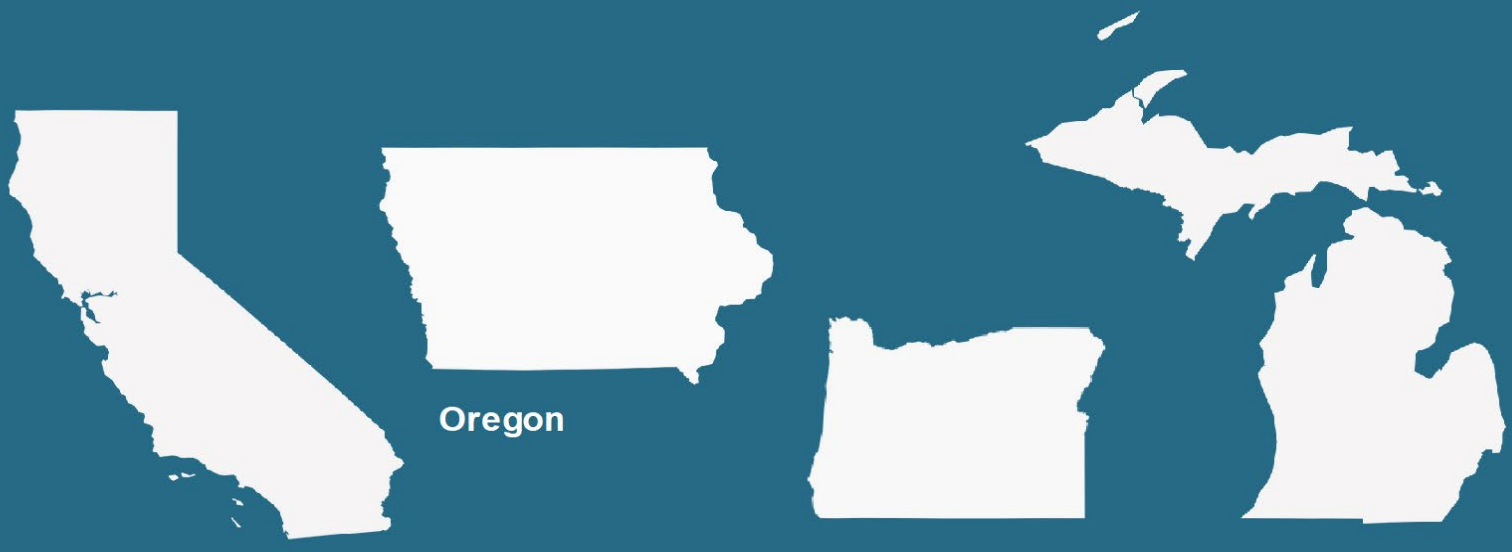
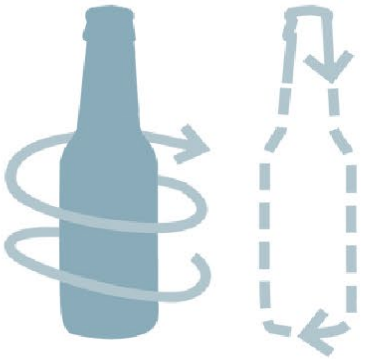


REPORT

UNCLAIMED CONTAINER DEPOSITS

National Waste and Recycling Association



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Disclaimer

GT provides the information contained in this report in good faith, and every attempt has been made to ensure accuracy. The facts and data gathered in this report are primarily from external sources, including publicly accessible annual reports released by system operators and stewardship agencies. Other information was obtained from interviews, personal communication, and e-mail correspondence. The information contained in this report is based on the best available data and information.

Discussed legislation was enacted effective January 1, 2024. Pending or proposed legislative changes are not considered. Data gathered and discussed in this report is for the year 2023 and years prior. Financial reports published and used were prepared on an annual basis but are generally based on a fiscal year (FY) rather than the calendar year.

