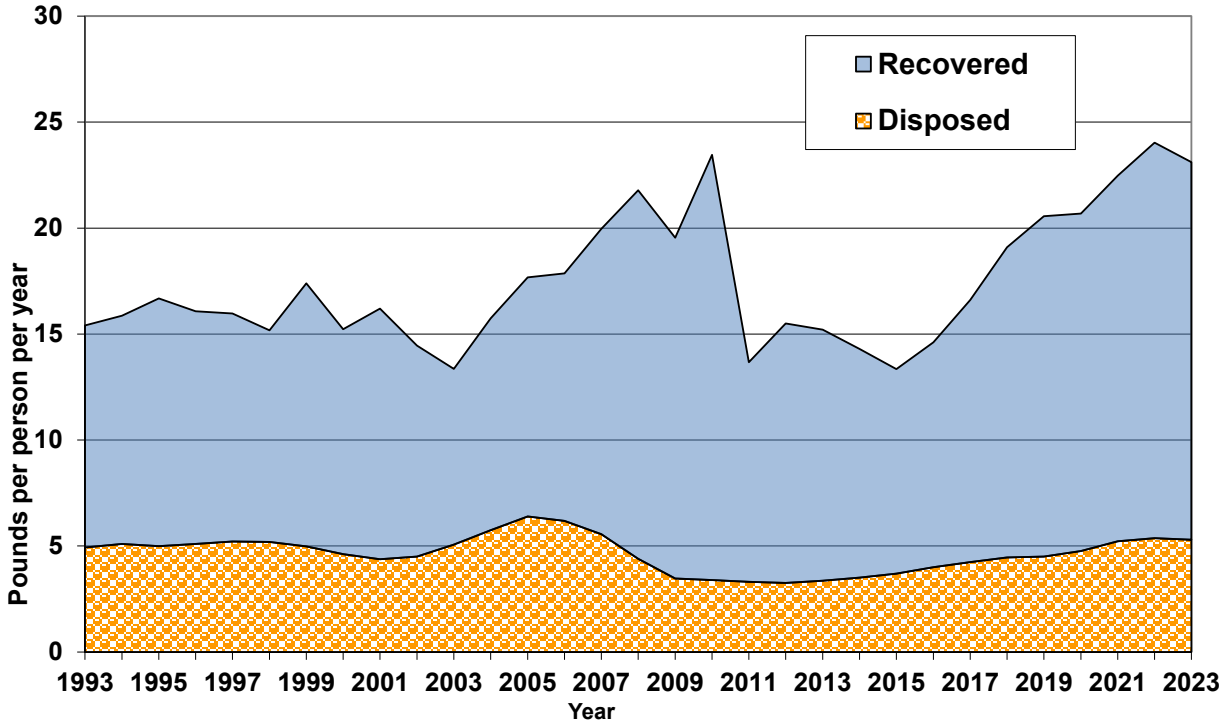
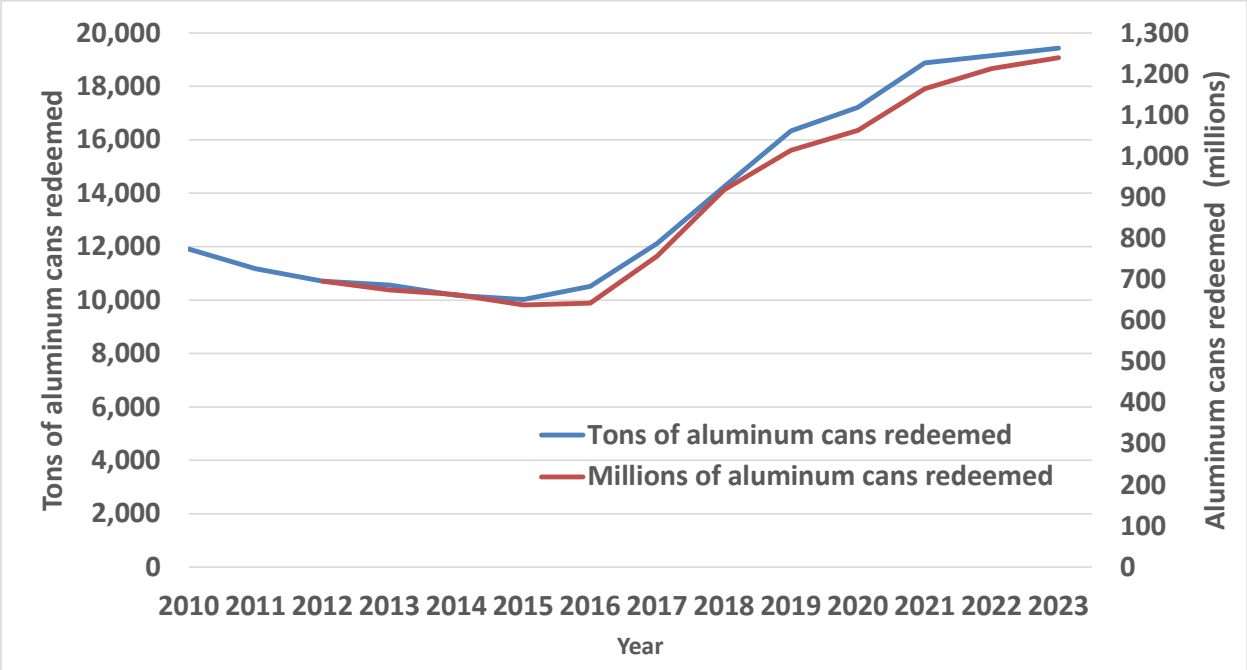


Figure 16. Aluminum can recycling under the Oregon Bottle Bill: tons and redeemed container count



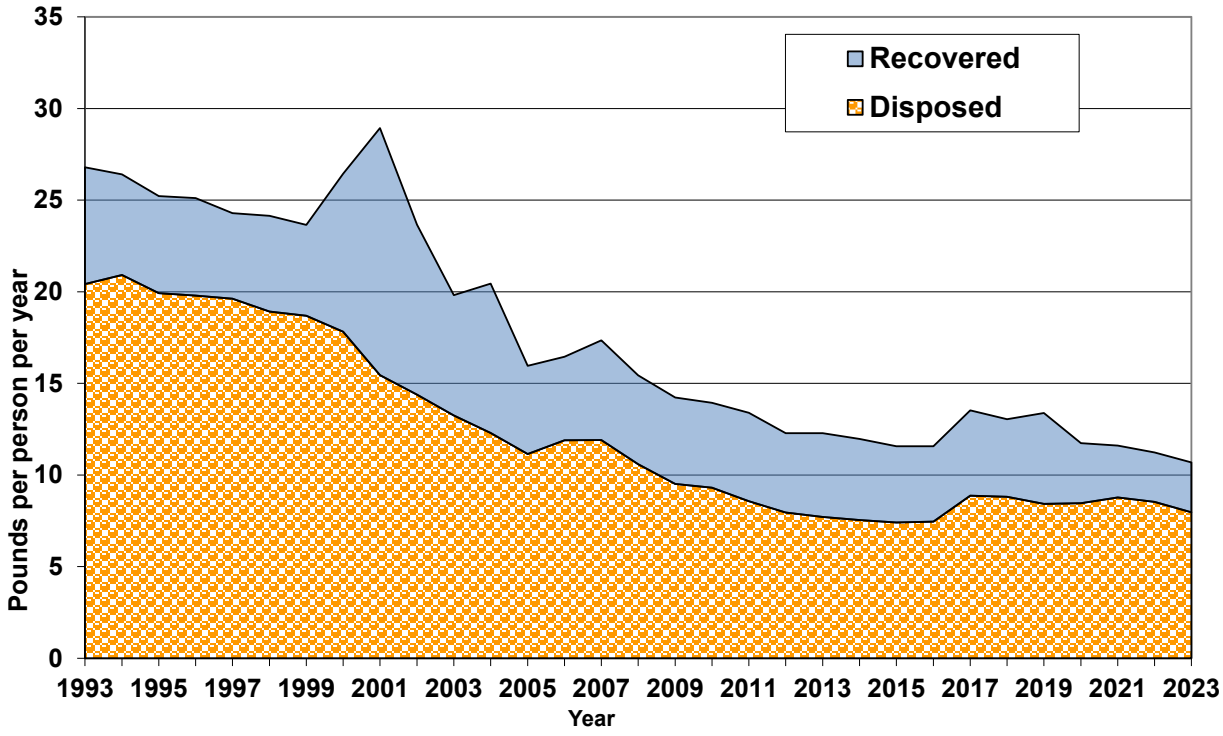
Steel Cans

Steel cans had been an important packaging material in the past and still are widely used, but their market share has steadily declined over the past 30 years. The recycling numbers shown in Figure 17 may be an underestimate as some recyclers mix their steel cans in with other scrap metal and report the tonnage in the scrap metal category.

Table 9. Composition of Oregon steel cans disposed in 2023, with 90% sampling confidence intervals

Material	Field Results	Contamination Corrected	Clean Tons
Steel (tinned) cans	**0.44% (0.39–0.49%)**	**0.40% (0.35–0.48%)**	**14,419 (12,424–17,246)**
Steel deposit beverage cans	**0.01% (0.00–0.01%)**	**0.01% (0.00–0.01%)**	**198 (95–334)**
Steel/bimetal-deposit beer, soft drink, water	0.00% (0.00–0.01%)	0.00% (0.00–0.01%)	86 (3–221)
All other steel/bimetal deposit (juice, etc.)	0.00% (0.00–0.01%)	0.00% (0.00–0.00%)	112 (63–166)
Steel/bimetal- non deposit beverage cans	0.00% (0.00–0.00%)	0.00% (0.00–0.00%)	0 (0–0)
Other steel cans	0.43% (0.38–0.48%)	0.40% (0.34–0.47%)	14,221 (12,260–16,982)

Figure 17. Steel can recovery and disposal per capita 1993 - 2023



Recovery Rate of Commonly Recycled Materials

Figure 18 shows the disposal and recycling weight per capita of the most common materials recycled by households and small businesses, including recyclable paper, rigid plastic containers, steel cans, aluminum, and container glass, and Figure 19 shows the overall recycling rate for these materials combined. Through 2008, the recycling rate rose steadily as collection programs grew and improved, and material that had been thrown away in earlier years was now being recycled. The amount of material recycled declined in the next few years as the sale of newspaper and other printing and writing paper dropped off sharply as people turned to electronic media for communication and due to the recession reducing the sale of packaging material, but the recycling rate continued to rise slowly until about 2014. Since then, the overall recycling rate for these materials has slowly declined. Part of this may be due to the near disappearance of newspaper from the recycling stream, as newspaper has always had a very high recycling rate relative to the other materials, but public attitudes towards recycling and the belief by some that the materials set out for recycling are not actually recycled may be a contributing factor.

Figure 18. Recovery and disposal of common recyclable materials combined, including recyclable paper, rigid plastic containers, tinned cans, aluminum, and container glass per capita 1993-2023

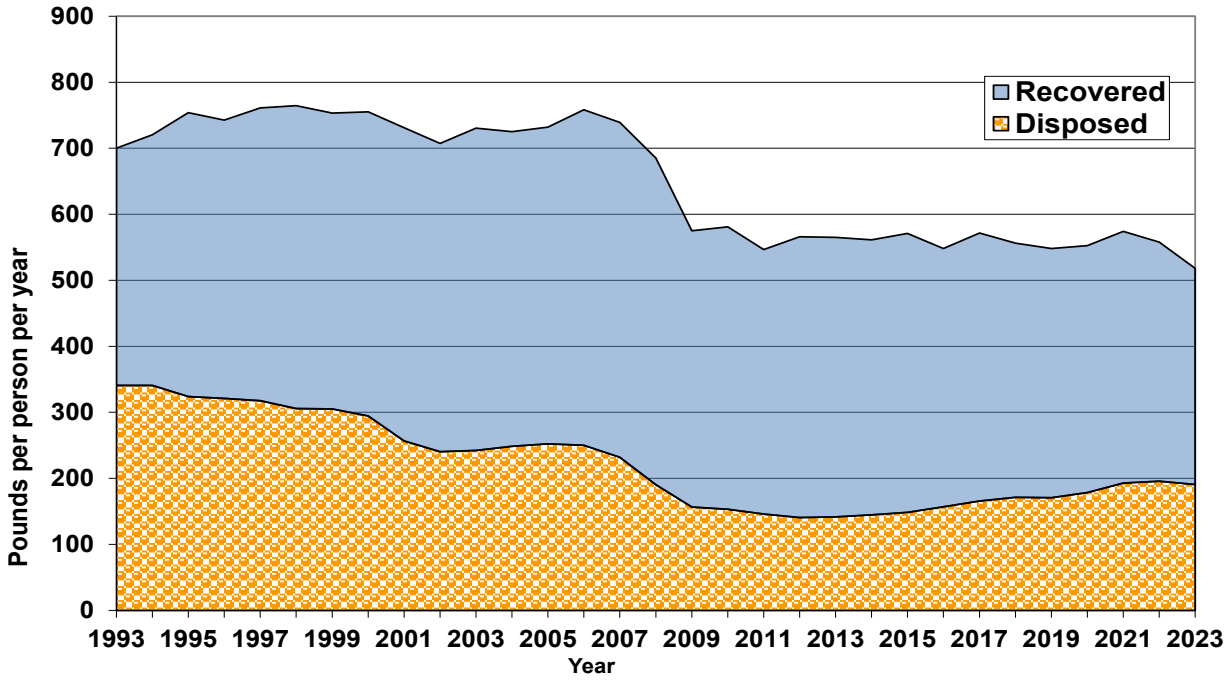
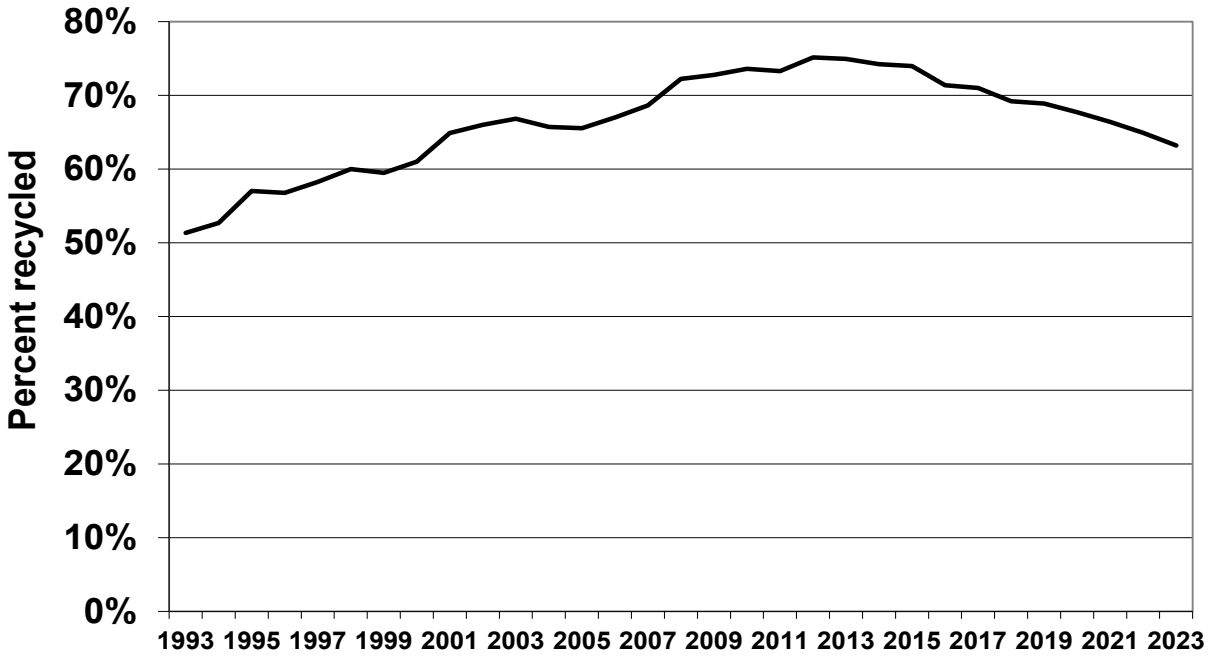


Figure 19. Recycling rate for common recyclable materials combined, including recyclable paper, rigid plastic containers, tinned cans, aluminum, and container glass 1993-2023



Food Waste

The production of food is arguably the most negatively impactful way in which humans affect Earth's environment. Food production is a major greenhouse gas contributor, a source of water pollution, eutrophication, and dead zones near river outlets into the ocean due to fertilizer use, and the largest user of land of all human activity. Food waste itself can be a major source of greenhouse gas in landfills as it decomposes quickly under anaerobic landfill conditions, releasing methane before the landfill is capped and the gas collection equipment is turned on. But the biggest impact of edible food waste is that it increases the need to produce more food to feed the same number of people. The environmental benefits of properly managing food waste by composting instead of landfilling are significant, but relatively small compared to either reducing waste to avoid having to grow more food or to growing and consuming foods that create far less greenhouse gases or other environmental damage to produce compared to many of the foods currently grown.

Table 10 shows the composition of Oregon's disposed food waste in 2023, while Figure 20 shows how food waste disposal, recovery, and generation have changed since 1994. Note that especially for food waste, adding together reported recovery and disposal from waste composition missed a substantial but not documented quantity of food that is composted at home or ground up in a kitchen sink grinder and discharged to a sewer or septic system. Also food is one of the few materials that increases with contamination analysis as some food is recovered from containers or adhering to other materials, but this increase is likely underestimated because an unknown but probably substantial portion of the "water and residue" in contamination analysis is food rinsed out of containers or the water from food waste that

either was cleaned up with paper towels before disposal or that absorbed into cardboard or other absorbent materials when compacted in a garbage truck.

"Edible Food" refers to food that was originally produced to be eaten, not the condition of the food at the time of disposal or sorting. "Non-edible Food" includes only materials such as shells, husks, and bones that were never intended to be eaten.

Table 10. Composition of Oregon food waste disposed in 2023, with 90% sampling confidence intervals.

Material	Field Results	Contamination Corrected	Clean Tons
All Food	**11.42% (10.64–12.21%)**	**11.95% (11.08–12.80%)**	**428,853 (397,881–459,537)**
Non-packaged bakery goods	0.23% (0.15–0.33%)	0.24% (0.16–0.35%)	8,763 (5,682–12,447)
Packaged bakery goods	0.50% (0.39–0.63%)	0.52% (0.41–0.66%)	18,834 (14,642–23,734)
Unpackaged Other Vegetative Food	**3.56% (3.28–3.85%)**	**3.73% (3.42–4.03%)**	**133,760 (122,851–144,742)**
Unpackaged veg edible	1.15% (0.98–1.32%)	1.20% (1.02–1.38%)	43,031 (36,648–49,485)
Unpackaged veg nonedible	2.42% (2.23–2.62%)	2.53% (2.33–2.75%)	90,729 (83,538–98,598)
Packaged other vegetative food	0.90% (0.75–1.10%)	0.94% (0.78–1.16%)	33,919 (27,848–41,616)
Unpackaged Non-vegetative + mixed food	**3.01% (2.51–3.61%)**	**3.15% (2.62–3.76%)**	**112,966 (94,082–134,958)**
Unpackaged edible meat, eggs, dairy	0.43% (0.31–0.59%)	0.45% (0.32–0.62%)	16,259 (11,565–22,376)
Unpackaged nonedible animal food-related	0.62% (0.28–1.20%)	0.64% (0.29–1.25%)	23,121 (10,369–44,992)
Mixed unpackaged foods	1.96% (1.70–2.22%)	2.05% (1.77–2.31%)	73,586 (63,530–83,083)
Packaged non-vegetative + mixed food	**3.21% (2.94–3.48%)**	**3.36% (3.07–3.64%)**	**120,610 (110,379–130,835)**
Packaged meat, eggs	0.41% (0.36–0.47%)	0.43% (0.38–0.49%)	15,565 (13,546–17,654)
Packaged dairy	0.21% (0.15–0.26%)	0.22% (0.16–0.28%)	7,756 (5,768–9,898)
Mixed packaged foods	2.59% (2.34–2.83%)	2.71% (2.44–2.98%)	97,290 (87,596–106,878)
All edible food	*8.39% (7.79–8.98%)*	*8.78% (8.14–9.41%)*	*315,003 (292,130–337,620)*
All non-edible food	*3.03% (2.61–3.58%)*	*3.17% (2.71–3.74%)*	*113,849 (97,439–134,248)*

Figure 20. Food Waste per capita recovery and disposal 1994-2023

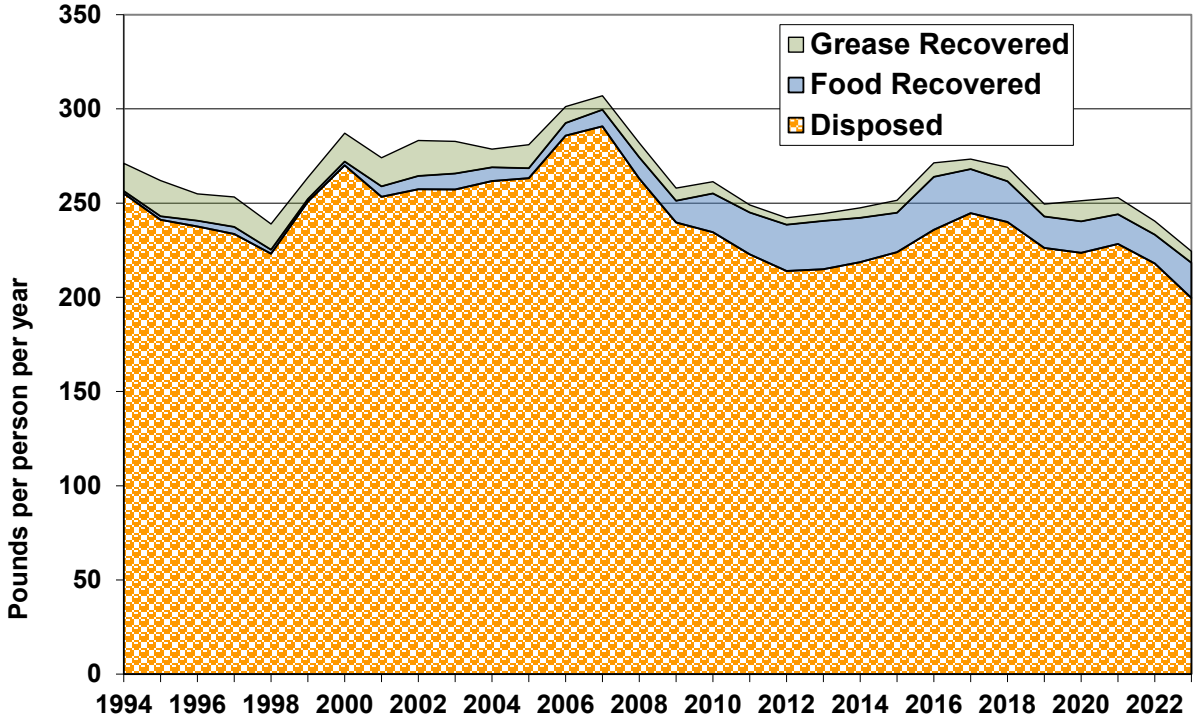


Table 11. Comparison of food disposal in pounds per person per year: 2016 vs. 2023

	2016 (90% conf. Int.)		2023 (90% conf. Int.)	
All food	235.9	(220.9-251.4)	199.6	(185.2-213.9)
Non-packaged bakery goods	10.4	(8.6-12.9)	4.1	(2.6-5.8)
Packaged bakery goods	12.8	(11.5-14.1)	8.8	(6.8-11.0)
Unpackaged other vegetative food	115.1	(106.6-124.9)	62.3	(57.2-67.4)
Unpackaged veg edible	33.0	(28.6-38.0)	20.0	(17.1-23.0)
Unpackaged veg nonedible	82.1	(74.9-90.0)	42.2	(38.9-45.9)
Packaged other vegetative food	40.7	(36.3-45.7)	15.8	(13.0-19.4)
Unpackaged non-vegetative + mixed food	32.8	(29.2-36.2)	52.6	(43.8-62.8)
Unpackaged edible meat, eggs, dairy	11.4	(9.6-13.3)	7.6	(5.4-10.4)
Unpackaged nonedible animal food-related	9.7	(8.2-11.4)	10.8	(4.8-20.9)
Mixed unpackaged foods	11.7	(10.0-13.7)	34.3	(29.6-38.7)
Packaged non-vegetative + mixed food	24.0	(20.7-27.6)	56.1	(51.4-60.9)
Packaged meat, eggs	12.3	(9.7-15.3)	7.2	(6.3-8.2)
Packaged dairy	5.9	(5.0-6.8)	3.6	(2.7-4.6)
Mixed packaged foods	5.8	(4.7-7.1)	45.3	(40.8-49.7)
All edible food	144.0	(133.8-154.3)	146.6	(136.0-157.2)
All non-edible food	91.9	(84.0-100.2)	53.0	(45.4-62.5)

Figure 20 shows a substantial decline in food waste generated per capita between the 2016 waste composition study and the current 2023 study. Table 11 shows the per capita disposal of the different categories of food waste for the 2016 study compared to the current 2023 study. When comparing waste composition of specific materials over time or between jurisdictions, it is better to use per capita figures rather than percentage of the waste stream, as increases or decreases in other materials will change the percentage of the material of interest even if the amount of the material of interest did not change.