1.0 Unclaimed Container Deposits

Container deposit systems, commonly known as Bottle bills, have been a part of the United States' recycling approach since the early 1970s. These systems see customers pay a small amount of money upfront, a deposit, on applicable beverage containers that is reimbursed when they return the empty container to a collection point.

Each state with a container deposit system has control to design and implement their own system, thus resulting in different handling of the unclaimed deposits. This report specifically explores the unclaimed deposits in the Bottle bill systems in California, Iowa, Michigan, and Oregon.

The Container Recycling Institute (CRI) analyzes each state's redemption rate. As shown in the table below, in 2022 anywhere from 14% to 63% of beverage containers covered are not being returned. So, what happens to the deposits on the beverage containers not being returned through the system?

	Redemption Rates[i]	
State	**2022**	**2023**
California	60%	59%
Iowa	37%	-
Michigan	76%	73%
Oregon	86%	87%

WHO KEEPS THE UNCLAIMED DEPOSITS?

California	State statute requires the state manage and control finances of the beverage container recycling system. Deposits of sold containers are paid in to the state fund. After refunds are paid out any unclaimed refund values stay with the state.	
Iowa	Per state statute unclaimed deposits are property of distributor.	
Michigan	State statute requires distributors to turn over unclaimed deposits.	Specifically unclaimed deposits are "escheated" to the state.
Oregon	Distributors keep unclaimed deposits.	

Escheat refers to a common law doctrine where property that goes unclaimed by its owner or heirs to take ownership will revert to the state. "Escheats in the deposit-recycling world only refer to those unclaimed deposits that state governments keep by law" (CRI)[ii]. California law does not permit beverage distributors or retailers to keep unclaimed deposits, they are property of the state in state-managed systems. Michigan's law escheats 75% of the unclaimed deposits to the state. Both Iowa and Oregon state law do not escheat unclaimed deposits to the state.

Throughout this report, the term “unclaimed” or “unredeemed deposits” will be used interchangeably with the term “escheat” to refer to accumulated container deposits that are not redeemed by the consumer within each state’s Bottle bill redemption system. The term “unclaimed deposit” **will not** be used to refer to containers that are recovered through other means such as being collected in a curbside recycling program.

How Are Unclaimed Deposits Used?

California	Statute requires unclaimed deposits be used for administering the beverage container recycling program. See section 1.1 for the list of who receives monies.
Iowa	Per state statute Iowa beverage distributors keep all unclaimed deposits.
Michigan	Statute states 75% stay with the state in a fund and 25% to retailers. The fund is overseen by the state treasury. Statue specifies how the 75% of unclaimed deposits in the fund must be distributed. See section 1.3 for the list of how the money is distributed. The distributed fund money does not flow back into the beverage container recycling system.
Oregon	Distributors keep unclaimed deposits. Beverage distributors joined together and formed the Oregon Beverage Recycling Cooperative (OBRC). OBRC serves as a not-for-profit statewide operator. The unclaimed deposits are reported to be invested directly back into the operation of the Bottle bill redemption system statewide[iii].

1.1 California

Who Keeps The Unclaimed Deposits

The California Beverage Container Recycling and Litter Reduction Act, enacted in 1986 was intended to encourage recycling and reduce litter. The Bottle bill program is a state-managed system and identifies CalRecycle as the administering department. In California, beverage distributors pay the redemption value (or deposit) to the state. This redemption value is passed on to the consumer. When the consumer returns the empty beverage container to a certified recycling center the redemption value is paid to the consumer. Any unclaimed redemption values (deposits) remain with the state.