Overall, Table 11 shows that total food waste was lower on a per capita basis in 2023 when compared to 2016, and that difference was statistically significant. In particular, bakery goods and vegetative food waste was down, as was non-edible food waste such as shells and bones. Edible food waste was virtually unchanged. However, it also appears that the sorters handled mixed foods differently in 2023 than in 2016, even though the category definitions were unchanged. Materials that are generated separately can get mixed together when first dumped into a garbage can, further mixed when loaded into a garbage truck and compacted, and then again when the truck dumps its load and the crew collects a sample. It can be a judgment call whether vegetative and non-vegetative foods were mixed together when first disposed or mixed subsequently. However, the largest difference between 2016 and 2023 results is in the category “mixed packaged food” which should be fairly easy to determine if mixed or not. As such, the drop in packaged vegetative food and packaged bakery goods in 2023 could be because the sorters in 2023 included some of these materials in the “mixed packaged food” category.

Metro, Marion County, and Lane County all participated in the 2016 waste composition study as well as the 2023 study, and so Table 12 shows how food waste disposal has changed, showing both per capita disposal and food waste as a percentage of the wastestream.

Food waste was reduced in all jurisdictions in 2023 when compared to 2016, and the difference in per-capita disposal was statistically significant at below the 5% level for Metro, Lane County, and the state as a whole. In all jurisdictions, the drop of food waste as a percent of the total wastestream is larger than the drop in per-capita disposal but that is only because the amount of other waste disposed was higher in 2023 than in 2016, diluting the food waste disposal numbers.

The drop in food waste disposal was particularly large for Lane County, dropping from about 250 to 150 pounds per person per year. Both Eugene and Springfield began collecting residential food waste in yard debris/organics collection carts after 2016, which helps explain why the drop in Lane County was so large, but the drop was larger than what might be expected for such a program, as similar food collection is provided in most of the 3 Metro counties and in the cities of Salem and Keizer in Marion County, so it could be that the true level of food waste disposal was near the low end of the confidence interval in 2016 and near the high end in 2023.

Table 12. Changes in disposal of food waste between 2016 and 2023 in different jurisdictions

Jurisdiction	Material	2016 Percent	2023 Percent	2016 Lbs/ person-year	2023 Lbs/ person-year
Statewide	All Food	15.66% (14.66–16.69%)	11.95% (11.08–12.80%)	235.1 (220.2–250.7)	199.6 (185.2–213.9)
Metro	All Food	15.41% (14.44–16.31%)	12.51% (11.44–13.62%)	219.8 (206.1–232.7)	189.5 (173.3–206.3)
Marion County	All Food	16.24% (14.53–18.15%)	11.39% (9.98–12.72%)	253.4 (226.8–283.2)	216.5 (189.8–242.0)
Lane County	All Food	17.97% (15.64–20.30%)	9.72% (8.26–11.30%)	251.3 (218.8–283.8)	150.2 (127.7–174.7)
Deschutes Cnty	All Food	in "Rest of Oregon"	8.88% (7.50–10.54%)	in "Rest of Oregon"	186.9 (157.9–221.9)
Rest of Oregon	All Food	15.33% (13.34–17.43%)	12.53% (10.63–14.46%)	275.1 (239.4–312.8)	222.3 (188.6–256.6)

Jurisdiction	Material	2016 Percent	2023 Percent	2016 Lbs/ person-year	2023 Lbs/ person-year
Statewide	All edible food	9.56% (8.88–10.24%)	8.78% (8.14–9.41%)	143.6 (133.3–153.8)	146.6 (136.0–157.2)
Metro	All edible food	9.46% (8.66–10.19%)	9.10% (8.21–10.03%)	135.0 (123.6–145.4)	137.9 (124.4–152.0)
Marion County	All edible food	8.60% (7.63–9.65%)	7.83% (6.88–8.74%)	134.1 (119.0–150.5)	149.0 (130.9–166.3)
Lane County	All edible food	11.27% (9.72–12.82%)	6.90% (5.79–8.07%)	157.6 (135.9–179.3)	106.7 (89.5–124.7)
Deschutes Cnty	All edible food	in "Rest of Oregon"	6.11% (5.02–7.40%)	in "Rest of Oregon"	128.7 (105.8–155.8)
Rest of Oregon	All edible food	9.51% (8.21–10.91%)	9.55% (8.18–10.96%)	170.8 (147.4–195.9)	169.4 (145.3–194.4)

Jurisdiction	Material	2016 Percent	2023 Percent	2016 Lbs/ person-year	2023 Lbs/ person-year
Statewide	All non-edible food	6.10% (5.58–6.65%)	3.17% (2.71–3.74%)	91.6 (83.8–99.9)	53.0 (45.4–62.5)
Metro	All non-edible food	5.94% (5.48–6.42%)	3.41% (3.03–3.80%)	84.8 (78.2–91.6)	51.7 (45.9–57.5)
Marion County	All non-edible food	7.64% (6.28–9.21%)	3.55% (2.69–4.48%)	119.2 (98.0–143.8)	67.5 (51.1–85.2)
Lane County	All non-edible food	6.70% (5.47–8.05%)	2.82% (2.24–3.41%)	93.7 (76.5–112.6)	43.5 (34.6–52.7)
Deschutes Cnty	All non-edible food	in "Rest of Oregon"	2.77% (2.20–3.46%)	in "Rest of Oregon"	58.3 (46.4–72.8)
Rest of Oregon	All non-edible food	5.82% (4.81–6.95%)	2.98% (1.94–4.58%)	104.4 (86.4–124.8)	52.9 (34.4–81.4)

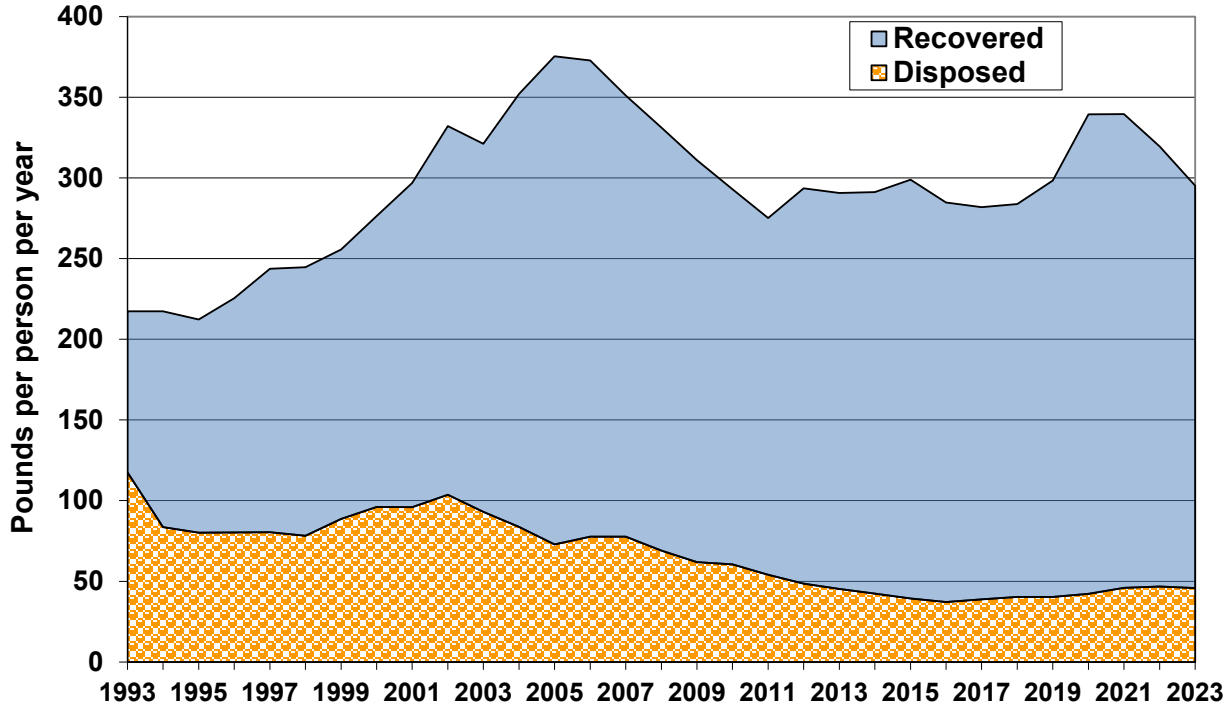
Yard Debris

The Environmental Quality Commission, DEQ's governing body, added yard debris to the then-existing "list of principal recyclable materials" for the Metro wasteshed in the early 1990's, leading to the residential collection of yard debris first in the Metro area and then spreading to much of the populated areas in the rest of the state. The results show clearly in Figure 21, with yard debris recovery increasing rapidly and disposal of yard debris declining.

Table 13. Composition of Oregon yard debris disposed in 2023, with 90% sampling confidence intervals.

Material	Field Results	Contamination Corrected	Clean Tons
Yard Debris	**2.72% (2.32–3.14%)**	**2.74% (2.32–3.17%)**	**98,293 (83,308–113,842)**
Leaves and grass	**1.37% (1.03–1.76%)**	**1.40% (1.05–1.81%)**	**50,178 (37,553–64,799)**
Grass clippings	0.55% (0.33–0.82%)	0.55% (0.32–0.82%)	19,828 (11,587–29,313)
Leaves and weeds	0.82% (0.59–1.11%)	0.85% (0.61–1.15%)	30,351 (21,754–41,331)
All Prunings and Stumps	**1.35% (1.10–1.62%)**	**1.34% (1.07–1.61%)**	**48,115 (38,407–57,917)**
Small Prunings < 2"	1.13% (0.89–1.38%)	1.12% (0.86–1.38%)	40,099 (30,758–49,429)
Large Prunings and Stumps	**0.22% (0.15–0.31%)**	**0.22% (0.15–0.31%)**	**8,016 (5,290–10,971)**
Large Prunings > 2"	0.19% (0.12–0.25%)	0.19% (0.12–0.25%)	6,648 (4,436–8,906)
Stumps	0.04% (0.00–0.09%)	0.04% (0.00–0.09%)	1,368 (99–3,202)

Figure 21. Yard debris per capita recovery and disposal 1993-2023



Wood Waste

Table 14. Composition of Oregon wood waste disposed in 2023, with 90% sampling confidence intervals.

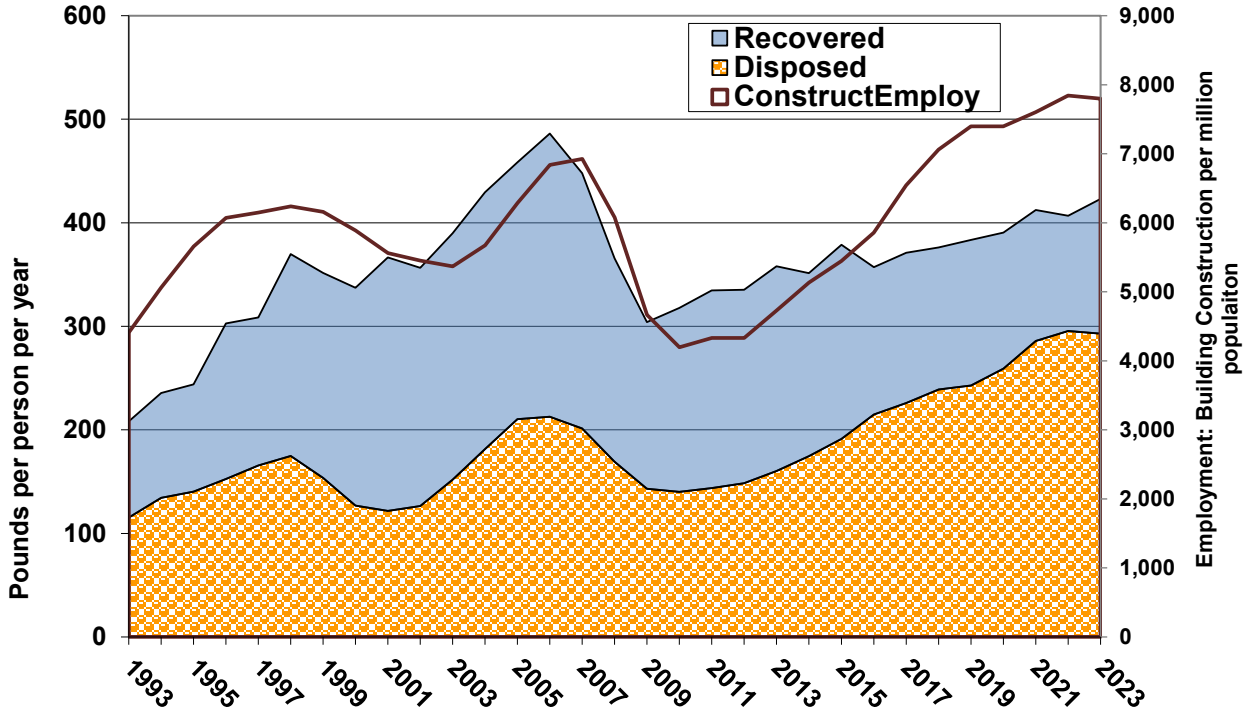
Material	Field Results	Contamination Corrected	Clean Tons
All Wood	**18.26% (17.18–19.39%)**	**17.54% (16.31–18.89%)**	**629,496 (585,591–678,031)**
Unpainted Lumber	**4.86% (4.31–5.44%)**	**4.42% (3.82–5.05%)**	**158,618 (137,098–181,169)**
Reusable unpainted lumber	0.90% (0.67–1.16%)	0.85% (0.61–1.10%)	30,391 (22,071–39,526)
Clean sawn lumber	3.96% (3.48–4.46%)	3.57% (3.04–4.16%)	128,227 (109,234–149,324)
"Hogged Fuel" Lumber	**2.67% (2.30–3.02%)**	**2.59% (2.22–2.94%)**	**93,035 (79,642–105,556)**
Clean engineered wood	2.63% (2.26–2.98%)	2.55% (2.18–2.91%)	91,456 (78,310–104,292)
Cedar shakes/shingles	0.05% (0.01–0.09%)	0.04% (0.01–0.09%)	1,579 (355–3,262)
Painted and Treated Lumber	**5.07% (4.51–5.62%)**	**4.92% (4.32–5.62%)**	**176,552 (154,911–201,855)**

Material	Field Results	Contamination Corrected	Clean Tons
Painted Lumber	**3.92% (3.46–4.35%)**	**3.83% (3.34–4.41%)**	**137,398 (119,770–158,408)**
Reusable painted lumber	0.31% (0.19–0.43%)	0.31% (0.19–0.44%)	11,051 (6,848–15,956)
Other painted lumber	3.62% (3.17–4.06%)	3.52% (3.02–4.09%)	126,347 (108,292–146,985)
Chemically-treated Lumber	1.15% (0.90–1.43%)	1.09% (0.83–1.38%)	39,154 (29,842–49,603)
Wood Pallets	1.86% (1.43–2.29%)	1.86% (1.41–2.30%)	66,696 (50,757–82,738)
Wood crates and other PKG + FSW	0.17% (0.07–0.28%)	0.17% (0.07–0.28%)	6,122 (2,625–10,088)
Wood Furniture	1.82% (1.46–2.26%)	1.79% (1.43–2.23%)	64,170 (51,425–80,195)
Other Wood Products	0.30% (0.23–0.37%)	0.29% (0.23–0.38%)	10,574 (8,126–13,490)
Mixed Wood/Materials	1.51% (1.17–1.88%)	1.50% (1.15–1.86%)	53,728 (41,230–66,841)
All Wood Except Crates, Packaging	*18.09% (17.01–19.23%)*	*17.37% (16.12–18.69%)*	*623,373 (578,808–670,998)*

PKG = Packaging
FSW = Food Serviceware

Wood waste is mainly generated by construction, demolition, and remodeling. Figure 22 show how generation and disposal of wood waste mirrors construction activity as measured by the number of people employed in building construction in the past 30 years. Clearly visible in the graph in the disposal numbers is the economic downturns of 2001 and 2008. The other trend clearly visible is changes in wood waste recovery. Two decades ago, Oregon had huge paper mills such as the paper mill in Newberg that would burn thousands of tons of wood waste to provide the energy needed to make paper. Now many of those mills, including the mill in Newberg, have been closed, and many other industrial facilities have moved to using natural gas instead of wood to fuel their processes. As a result, markets for wood waste are much more limited now, so since 2013 recovery of wood waste has declined while Disposal has steadily increased.

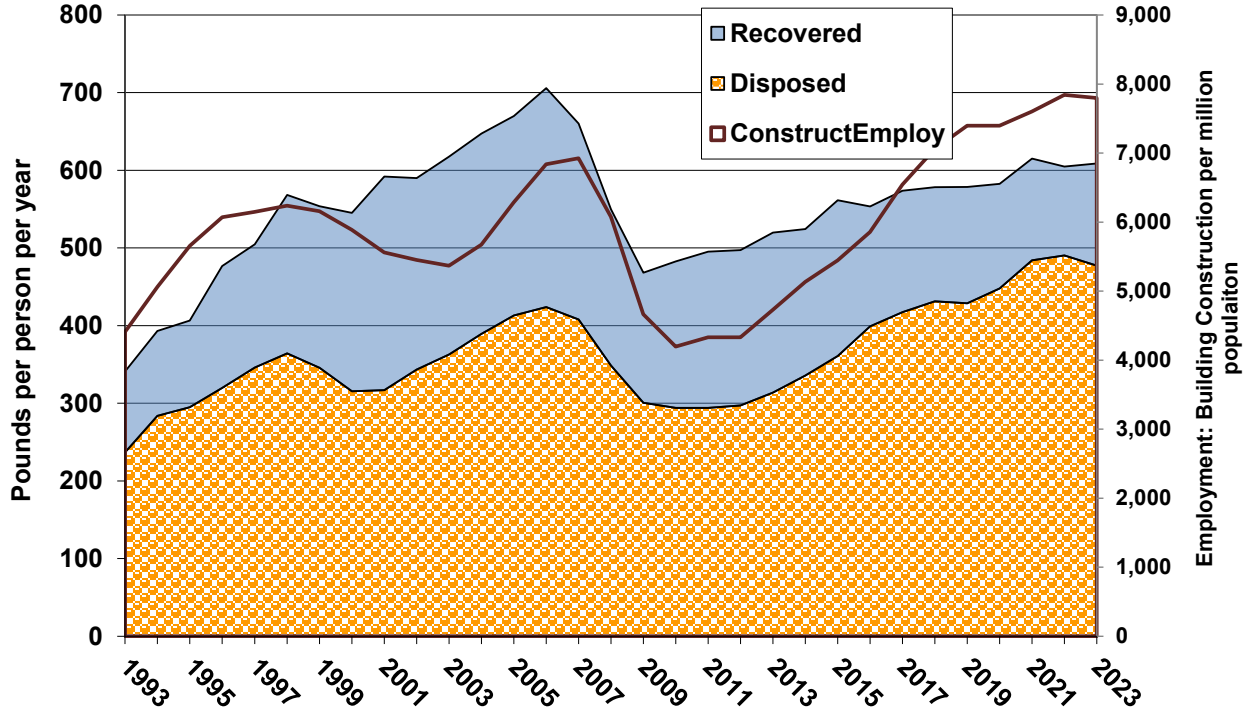
Figure 22. Wood waste per capita recovery and disposal 1993-2023, plus building construction employment.



Construction and demolition materials

Besides wood waste, other common items found in the construction and demolition stream include cardboard, rigid plastic products such as plastic pipe, carpet, asphalt roofing materials, window glass, scrap metal, rock, concrete and brick, gypsum wallboard, fiberglass insulation, and other inorganics. Figure 23 shows the per capita disposal and recovery of these materials combined, as well as employment in the building construction sector. As was the case for wood waste, the generation and disposal of these materials fairly closely mirrors the employment data, with employment lagging behind generation and disposal by a year or so, but recovery of these materials hassince4 about 2014 has not kept pace with the generation of the materials due to declines in markets for wood waste and for post-consumer asphalt roofing materials.

Figure 23. Selected construction material recovery and disposal per capita 1993 - 2023



Additional analysis

As part of this study, DEQ collected data on rigid plastic resin identification beverage container counts. Future updates to this 2023 Oregon Disposed Solid Waste Characterization and Composition report will include analyses on rigid plastic resin identification and beverage containers.

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- Recology Suttle Road
- Republic Services Bend- Ron Shearer, Jeramy Cummings, Forrest Cary, Bradford Miller, Abie Burkus
- Republic Services Woodburn – Luba Toran, Joshua Harvey
- Roseburg Landfill and Transfer Station – Nick Frisinger, Josh Klein
- Sandy Transfer Station
- Short Mountain Landfill, Glenwood Receiving Station, Florence Transfer Station, Veneta Transfer Station – Jeff Orlandini, Tim Cogswell
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- The Dalles Transfer Station
- Thompson's Transfer Station, Newport – Aimee Thompson, Rob Thompson, Ken Riley, Jason Collard
- Tillamook Transfer Station - Justin Weiss
- Toledo Transfer Station – Dave Larmouth

- Troutdale Transfer Station – Tom Nino, Kathleen Borgun
- Tualatin Valley Waste Recovery – John Cunningham
- Valley View Transfer Station, Ashland – Gary Blake, Eric Ahnmark
- Wasco Landfill – Nancy Mitchell, Jim Winterbottom, Christopher Rippy, Heather Bucher
- Waste Management Klamath Falls - Ben Hirenge, Barry Thompson
- Waste Pro Transfer Station, La Grande – Darin Larvik, Amber
- West Coast Transfer Station, Coos Bay – Angela Mott, Bill Richardson
- Willamette Resources, Wilsonville +Republic Services – Steve Baker, Emily Harbison, Sal Navarro Lugo, Kelly Harrod, Lawrence Piete, Michael Hodge, Matt Ketchem
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Appendix

Appendix A: Material Categories

Field sorting categories – disposal site garbage samples

The individual material categories as sorted and weighed in the field are **bold**, preceded by numbers below, and followed by descriptions. “Counted” indicates that counts of the items in this category were recorded (mainly for beverage containers). “Acceptable in curbside” uses the **Metro Curbside List 2010 - 2021** with slight modifications.

Paper

1. **Gable top beverage cartons**. 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. Counted.
    - Excludes cream, half and half boxes (see Polycoat Paper).
2. **Aseptic drink boxes**. Paper/foil/plastic laminate boxes used to package juice and other ready-to-drink beverages. Counted.
    - Excludes aseptic containers used to package non-beverages (see Polycoat Paper).
3. **Wine bag-in-boxes**. Corrugated outer box with a plastic film bag inside used as a container for wine. Counted.
4. **Corrugated cardboard and kraft paper (Old Corrugated Containers)**. Unwaxed kraft linerboard and containerboard cartons and shipping boxes with corrugated paper medium. This category includes boxes shrink-wrapped in plastic and unbleached kraft (brown) paper bags, and pizza boxes.
    - Excludes waxed and plastic-coated cardboard (plastic coating bonded to the cardboard), solid boxboard, and multi-walled bags that are not pure unbleached kraft. Cardboard kitty scratching boxes go in low-grade recyclable paper products (in #15).
5. **Waxed corrugated cardboard**. OCC that is saturated with wax, commonly used for grocery produce boxes.
6. **High-grade office/printing/writing paper (uncoated high grades)**. Printing, writing and computer papers, including mainly thermo-chemical pulps. Both virgin pulp substitutes and high-grade de-ink fibers are included. This category is composed of high-grade paper, which 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 unbleachables, and glue-bound publications.
    - Excludes shredded paper (in #10).

- Excludes scattered sheets such as in residential junk mail (in #9).

7. **Newspaper (Old Newspapers)**. Printed ground-wood newsprint (minimally bleached fiber); commonly referred to as #1 news. This category includes glossy paper typically used in newspaper insert advertisements, if believed to be distributed with newspapers.

8. **Magazines**. Includes other glossy publications such as some catalogs.
   - Excludes newspaper glossy inserts (in #7).

9. **Low-grade printing and writing paper**. This includes junk mail, glossy and uncoated advertising sheets, envelopes (except those included under high-grade and brown unbleached kraft envelopes), construction paper, used envelopes with sticky labels and/or plastic windows, greeting cards, sticky notes, phone books, uncoated groundwood catalogs and advertisements. Includes paper bound with fasteners including spiral-bound notebooks.
   - Excludes shredded paper (in #10).

10. **Shredded paper**. Any type of printing and writing paper which has been shredded into strips or small pieces.

(11. used only in inbound recycling study: shredded paper in a plastic bag)

(12. used only in inbound recycling study: shredded paper in a paper bag)

(13. used only in inbound recycling study: loose shredded paper)

14. **Low-grade packaging paper and recyclable food serviceware paper**. Includes any recyclable packaging paper, paper bags other than brown unbleached bags, and also file folders and packaging tissue. Drug packaging, although excluded from being a covered material under Senate Bill 582, is included here for the disposal site study, but is separated into new categories for the inbound recycling study as discussed in that section.
   - Excludes paper cups and paper plates (in #16).

15. **Low-grade recyclable paper products**. 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 or food processor.

16. **Polycoated paper, freezer boxes, cups and take-out containers**. 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 and cream cartons. Change from 2016: 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.

17. **Hard-covered books**. Books with hard covers. Excludes paperbacks.

18. **Compostable nonrecyclable paper products**. Facial tissue, paper towel, napkins. Does not include any covered products under SB 582. Does not include molded paper plant pots.
    - Excludes recyclable paper. Excludes all covered products under Recycling Modernization Act - SB582 from 2021.

19. **Compostable nonrecyclable paper packaging, printing and writing paper, and food serviceware.** Includes molded paper flowerpots.