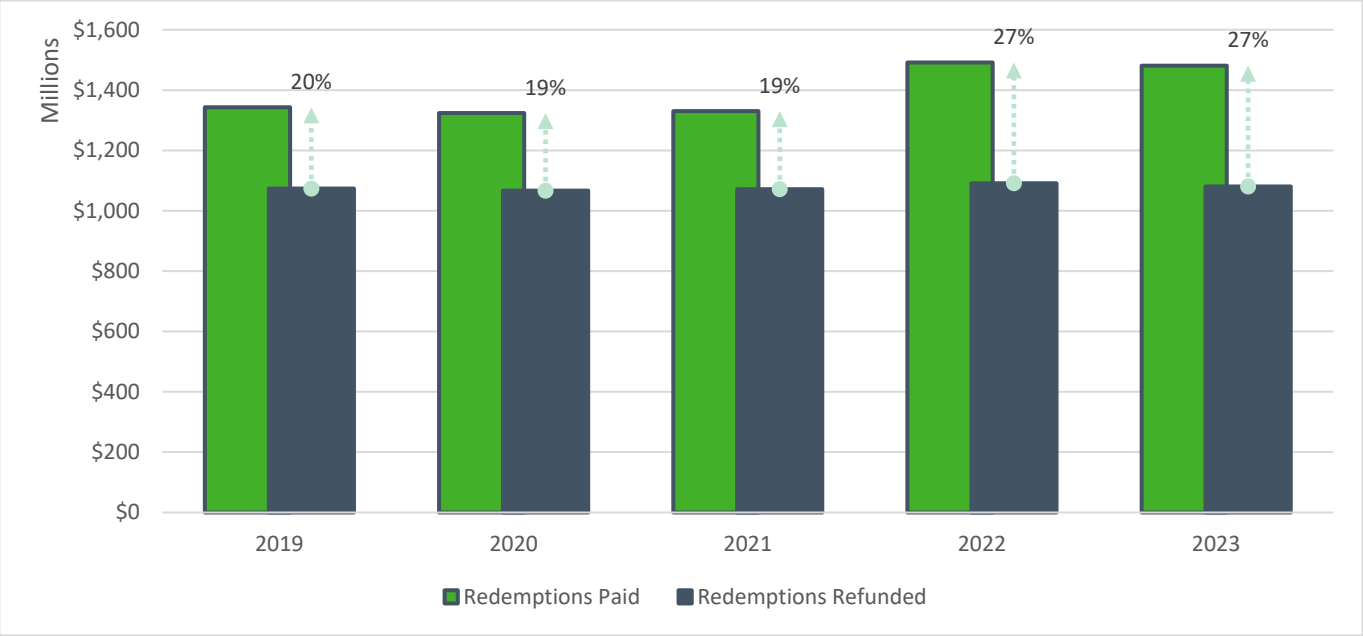
The Bottle bill program operates from a state fund, the California Beverage Recycling Fund (California Fund) and related accounts[1]. Activities in the California Fund are accounted for in five separate special funds:

- California Beverage Container Recycling Fund
- Glass Processing Fee Account, Beverage Container Recycling Fund
- Penalty Account, Beverage Container Recycling Fund
- Bimetal Processing Fee Account, Beverage Container Recycling Fund
- PET Processing Fee Account, Beverage Container Recycling Fund

[1] Note: Beginning in 2018-19, the California Fund became a shared fund with the California EPA.

There are several revenue streams into the fund which include redemption values; processing fees; interest income earned on funds deposited in surplus money investment fund; penalties; and Option B payments (Legislation allows fine/payments by beverage retailers in lieu of redeeming in-store). This report examines the unclaimed redemption values and does not track the other activity in the California Fund. CalRecycle publishes "Status of the Beverage Container Recycling Fund" semi-annually. Using these historical reports, GT calculated unclaimed deposits in fiscal years 2019 to 2023, by subtracting "California Refund Value-in" and "California Refund Value-out" as shown in the semi-annual reports. Thus, inferring the remainder is the unclaimed deposits.

Figure 1: California Unclaimed Deposits[iv]



Year	Redemption Value Paid	Redemption Value Returned to Consumer	Unclaimed Deposits	Unclaimed Monies
2019	$1,342,961,000	$1,073,509,000	20%	$269,452,000
2020	$1,323,898,000	$1,066,573,000	19%	$257,325,000
2021	$1,330,220,000	$1,071,678,000	19%	$258,542,000
2022	$1,491,585,000	$1,091,381,000	27%	$400,204,000
2023	$1,480,678,000	$1,080,523,000	27%	$400,155,000

Using this estimation, as shown in Figure 1, in more recent years roughly 73% was redemption values paid, leaving 27% redemptions unclaimed. California statute requires the unclaimed deposits be retained in the state treasury and be spent on recycling-related programs. In theory, as the redemption rate in California increases, then more redemptions are paid out of the fund, leaving less funding available to make statutorily required payments to the other programs[v].