20. **Non-compostable, non-recyclable paper products**. Includes only paper products that are not covered products under RMA (SB 582). Examples include playing cards, wallpaper, solid paper gameboards, photos, carbon paper, products made from a mixture of paper and other materials where paper is the majority or plurality of the weight.

21. **Non-compostable, non-recyclable paper packaging, food serviceware, and printing and writing paper**. Paper not included above that is not easily recyclable in the United States, and which is not acceptable in composting programs, and which generally is a covered material under RMA (SB 582). Includes mixed paper and materials packaging and food serviceware, old blueprint paper made with the ammonia process, juice and oil cans, foil containing wrapping paper and cards, foil lined fast food papers, microwave paper food trays used in frozen dinners, individual cigarette packages, paper with large thick plastic windows, paper containers that held hazardous products, thin bound reports with plastic covers. Paper-bound 3-ring binders go here, but the paper contained goes in the appropriate grade.

    (22. used only in inbound recycling study – recyclable “exempt” paper packaging and printing/writing paper.)

    (23. used only in inbound recycling study – non-recyclable “exempt” paper packaging and printing/writing paper.

24. Reserved

Plastics (see additional component information)

25. **Deposit beer and soft drink plastic beverage bottles**. Any beverage container up to 3 liters in size with an Oregon deposit for beer, soft drink, carbonated water and carbonated juice. Counted.
    - Does not include soft drink syrup containers.

26. **Deposit plastic water bottles**. Only includes still waters and flavored waters added to the bottle bill as of 2009, up to 3 liters in size. Counted.

27. **Other deposit plastic beverage bottles**. This include all beverages that became deposit containers in 2018 and 2019, that are at least 4 oz in size and no greater than 1.5 liters. Kombucha is included in any size up to 3 liters. Examples include juices, energy drinks, teas, and coffee.

- Does not include beer, soft drink, or water plastic bottles.
- Does not include distilled liquor, wine, dairy or plant-based milks, and infant formula that is a container.
- Does not include pouches or cups. Counted.

28. **No-deposit plastic beverage bottles (RPCs)**. 8-oz to 5 gallons plastic beverage bottle *without* an Oregon deposit. This includes dairy and plant-based milks, wine, distilled liquor, and infant formula. It also includes juice, tea, or other no-deposit beverages in bottles larger than 1.5 liters, plus beer, soft drink, and water bottles that are over 3 liters in size or that are from out-of-state that are not marked with the Oregon refund value. Counted.
    - Does not include cream, half and half, syrups, and powdered beverages. “Beverage” includes only ready-to-drink beverages, not concentrates or flavorings.
    - Small juice cups (with foil lids) go in “Other Rigid Plastic Packaging” (in #38).
29. **No-deposit very small plastic beverage bottles**. Plastic bottles less than 8 oz that hold ready-to-drink beverages. Mainly small liquor bottles. Counted.
30. **No-deposit very large plastic beverage bottles**. Plastic bottles greater than 5 gallons that hold ready- to-drink beverages. Mainly large water bottles, plastic beer kegs. Counted.
31. **Other plastic bottles**. All non-beverage bottles 8 oz-to-5 gallons used for non-beverage food, medicines, vitamins, hair and bath products, laundry supplies, antifreeze, oil. Also include plastic jars with necks narrower than the body (blow-molded plastic).
32. **>2 Gallon to 5 Gallon buckets, flowerpots**. Large plastic buckets and flowerpots or other rigid plastic containers (non-bottle) larger than 2 gallons up to 5 gallons in size.
33. **Other plastic tubs, pails acceptable in curbside**. Tubs, pails (buckets), flowerpots 4" or larger, from 8 oz up to 2 gallons in size made from plastic and meeting the definition in Oregon Revised Statute 459A.650 for Rigid Plastic Container.
    - Does not include trays or clamshells.
34. **Other plastic tubs, and trays that meet Rigid Plastic Container definition but are not acceptable in curbside and all cups 8 oz or larger**. 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., all plastic clamshells including take-out containers, all plastic cups that are 8 oz or larger, and flowerpots <4" that are 8 oz. or larger, foam coolers 5 gallons or less used for packaging.
    - Excludes tubs/pails that are acceptable in curbside, or any bottles.
    - Excludes lids, unless the lid is attached or is itself a rigid plastic container.
    - Excludes flexible tubes like bathroom caulk, toothpaste.
    - Excludes blister-pack (Plastic dome adhering to a paper card. A clamshell

with a paper card inside capable of holding 8 oz or more is a rigid plastic contain and not a blister pack).

35. **Small plastic tubs acceptable in curbside**. Includes the plastic tubs and yogurt containers that are at least 6 oz in size, but less than 8 oz.

36. **Bulky plastic packaging**. Includes all-plastic large crates, totes, and containers except beverage bottles larger than five gallons. Also includes large non-decorative flowerpots used for sale of large plants if over 5 gallons in size. Minimum size for most bulky packaging is equivalent in volume to just larger than a 2-gallon bucket (for non-rigid plastic containers) or just greater than a 5-gallon bucket (for containers). Also includes large lids for storage tubs and 5-gallon buckets.
    - Excludes all RPCs.
    - Excludes block foam plastic packaging (goes in block foam plastic packaging (#37).
    - Excludes beverage bottles larger than five gallons (in #30).
    - Excludes plastic pallets (in #39).

37. **Block foam plastic packaging Block foam plastic regardless of resin, plus polystyrene (or other resin) foam coolers larger than 5 gallons.**
    - 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 clamshells, cups 8 oz or larger, foam coolers 5 gallons and smaller used as packaging and any other foam container meeting the definition of “rigid plastic container” goes in 34.
    - Foam dishware, food trays, and cups smaller than 8 oz go under 41 Rigid Plastic Food Serviceware.
    - Foam peanuts go under 38 Other Rigid Plastic Packaging.
    - Foam housing insulation board, foam marine float, and foam toys or other products go under #40 other rigid plastic products regardless of size.

38. **Other rigid plastic packaging.** Includes plastic packaging that does not meet the definition of rigid plastic container, or bulky plastic packaging (36), or block foam plastic packaging (37) This includes expanded polystyrene peanuts and food trays that are not rigid plastic containers (i.e. holding less than 8 oz). 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.
    - Excludes all rigid plastic containers.
    - Excludes block foam (#37).
    - Excludes bulky plastic packaging as defined in #36.
    - Excludes foam insulation board (#40) and other products.

39. **Bulky rigid plastic products**. Includes larger all-plastic items such as plastic garbage cans, toys, bins, baskets, lawn furniture, Minimum size about the

equivalent of just larger than a 2-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 #40 Other rigid plastic products, regardless of size).

40. **Other rigid plastic products not food serviceware**. 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 (its own category).

41. **Rigid plastic food serviceware excluding rigid plastic containers and all cups 8 oz or larger**. Dishware and utensils, including plastic cups that are smaller than 8 oz, cup lids, plates, plastic straws, stirrers, small sauce containers and their lids.
    - Excludes clamshells that meet the definition of “rigid plastic container” even if used for take-out.
    - Excludes plastic cups 8 oz or larger.

42. **Rigid Mixed plastics/materials packaging and food serviceware**. Packaging and food serviceware whose predominant material is plastic but is combined with other material. Examples include paint cans with metal rims and blister-pack that is mostly plastic but with firmly attached paper or foil. Note that much blister-pack is more paper than plastic.

43. **Rigid Mixed plastics/materials products**. 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.

(44. used only in inbound recycling study: “Exempt” recyclable rigid plastic containers)

(45. used only in inbound recycling study: “Exempt” non-recyclable rigid plastic containers) (46. used only in inbound recycling study: “Exempt” recyclable small containers)

(47. used only in inbound recycling study: “Exempt” non-recyclable small containers)

48. **Plastic beverage pouches**. Includes ready-to-drink beverages only. Counted.

49. **Plastic grocery/merchandise bags**. Single-use plastic shopping bags and thicker solid polyethylene bags used to carry merchandise out of a store. Includes dry cleaner bags intended for one-time use. Include even if used as a garbage bag. Count only in inbound recycling study.
    - Does not include produce bags (in #50 if polyethylene, #53 if not).

50. **"Recyclable" polyethylene film plastic packaging and food serviceware**. Includes newspaper bags, bread bags, produce bags (excluding biodegradable

bags), product wrap (for example used on paper towels, tissue, diapers, and water bottles), zip-close bags, pallet-wrap, shrink wrap, fertilizer/peat/feed bags, furniture and mattress wrap, bubble wrap, woven lumber wrap, roofing material wrap, insulation wrap, commercial bags and liners, commercial parts packaging, building wrap, and parts bags.

- Excludes plastic grocery/merchandise bags, any film that is not polyethylene, biodegradable bags, any film that is laminated to other materials (limited tape/labels are OK), any bag used as a garbage bag (can liners and tied-off garbage bags), bags contaminated with food and other sticky/contaminating materials on the inside, frozen vegetable bags, stand-up pouches, and plastic sheeting used for ground cloths or masking, if contaminated. Count a subsample only in inbound recycling study. (change from 2016 – exclude polypropylene film).

51. **"Recyclable" polyethylene film plastic products**. Includes clear and white polyethylene sheeting, hay sleeves and silage bags. Count a subsample only in inbound recycling study.

52. **Plastic garbage bags**. Includes any bag that was originally sold to as a trash can liner or to hold garbage. Count a subsample only in inbound recycling study.
    - Does not include bags originally sold/provided for other purposes that are used for garbage. These go in #53.

53. **Other nonrecyclable film plastic packaging and food serviceware**. 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. Count a subsample only in inbound recycling study.

54. **Other nonrecyclable plastic film products**. Includes polypropylene woven tarps, black plastic sheeting, shower curtains, plastic used as ground cover, plastic gloves (non-medical) Count a subsample only in inbound recycling study.

(55. used only in inbound recycling study: “Exempt” plastic film packaging. Count a subsample only in inbound recycling study).

(56-60: reserved)

Other organic wastes

“Organic” used in the “carbon-containing” (or burnable) sense.

Yard Debris: natural vegetative material

61. **Grass clippings**. Grass clippings and leaves can be weighed together, and the weight allocated by estimate to grass vs. leaves/weeds. Grass does not include sod (goes soil/dirt/sand).

62. **Leaves/weeds**. Herbaceous plant material excluding grass clippings.

63. **Small prunings less than 2" diameter**. Natural woody material from trees, plants, and shrubs. Could be chipped with a small chipper for home composting.

64. **Large prunings more than 2" in diameter**. This category is composed of trees and large branches greater than 2" diameter and small stumps/roots less than 1' in diameter and less than 100 pounds. Not easily home-composted due to its size, weight and composition.

65. **Stumps**. Stumps too large to be ground by most commercial composters due to size, without use of special stump-splitting devices (greater than 1' diameter or 100 pounds).

66. **Reusable dimensional lumber - unpainted**. Unpainted solid sawn or engineered lumber products at least 0.75" thick by 3.5" wide, and at least 4 feet long, which is clean (nails and minimal fasteners OK, with more allowed in larger pieces) and not rotted, pest-infested, or damaged, and without significant dirt and no other materials being firmly attached such as wallboard. Also includes at least half-sheets of plywood or oriented strand board at least 3/8 inch thick in good condition.

67. **Clean solid sawn lumber**. Unfinished, unpainted and untreated solid sawn dimensional lumber or wood.
    - Excludes cedar shakes, shingles, reusable dimensional lumber, plywood, oriented strand board, and all other engineered lumber products, and pallets/crates.

68. **Clean engineered wood**. Unfinished, unpainted and untreated engineered wood including plywood, oriented strand board, particleboard, medium density fiberboard, high-density hardboard (pegboard), composite siding, TJI joists. cross-laminated timber, glue-lam beams, laminated veneer lumber, laminated strand lumber/timber strand, finger-jointed lumber or trim, veneered or laminated wood and paneling, melamine coated wood, etc.
    - Excludes reusable dimensional lumber and furniture.

69. **Reusable dimensional lumber - painted**. Same as unpainted reusable dimensional lumber, but is primed, painted, or stained (and not chemically treated). To be included, the entire paint surface must be completely adhering to the wood. No peeling, chalking, flaking, alligatoring, or blistering paint.

70. **Other painted lumber**. Includes any lumber (solid sawn or engineered) that is painted or primed, excluding reusable dimensional lumber, furniture, chemically treated lumber, and mixed wood/materials (split from chemically treated lumber in 2000).

71. **Chemically treated lumber**. Pressure-treated or creosoted lumber or wood treated for either rot or fire resistance.

72. **Wood pallets**. Dimension lumber material used as pallets.

73. **Wood crates and other wood packaging and wood food serviceware**. Includes wood/wire crates with thin slats, if not mixed with plastic and other

materials. Also includes woody bamboo plates, and wood popsicle sticks, chopsticks and stirrer sticks and the wood toothpicks that hold sandwiches together.

74. **Cedar shakes or shingles**. Cedar roofing, excluding tar paper and other non-wood components.

75. **Wood furniture**. Includes desks, chairs, bureaus, and other furniture items made from wood.

76. **Other wood products**. Includes pencils, coat hangers, and other objects made of wood that are not used for packaging or construction or as furniture. Does not include wood food serviceware.

77. **Mixed wood/materials**. Mostly wood items combined with plastic, metal, or other materials. Excludes items that are better included in another category.

(78-80: reserved)

Food

81. **Non-packaged bakery goods**. Includes bread, rolls, cake, crackers, donuts, unpackaged dough. "Non- packaged" includes open bags and boxes (easily dumped) but does not include any sealed packaged items.

82. **Packaged bakery goods**. "Packaged" includes sealed containers but not open bags or boxes that are easily dumped.

83. **Non-packaged "edible" other vegetative food**. "Vegetative" contain no animal products other than traces. "Edible" includes any food, even if spoiled, that was originally produced to be eaten.

84. **Non-packaged "non-edible" other vegetative food**. "Non-edible" is limited to items associated with food that are universally accepted as not being edible, such a fruit pits, corn husks, carrot tops, thick peels from fruit, and coffee grounds. For fruits and vegetables that are eaten by many with their peels (such as apples, carrots, and potatoes), peels are considered "edible" even when purposefully removed and discarded.

85. **Packaged other vegetative food.**

86. **Non-packaged "edible" meat, eggs, and dairy**. Non-packaged "edible" food that is mainly meat, animal grease, eggs, or dairy. Excludes bones, shells, and other animal products that are fairly universally accepted as not being edible.

87. **Non-packaged "non-edible" animal food-related products**. Includes only bones, shells, gristle, and other animal products that are fairly universally accepted as not being edible.

88. **Packaged meat or eggs.**

89. **Packaged dairy.**

90. **Mixed unpackaged foods**. Unpackaged foods that were originally prepared as mixtures, that are mainly vegetative by weight, but that contain more than a

trace of animal products. Examples include pizzas, pasta with meat sauce, stir-fries with pieces of egg or meat.

91. **Mixed packaged foods**. Packaged foods that are mainly vegetative by weight but that contain more than a trace of animal products.

Other organics (carbon-containing, not "organic" from a biological standpoint)

92. **Disposable diapers**. Disposable diapers, including fecal materials contained within. Cloth diapers are to be sorted under textiles.

93. **Clothing textiles**. Include clothing made only from fabric materials, including natural and synthetic fibers. (cottons, wools, silks, woven nylon, rayon, polyesters, and other materials). Excludes other textiles such as sheets, towels, and curtains, and excludes items such as gloves, belts, and shoes.

94. **Other textiles excluding clothing**. Towels, sheets, curtains, and other material made of fabric (natural and man-made textile materials).
    - Excludes non-fabrics such as dryer sheet, "Swiffer" duster refills – go under "mixed".

95. **Mixed textiles/materials**. Include textiles that have significant amounts of non-textile components, plus shoes, belts, gloves, and similar clothing articles that may have insignificant amount of textile material. Also includes textile-like materials that are not regular fabric, such as most twine, string, rope, dryer sheets and Swiffer duster refills.
    - Polypropylene (baler) twine goes in "other film plastic". Polypropylene rope goes here.

96. **Carpet**. Synthetic and natural fibers attached to a backing intended to be affixed to a floor as a floor covering.
    - Excludes rugs (loose floor coverings) and carpet pads.

97. **Rugs**. Synthetic or natural fibers attached to a backing intended to cover part of a floor without being affixed.
    - Excludes carpet and carpet pad.

98. **Polyurethane foam carpet/rug pads.**

99. **Other carpet/rug pads**. Includes fiber and other pads
    - Excludes polyurethane foam carpet pad, rubber padding (other rubber), and the carpet or rug itself.

100. Reserved

101. **Automotive/truck tires**. Whole tires meeting the definition in ORS 459.705.

102. **Other tires**. Bicycle tires, off-road vehicle tires, cart tires, or other tires not meeting the definition in ORS 459.705. Also included shredded automotive tires.

103. **Other rubber products**. Includes toys, inner tubes, rubber mats, rubber gloves, rubber carpet padding.

104. **Asphalt shingles and tar roofing paper - recyclable**. "Recyclable" asphalt roofing includes tarpaper and regular 3-tab roofing architectural-grade composition shingles, and roll roofing.

105. **Asphalt and tar roofing paper – nonrecyclable**. "Nonrecyclable" asphalt roofing includes such things as built-up asphalt roofing commonly used on flat-roofed commercial buildings.

106. **Mattresses and box springs**. Mattresses, box springs, and futons (excludes water beds) Separate counts for mattresses, for foundations including box springs, and for futons.

107. **Furniture and furnishings**. Includes mixed-material reusable and non-reusable household items that are large such as chairs and tables.
    - Excludes furniture made from a single material (all metal, all plastic, all wood).

108. **Paper composite ceiling tiles.**

109. **Compostable other organics**. Carbon-containing easily compostable wastes not otherwise categorized, including sawdust and organic fines, pet food.

110. **Non-compostable other organics**. Carbon-containing wastes not otherwise categorized including wax, linoleum, vacuum bags, charcoal, cigarette butts, hair, dryer lint, disposable hygiene products, soap, gel pads, and dead animals.

Glass

Container glass

111. **Deposit beer, soft drink, water glass bottles**. Oregon deposit beer, soft drink, carbonated water, carbonated juice, and still water. Counted.

112. **Other deposit glass beverage bottles**. This include all beverages other than beer, soft drink, water, distilled liquor, wine, dairy or plant-based milks, and infant formula that is a container at is at least 4 oz in size and no greater than 1.5 liters, plus kombucha in sizes from 0 up to 3 liters. Examples include juices, energy drinks, teas, coffee, and kombucha. Counted.

113. **Non-deposit beverage glass bottles**. Wine, liquor, and milk/milk substitute glass bottles. Counted.

114. **Other container glass**. Includes glass jars, ketchup/mustard bottles, baby food jars, pickle jars and mayonnaise jars, medicine and other non-beverage bottles, and other container glass that is not a beverage bottle.

    (115. Used only in inbound recycling study: “Exempt” glass containers)

Window and other glass

116. **Flat window glass**. Excludes auto glass and mirrors.

117. **Other nonrecyclable glass**. This category includes products such as incandescent light bulbs, glass plates and cups, auto and cooking ware glass and mirrors, but excluding ceramics. This glass is not accepted by glass beverage container manufacturers for recycling, although some can be recycled into other uses.
    - Excludes fiberglass insulation (166).
    - Excludes fluorescent tubes (181) and compact fluorescents (182).

118. Reserved

119. Reserved

Metals (and appliances)

120. **Deposit beer, soft drink, water aluminum cans**. Oregon deposit beer, soft drink, carbonated water, carbonated juice, and still water. Counted.

121. **Other deposit aluminum beverage cans**. Examples include non-carbonated juice, tea, and other deposit beverages except deposit beer, soft drink, and water (above)
    - Excludes wine, liquor, dairy and milk substitutes. Counted.

122. **Other aluminum beverage cans**. No Oregon deposit. Includes wine, liquor, milk, and milk substitutes, and any other beverage that does not have a refund value in Oregon. Counted.

123. **Other aluminum containers and foil**. Aluminum pet food cans, foil-formed trays/containers, and foil.

124. **Other aluminum curbside acceptable**. Includes all other aluminum materials such as cookware and scrap, but exclude material not accepted in a curbside program such as items longer than 18" or weighing more than 10 pounds.

125. **Larger aluminum not acceptable curbside**. Includes other aluminum materials including furniture, house siding, cookware, and scrap that cannot be put in curbside programs due to being more than 18" long or weighing more than 10 pounds or not being pure metal.

126. **Steel/bimetal deposit beer, soft drink and water cans**. Oregon deposit usually imported beer (rare). Counted.

127. **Steel/bimetal other deposit beverage cans**. Juice, tea, and other beverages with deposits. Does not include beer, soft drink, or water (above) or wine, liquor, dairy and milk substitutes (no deposit). Counted.

128. **Steel/bimetal other beverage cans**. Wine, liquor, dairy or milk substitutes, or other beverages not covered under the bottle bill. Counted.

129. **Other tinned cans**. Predominantly steel cans (some with tin or enamel coatings) used to hold food, and non-food items. (Prior to 2005 food and non-food tin cans were measured separately.)

130. **Other non-ferrous metals curbside acceptable**. Metals that are not materials derived from iron, including copper, brass, bronze, lead, pewter, zinc, "stainless steel", and other metals to which a magnet will not adhere.
    - Excludes materials proposed not to be acceptable in curbside recycling containers due to being longer than 18 inches or weighing more than 10 pounds or not being pure metal.

131. **Other non-ferrous not acceptable at curbside**. Includes non-ferrous metal pieces longer than 18" or weighing more than 10 pounds or not being pure metal, such as insulated copper wire or incandescent holiday light strings.
    - Light Emitting Diode holiday light strings go in #148

132. **Other ferrous metals curbside acceptable**. Ferrous and alloyed ferrous scrap materials derived from iron, including household, industrial and commercial products not containing significant contaminants. This category includes scrap iron and steel to which a magnet adheres. Includes all-steel furniture such as bed frames. Does not include appliances, food cans, or other ferrous metal items listed elsewhere.
    - Excludes ferrous metal that may not be acceptable in future curbside programs due to being longer than 18", heavier than 10 pounds, or not being pure metal.

133. **Other ferrous metals not curbside-acceptable**. Ferrous and alloyed ferrous scrap materials derived from iron, including household, industrial and commercial products not containing significant contaminants. Includes only ferrous metal not acceptable in curbside programs due to being longer than 18", heavier than 10 pounds, or not being pure metal.
    - Does not include appliances, food cans, or other ferrous metal items listed elsewhere.

134. **White goods**. This category is composed of discarded stoves, washer, dryers, refrigerators and other large household appliances.

135. **Oil filters**. Used oil filters. Counted. (Moved here from Household Hazardous Waste category.)

136. **Empty or non-hazardous aerosol cans**. Note - aerosol cans still containing hazardous materials such as oil-based paint or pesticides are included in the "hazardous materials" categories. Cans that by weight are more than 50% of a non-hazardous product should be classified in that product category.

137. **Mixed ferrous/non-ferrous curbside acceptable**. Items that are mainly metal, but a mixture of ferrous and non-ferrous, such as electric motors, and small gas engines.
    - Excludes metal not acceptable in curbside programs due to being longer than 28", heavier than 10 pounds, or not being pure metal.

138. **Mixed ferrous/non-ferrous not curbside-acceptable**. Items that are mainly metal, but a mixture of ferrous and non-ferrous, such as electric motors, old lawnmowers, engines and other metal items that weigh more than 10 pounds, are larger than 18", or are not pure metal.

139. **Mixed metals/materials**. 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. Generally, if an item is at least 70% ferrous metal or 50% copper or aluminum, it should be classified in one of the recyclable metal categories, not here.

(140. Used only in inbound recycling study: “Exempt” metal packaging)

Computers, brown goods, other small appliances

141. **Computers monitors**. This category includes both flat screen and cathode ray tube type computer monitors but excludes devices with a 4-inch or less diagonal screen. (2005 study excluded flat screen monitors).

142. **Computer main Central Processing Units**. Includes computers, laptops, cell phones only with a screen larger than 4” diagonal, and tablets (excluding tablets and phones with a 4-inch or less diagonal screen, and excludes separate monitors and peripherals such as mice, keyboard, and printers. Count of cell phones with a screen larger than 4” diagonal.

143. Reserved

144. **Printers**. Desktop printers including all-in-one devices that function as printers, but does not include copiers, scanners, or other separate devices.

145. **Computer mice and keyboards**. Includes only computer mice and keyboards and their cords, and no other peripherals such as separate speakers or video cameras.

146. **TVs**. Includes Cathode Ray Tubes, flat screen, and projection TVs.

147. **Microwaves.**

148. **LED lights**. New category Includes all forms: bulbs, LED holiday lights, LED grow lights.

149. Reserved

150. Reserved

151. **Other consumer electronics**. Includes other computer peripherals such as separate computer speakers and scanners, and other electronic devices such as VCR and DVD players, radios, stereos, calculators, digital cameras, computer game systems, cell phones with a 4-inch or less diagonal screen, telephones and other devices with circuit boards. Count of cell phones with a screen 4” diagonal and smaller.
    - Excludes microwaves, computers, TVs, printers, mice, and keyboards – all in categories above.

152. **Non-electronic small appliances**. Includes fans, hair blowers, can openers, kitchen blenders, and shop tools. These may contain small electronic components such as digital readouts and controls, and often will have electric motors, but do not have significant amounts of circuit-board electronics.

153. **E-Cigarettes and vapes.**

(154 to 160: reserved)

Other inorganics

161. **Rock, Concrete, and Brick**. Generally, particle sizes of 0.4” or greater.
162. **Soil, dirt, sand**. Includes sod.
163. **Pet litter, animal feces.**
164. **New gypsum wallboard**. Unpainted scrap and excess gypsum wallboard from new construction or remodeling.
165. **Old gypsum wallboard**. Old painted or other demolition gypsum wallboard.
166. **Fiberglass insulation.**
167. **Other inorganics**. Includes plaster, ash, ceramics, china, and porcelain. Does not include items that contain significant amounts of carbon.
168. Reserved
169. Reserved
170. **Medical waste excluding sharps**. Includes, tubing, gauze, blood-containing, and similar materials, including urine-filled roadside bottles). Also includes medical face masks and COVID test materials. Does not include drugs covered by the Drug Take-back Program (separate category under hazardous materials) Bags and containers with medical waste are not sorted further. Thus, other non-medical waste is weighed as medical waste if it is in a bag or container with other apparent medical waste.
171. **Sharps**. Needles, syringes, lancets, auto-inject pens, and connection needles. Can estimate both count and weight if advisable for safety reasons. Counted or estimate.

Hazardous materials (see additional component information)

172. **Lead-acid batteries**. Only the large batteries from vehicles, boats. Does not include SSLAs (small, sealed lead-acid batteries) sometimes used in camcorders and other electronic equipment.
173. **Dry-cell batteries**. Includes regular alkaline, NiCad, lithium, and similar batteries, and small sealed lead- acid batteries (changed from previous studies). Includes rechargeable flashlights.
174. **Latex paint**. All water-based architectural paints and stains. Includes dried paint in cans.
175. **Oil-based paints**. All oil-based architectural paints and stains. Includes dried paint in cans.
176. **Motor oil**. Includes drain oil, transmission fluid and similar petroleum hydraulic oils.

177. **Other flammables**. Thinners, solvents, fuels (diesel, gasoline, kerosene, lighter fluid), flammable/combustible adhesives, sealants, and strippers, flammable furniture polish, nail polish, flammable hair spray, oil-based hobby/spray paints, lighters.
    - Does not include oil-based architectural paints. (#175).

178. **Pesticides/herbicides**. Chemical products designed/intended to kill plants and/or animals, including fertilizers that contain pesticides, such as "Weed and Feed". Includes mothballs.
    - Does not include fertilizers without pesticides, or antimicrobial cleaners.

179. **Corrosive cleaners**. Any cleaning product with the words "corrosive" or "caustic" or other evidence of strong acid or base content. Could include pool and spa chemicals, household cleaners and disinfectants, oven cleaner, drain cleaner, tarnish remover, strippers, floor and carpet cleaners, etc.

180. **Asbestos.**

181. **Fluorescent light tubes**. Includes individual separate light tubes. Does not include light fixtures/ballasts.

182. **Compact fluorescent lights**. This includes small fluorescent fixtures that are sold as complete units, with both the ballast and tube attached.
    - Does not include regular (full-sized) ballasts commonly used with full-sized fluorescent tubes.

183. **Other mercury-containing items**. Includes mercury thermometers, thermostats, dairy manometers.

184. **Live ammunition and explosives**. Unused bullets and fireworks. Includes flares, dynamite and C-4.

185. **Compressed gas cylinders**. Includes all intact gas cylinders (even helium) including fire extinguishers.
    - Cylinders that are cut in half or have a hole and thus are clearly empty are put in "other ferrous scrap metal" instead of here.

186. **Drugs covered by the Drug Takeback Program**. Includes generally both prescription drugs and non- prescription drugs, as defined in Oregon Revised Statute 689.505, but excludes homeopathic drugs, products that are regulated both as a cosmetic and a drug, and other specified health products. This category includes the drugs themselves, and not the packaging. Drug packaging typically has a “Drug Facts” section and list “Active ingredients”. Examples of non-prescription drugs include sunscreens, pain- relief medicines, laxatives, anti-diarrheal medicines, antihistamines, and many others.
    - Does not include vitamins or supplements, which typically have “Supplement Facts” on the label.
    - Does not include herbal-based remedies or homeopathic drugs, products or remedies, or drugs marketed for use as animal medicines (note that these products with have “Drug Facts” and “Active ingredients” on the labeling but homeopathic drugs may be labeled as “homeopathic” and animal medicines will

be marketed for animals).

- Does not include nonprescription drugs that are also regulated as cosmetics, such as dandruff shampoos, fluoride and anticavity toothpastes, deodorants that are also antiperspirants, and moisturizers and make-up with sun protection claims.

187. **Other hazardous chemicals**. Includes only chemicals that show hazardous characteristics other than those specified above. Includes acids and bases that are not cleaners, corrosive water-based paint strippers, toxic substances, oxidizers, liquid bleach, antifreeze, brake fluid, equipment hydraulic fluid. Include ionizing smoke detectors (lightly radioactive).
    - Does not include non-hazardous chemicals such as detergents, vegetable oils, or non-hazardous inorganic salts (such as Epsom salt), fertilizers that do not contain pesticides, water-based adhesives and sealants (such as latex caulk), water-based paints (other than architectural paints) such as tempera and watercolors, bacterial or enzyme-type drain cleaners.

188. **Unknown hazardous**. Unlabeled chemicals believed to be hazardous but not identifiable.

Beverage categories – used in counts

1. **Beer**. Any malt beverage that would be required to carry a 10-cent refund value if sold in Oregon. Includes malt coolers and hard lemonade for those brands that require a deposit.

2. **Soft drink**. Carbonated non-alcoholic and non-malt-based beverage such as sodas that would be required to carry a 10-cent refund value if sold in Oregon. Carbonated sports drinks, waters, and juices are included in this category, but uncarbonated versions of these beverages are not.

3. **Still water and flavored water**. Non-carbonated water that carries a deposit in Oregon as of 2009. Carbonated water is included in soft drinks.

4. **Juice/tea/sports/coffee**. Includes all other beverages covered under the Oregon Bottle Bill as of 2021, excluding beer, soft drinks, and waters. Includes non-carbonated juices, teas, coffees, sports drinks, kombuchas, and any other beverage that carries a deposit and is not in one of the above 3 categories. These beverages became deposit by 2018 and 2019. Does not include wine, liquor, milk or milk substitutes.

5. **Liquor**. Distilled alcoholic spirits (no deposit required).

6. **Wine**. Includes wine and champagne. Alcoholic. (Non-alcoholic wine would go under "juice"). Does not include distilled liquor or malt beverages such as malt coolers.

7. **Milk**. Beverage containing dairy where milk is the main ingredient. Includes eggnog. Does not include cream or half-and-half as these are not ready-to-drink beverages. Does not include soy milk or rice milk as these are not dairy products.

8. **Milk substitutes**. Includes beverages such as soy, rice, oat, hemp, or similar milks.
9. **Other**. Includes infant formula, diet beverage meal drinks such as slim-fast. Only no-deposit containers.

Counts are to be done for each beverage category, separately for glass, plastic, aluminum, steel.

Resin categories for rigid plastic containers for contamination analysis

After sorting, rigid plastics are to be sorted and weighed by resin in the following four material categories:

1. Rigid plastic container bottles and blow-mold jars
2. Rigid plastic container tubs, injection mold, thermoform, or other molding
3. Bulky rigid plastic
4. Other rigid plastic

The plastic in each of the categories would then be classified into at least the following categories:

- 1 Polyethylene Terephthalate. PET
- 2 High-Density Polyethylene. HDPE
- 3 Polyvinyl Chloride. PVC
- 4 Low-Density Polyethylene. LDPE
- 5 Polypropylene. PP
- 6 Polystyrene. PS (not foam)
- 6 Polystyrene. PS (PS foam)
- Polylactic Acid. PLA (part of #7)
- Nylon
- Acrylonitrile Butadiene Styrene. ABS
- Teflon/fluorinated polyolefins
- Unknown

For rigid plastic containers, each resin should be split into 2 categories: blow-mold (bottles) and other molding (injection, thermoform). For other rigid plastics, the resin categories for bulky rigids should be weighed separately from those of other rigid plastics.

Identifying hazardous material

The labels of products which may contain dangerous material use key words like:

- Flammable
- combustible
- corrosive
- irritant
- inhalation hazard
- contact hazard
- poison
- explosive
- reactive
- toxic
- radioactive

They may show cautionary symbols, such as the “skull and crossbones”, “Mister Yuk”, or other universal symbols of warning.

Products packaged for home use in the U.S. are generally not required to warn of potential chemical hazards. When packaged for commercial distribution (used by business and industry), the same product must disclose the chemical hazards contained within, if any.

If a chemical can readily burn and can become a fire hazard, it should say so on the label. Transportation regulations are the main reason for this. A flammable liquid has a flash point of 141°F (60.5°C) or lower, and will ignite more readily than a combustible liquid, which has a flash point between 141°F and 200°F (93°C).

Non-hazardous products often use water, rather than oil, alcohol, or a chemical solvent as their base. This normally renders them non-flammable. Water-based products may be labeled to “protect from freezing” or “clean up with soap and water”.

However, water is also the vehicle for a vast number of products containing dangerous chemicals. Instructions to wear gloves or a mask may indicate the presence of hazardous chemicals, as may precautions to protect surrounding surfaces or vegetation.

Appendix B: Tons disposed for each jurisdiction/substream/season

Metro	**Cold Season Q1 + Q4**	**Warm Season Q2 + Q3**	**Total**
All route trucks	321,232	319,122	640,355
Residential Route	154,272	153,259	307,530
Mixed Route	74,613	74,123	148,735
Commercial Route	92,348	91,741	184,089
Compacting drop box	53,601	54,298	107,899
Loose drop box	56,153	55,052	111,205
Self-haul	88,767	105,536	194,302
Mixed waste processing residue	160,554	179,011	339,564
Total sampled waste - Metro	**680,306**	**713,019**	**1,393,325**
Tires to tire processor and then landfilled	6,721	6,156	12,877
Covanta Supplemental Waste not sampled	1,384	1,155	2,539
Total Waste - Metro	**688,411**	**720,329**	**1,408,741**

Marion County	**Cold Season Q1 + Q4**	**Warm Season Q2 + Q3**	**Total**
All route trucks	73,143	71,371	144,515
Residential Route	39,653	38,692	78,345
Commercial Route	12,687	12,379	25,066
Mixed Route	20,804	20,299	41,103
Compacting drop box	8,787	8,290	17,077
Loose drop box	6,470	6,323	12,793
Self-haul to Coffin Butte	406	570	976
Special-Purpose Self-haul (Browns Island)	9,594	15,519	25,112
Mixed waste processing residue	62,045	73,791	135,836
Top Load - large items going direct to disposal	19,854	23,613	43,468
"Belt Feed" - rejects loaded on a belt to compactor	21,095	25,089	46,184
Residue from sort line - ground-up	21,095	25,089	46,184
Subtotal sampled waste - Marion County	**160,445**	**175,864**	**336,309**
Tires to tire processor and then landfilled	1,100	1,039	2,139
Covanta Medical Waste (not sampled)	292	284	576

Covanta Supplemental Waste (not sampled)	142	149	291
Total Waste - Marion County	**161,979**	**177,336**	**339,315**

Lane County	**Cold Season Q1 + Q4**	**Warm Season Q2 + Q3**	**Total**
All route trucks	67,432	67,047	134,479
Residential Route	32,316	32,131	64,447
Commercial Route	13,641	13,563	27,203
Mixed Route	21,476	21,353	42,829
Compacting drop box	4,460	3,972	8,432
Loose drop box	13,008	13,576	26,585
Self-haul	40,875	51,547	92,422
Mixed waste processing residue	17,616	17,578	35,194
Total sampled waste - Lane County	**143,393**	**153,719**	**297,112**
Tires to tire processor and then landfilled	853	946	1,799
Total Waste - Lane County	**144,246**	**154,665**	**298,911**

Deschutes County	**Cold Season Q1 + Q4**	**Warm Season Q2 + Q3**	**Total**
All route trucks	43,492	45,810	89,302
Residential Route	24,711	26,028	50,740
Commercial Route	11,861	12,494	24,355
Mixed Route	6,919	7,288	14,207
Compacting drop box	3,745	3,798	7,543
Loose drop box	10,409	12,074	22,483
Self-haul	42,399	61,650	104,049
Total sampled waste - Deschutes County	**100,045**	**123,332**	**223,377**

Tires to tire processor and then landfilled	1,951	2,227	4,178
Total Waste - Deschutes County	**101,996**	**125,559**	**227,555**

Rest of Oregon	**Cold Season Q1 + Q4**	**Warm Season Q2 + Q3**	**Total**
All route trucks	308,904	327,101	636,005
Residential Route	188,283	199,374	387,657
Commercial Route	64,741	68,555	133,296
Mixed Route	55,880	59,172	115,052
Compacting drop box	35,733	37,848	73,581

Loose drop box	105,423	104,756	210,179
Self-haul	187,190	230,565	417,755
Mixed waste processing residue	968	959	1,927
Total sampled - Rest of Oregon	638,217	701,229	1,339,446

Tires to tire processor and then landfilled	6,522	7,096	13,618
Covanta Supplemental Waste (not sampled)	120	101	221
Total Waste - Rest of Oregon	**644,859**	**708,426**	**1,353,285**

Oregon Statewide Totals	**Cold Season Q1 + Q4**	**Warm Season Q2 + Q3**	**Total**
All route trucks	814,204	830,451	1,644,655
Residential Route	439,235	449,485	888,720
Commercial Route	177,543	181,113	358,656
Mixed Route	197,426	199,853	397,280
Compacting drop box	106,326	108,206	214,532
Loose drop box	191,462	191,782	383,244
Self-haul	359,637	449,867	809,504
Browns Island Special Purpose Landfill	9,594	15,519	25,112
Mixed waste processing residue	241,182	271,339	512,521
Total sampled - Oregon Statewide	**1,722,406**	**1,867,163**	**3,589,569**

Tires to tire processor and then landfilled	17,147	17,463	34,610
Covanta Medical Waste (not sampled)	292	284	576
Covanta Supplemental Waste (not sampled)	1,646	1,404	3,050
Total Waste - Oregon Statewide	**1,741,491**	**1,886,315**	**3,627,806**

Appendix C: Methodology

This study was based on samples of disposed solid waste collected directly from disposal route trucks, compacting and loose drop boxes, self-haul vehicles when they unloaded their materials at transfer stations or landfills, plus samples of the disposed residue produced at mixed solid processing facilities that receive construction, demolition, and other wastes and sort out metal, cardboard, wood, and other recoverable materials and send the rest to landfill.

Sample Selection

Overall, we collected samples directly at 11 landfills and 44 transfer stations or mixed waste processing facilities. The number of samples collected at each facility was roughly proportional to the disposed solid waste directly collected at that facility, excluding loads transferred in from other facilities, based on the tonnage facilities reported on quarterly or annual reports by the disposal sites to DEQ, plus extensive transaction data provided by Metro and some counties. We did not sample all small rural facilities though but instead collected at just a few of them to represent the whole class of small rural transfer operations. The number of samples taken at each facility increased in our partner jurisdictions that paid for additional sampling within their jurisdiction, but we used weighting when combining the compositions in each jurisdiction to calculate statewide results. We collected samples in the Metro area twice each quarter at roughly 45-day intervals, in Marion, Lane, and Deschutes counties and “Rest of Oregon” quarterly at roughly 90-day intervals.

Samples at each facility were selected to be representative of all disposed solid waste directly received at that facility using a protocol described below to randomly pre-select the routes/trucks to be sampled such that the chance of a specific load being selected was directly proportional to the weight of that load, so any pound of recycling would be equally likely to be picked. Different protocols were used for route trucks, for drop boxes and self-haul vehicles, and for residue from mixed waste processing facilities. The general protocol for route trucks was as follows:

- Roughly a week before when the sort crew was scheduled to collect samples at a facility, we would request that the facility provide us with a list of all the route trucks that collected and then directly unloaded disposed solid waste on the same day of the week that the crew would be there, but exactly two weeks before the scheduled sample collection date. Transfer trailers were excluded from the list. Information requested included:
    - Company name
    - Truck number
    - Net weight of the load
    - If available, the time each load of the truck arrived
    - If available, whether the truck was on a residential or commercial route

Appendix C Table 1. Example of sample selection at one facility

RES or COM	Company	Truck	Time or ticket #	Load net weight (lbs)	Running total	Load selected	Randomly selected pound
Commercial	Company B	10177	10:23 AM	3440	3,440		
Commercial	Company C	417427	3:17 PM	420	3,860		
Commercial	Company D	34	10:31 AM	5040	8,900		
Commercial	Company D	43	10:32 AM	7220	16,120	1st of 1	9,151
Commercial	Company D	67	10:32 AM	4300	20,420		
Commercial	Company D	135	10:48 AM	5360	25,780		
Commercial	Company E	10408	2:55 PM	440	26,220		
Commercial	Company E	11433	2:57 PM	2860	29,080		
Commercial	Company F	1156	10:36 AM	1920	31,000	1st of 1	30,094
Commercial	Company F	1209	10:20 AM	4460	35,460		
Commercial	Company F	1211	10:26 AM	7600	43,060		
Commercial	Company F	1213	10:23 AM	8700	51,760	1st of 1	51,036
Commercial	Company H	211778	3:22 PM	8440	60,200		
Commercial	Company H	214450	10:02 AM	9140	69,340		
Commercial	Company H	313563	10:00 AM	2420	71,760		
Commercial	Company H	363523	9:48 AM	3780	75,540	1st of 1	71,979
Residential	Company A	295	T 438288	3900	79,440		
Residential	Company B	18	T 438290	1700	81,140		
Residential	Company B	21	T 438292	5000	86,140		
Residential	Company B	10186	T 438289	3980	90,120		
Residential	Company B	10192	T 438279	340	90,460		
Residential	Company B	96695	T 438245	3620	94,080	1st of 1	92,921
Residential	Company G	1	T 438247	200	94,280		
Residential	Company H	104349	T 438241	6000	100,280		
Residential	Company H	104349	T 438268	5000	105,280		
Residential	Company H	104478	T 438260	9960	115,240	1st of 1	113,864
Residential	Company H	104809	T 438261	8680	123,920		
Residential	Company H	104813	T 438246	7080	131,000		
Residential	Company H	104820	T 438264	5420	136,420	1st of 1	134,806
Residential	Company H	152824	T 438269	4640	141,060		
Residential	Company H	152825	T 438232	4080	145,140		
Residential	Company H	152868	T 438258	6780	151,920		
Residential	Company H	152871	T 438248	3080	155,000		
Residential	Company H	152871	T 438257	4220	159,220	2nd of 2	155,749
Residential	Company H	152884	T 438259	2140	161,360		
Residential	Company H	152885	T 438267	6180	167,540		

167,540.00	Total weight (pounds)
8	Number of samples to collect
20,942.50	Total pounds divided by # samples
9,151.09	Random number chosen between 0 and 20,942.5 pounds: Sample 1
30,093.59	add 20,942.5 to the random number above: Sample 2
51,036.09	add 20,942.5 to the number for Sample 2: Sample 3
	continue adding 20,942.5 to preceding number for samples 4-8

DEQ would then sort that list by whether the truck was commercial or residential, by company name, by truck number, and then by time or ticket number. Appendix C Table 1 shows an actual example of load selection at one facility – in this case for a commingled recycling sample but the procedure was the same for route trucks at disposal sites. After lining the loads up in this order, we would make a column with a running total of the pounds collected (6th column in Appendix C Table 1). In the case shown in Appendix C Table 1, we wanted to collect 8 random samples at the facility that day. The first step was to divide the total pounds (167,540) by the number of samples desired (8), giving a result of 20,942.5 pounds. We then used a random number generator to pick a random number between 0 and 20.942.5 pounds. The random number chosen in this case was 9,151.09. We then compared this random number to the column of the table with the running total of pounds to see which truck was carrying pound 9,151 – in this case it was Company D truck number 48. We would then move to the second interval by adding that 20,942.5 pounds to that random number 9,151.09, giving a total of 30,093.59. That pound of disposed solid waste arrived at the facility in Company F truck 1156. We would then continue down the list in this manner until all 8 trucks were selected.

Although we were doing this by truck numbers, in fact what we were doing was selecting the collection routes from which we would get our sample on sample-collection day. After choosing the whole list, we would contact the companies involved to confirm that we would want to collect a sample from that truck when it arrived at the facility on sample collection day, and to ask them to do the following:

- Let the driver know that their truck and specific load was selected for sampling and what would be involved, including where to find the crew.
- Tell us if that truck would be expected to run that same route on sample collection day. If not, ask them what truck would be covering that same route, because again we wanted the sample to be from the selected route. We also asked them to let us know if a selected truck breaks down on collection day and to tell us what truck or trucks would be finishing that route.
- We would also give the list of selected loads to the facility. Facility staff were very helpful in making sure the selected loads were directed to where we could collect the sample.

If we had many samples to sort at a facility, we would ask if we could sort at that facility, and all facilities were very accommodating even though many had little space available. If it was a small facility and we only needed a few samples, the crew would often send a person out with a trailer to collect the samples and bring them back to the facility where the crew is sorting or will be sorting the next day.

For drop boxes and self-haul vehicles, it was not possible to pre-select loads as vehicles arrive at random times with no set schedule. For self-haul vehicles, DEQ would provide Sky Valley with instructions to collect samples from vehicles of different sizes, For example, if self-haul data from a transfer station showed that 1/4th of the self-haul garbage received at that transfer station arrived in loads weighing 2,780 pounds or more, and we wanted 4 loads from that facility, DEQ would ask Sky Valley to randomly select one load from a vehicle carrying 2,780 pounds or more, and the other three vehicles to represent three other size classes. We did this because large vehicles usually bring in very different wastestreams than do small pickups and household

vehicles. Most of the self-haul vehicles arriving at a transfer station are small pickups and cars, but most of the waste arrives in large loads. Choosing loads by size classes makes sure we do not oversample the small household loads, as we want any pound of garbage to be equally likely to be sampled instead of every vehicle being equally likely to be sampled. For drop boxes though, it would have been difficult to do this sort of load selection by size class, and so the contractor just picked vehicles at random.

Sample sorting

When a selected load arrived at the facility, the driver was directed to an area where they would dump the load and the crew could get a sample. A member of the Sky Valley crew would interview the driver to obtain information such as what percentage of the load came from households, from apartments or condos, or from commercial sources. Usually, the facility would assist by having one of their staff bring over one of their pieces of equipment that could scoop out a sample weighing 200 pounds or more. When DEQ provided the list of samples to be collected at each facility, we would also give a randomly chosen number from 1 to 12 for each sample. That random number would designate where in the unloaded pile that the sample was to come from, designating if it was from the front, middle, or back, from the left side or the right side, and if it was from near the bottom of the pile or higher up.

Appendix C Figure 1. Initial sort of a sample at Short Mountain Landfill.

Once the sample was scooped up, it was dumped on a tarp and covered up until the sort crew got to sort it. For most samples, and initial sort would separate paper, plastic, metal, and other materials into separate piles, and then crew members who specialize in each type would sort

the materials into individual categories using pre-weighed laundry baskets or plastic garbage cans to hold each category of material.

Appendix C Figure 2. Sorting a sample at Short Mountain Landfill.

Then each container of material would be weighed and the net weight recorded in a Microsoft Access database provided by DEQ. In addition to weight, all beverage containers were counted by both beverage type and material, as were oil filters, film plastic merchandise bags, cell phones, and sharps, the count of the latter being estimated if it was not safe to be counted individually such as if in a container. The crew would then run a pre-program quality control check to flag any issues such as missing information, total sample weights that were too light, or counts of beverage containers that were inconsistent with the weights. The crew would then correct anything that needed correction. If in rare cases a sample was too light, the crew would capture make-up weight from a different vehicle that ran a route similar to the originally-selected vehicle.

Data analysis

When sample collection and sorting was complete for each week of field work, the Sky Valley crew would email the data file to DEQ. DEQ would also do quality control checks on the data and then combine those data with all previously gathered data. For analysis, DEQ would first convert each separate material weight into percentages of the entire sample weight, so each

sample would be weighted equally. Then DEQ would find the average percentage of each material in each of the 66 jurisdiction/substream/season categories listed in Appendix B: Tons disposed for each jurisdiction/substream/season. For four very small substreams that together made up less than 0.1% of Oregon's total waste, we used data from other facilities as a proxy for their composition, as follows:

- For Marion County self-haul waste received at the Coffin Butte Landfill, we used data from 50 Marion County transfer station loads that was collected as a related project funded by Marion County
- For the only mixed solid waste processing facility in "Rest of Oregon" that produced less than 2,000 tons of residue, we used data from all other mixed waste processing facilities scaled to the size of that one facility.

The now 70 jurisdiction/substream/season separate compositions were then combined into a total statewide composition by weighting each jurisdiction's composition by the total weight of disposed solid waste material collected in that jurisdiction/substream/season in 2023 as using the tonnages in Appendix B: Tons disposed for each jurisdiction/substream/season. Confidence intervals were calculated using the Bootstrap method- a Monte Carlo method that involved randomly pulling samples from each jurisdiction or substream with replacement, up to the same number of samples as originally captured, and then analyzing this "bootstrapped" sample in the same manner as the original samples and recording the results. We did 1,001 repetitions of bootstrapped samples and calculated the averages for each. The 90% confidence interval then had an upper limit of the 50th largest of the bootstrapped averages, and the lower limit was the 50th lowest bootstrap averages, thus leaving 90% of the bootstrapped averages within these upper and lower limits. We also calculated confidence intervals using normal parametric methods as a double-check, and results were always close. At the time of this publication, we have not yet analyzed the beverage container count data to estimate how many beverage containers of each type are being disposed. That work is scheduled for a future update of this report.