How Are Unclaimed Deposits Used

There are several different parties involved in operating the Bottle bill: distributors, processors, and recyclers; and each serving a certain role in the system. For a consumer to receive their redemption value they must return the empty beverage container to a certified recycling center (also referred to as a recycler). California does not obligate beverage retailers to accept empty beverage containers, instead, independent recycling centers have been established. Though not required to supermarkets can be recycling centers. Rural region recyclers and non-profit convenience zone recyclers (a zone about a half mile around convenience stores and markets) may also be certified recycling centers[vi].

California's Bottle bill law identifies specific use of the revenue coming into the fund into the following payments:

- Refund beverage container redemption values,
- Pay for administrative fees to processors (processors sell empty beverage container to manufacturer or end user),
- Reserve for contingencies,
- Expend to CalRecycle for administration of program, and
- Fund the following statutorily listed purposes:
    1) Handling fee payment
    2) $15 million for curbside recycling programs and neighborhood recycling drop-off programs
    3) $10.5 million for cities ($5,000) and counties ($10,000) for recycling and litter cleanup activities (or per capita basis calculations may be used). Statute directs allowable recycling and litter cleanup activities.
    4) $1.5 million for grants for litter beverage container recycling and litter reduction programs
    5) Processing payment (amount necessary)
    6) Up to $5 million for state-wide education and information campaign aimed at promoting increased recycling of beverage containers
    7) Up to $15 million for quality incentive payments for empty glass beverage containers
    8) Dollar amount not statutorily set, but fund can be expended for market development payments to reclaimers and product manufacturers from FY 2019-20 through FY2025-26
    9) Up to $5 million for pilot projects
    10) Up to $4 million for glass processing incentive grants
    11) Up to $4 million for empty glass beverage container grants
    12) Up to $1 million to facilitate transportation of empty glass beverage containers
    13) Up to $60 million for glass market development payments
    14) Grants for local conservation corps

After redemption value payments and administrative fees, if CalRecycle is unable to make all the handling fee and processing payments due to insufficient monies, they may inform the Legislature of the deficit and reduce the other payments and grant program expenditures accordingly.

Payment Calculations

Administrative Fee to Processor - Payment is to processor (PRC 14580 and 14573). A processor is a certified business that buys empty beverage containers from certified recycling centers, drop-off locations, and curbside programs.

Formula to Determine Payment:

Administrative Fee = 2.5% x Refund Value

*Statute allows for an additional payment to rural region recycler, which is a recycling center for transportation, operations, and logistics for glass containers (PRC 14573.1).

Formula to Determine Payment:

Payment to Rural Region Recycler = $60 per ton for glass containers

Reserve for Contingency - The reserve shall not be greater than an amount equal to 5% of the total amount paid to processors during the preceding calendar year, plus the interest earned on that amount (PRC 14580).

Formula to Determine Payment:

Reserve for Contingency = < 5% Total Paid to Processors + Interest

Total Paid to Processors = Refund Value + 2.5% of Refund Value + Processing Payment

Handling Fee Payment – These handling fee payments are paid to recycling centers (certified business accepting beverage containers for redemption and recycling) that are supermarkets, nonprofit convenience zone recyclers, and rural region recyclers. Handling fee payments are meant to incentivize the redemption of empty beverage containers across the state, to expand and stabilize consumer redemption opportunities. Handling fees are assessed monthly, once eligible sites submit their monthly combined volume or empty beverage containers collected[vii]. (PRC 14581(a)(1) and 14585)

Formula to Determine Payment:

Eligible Containers A = PET + Glass + Aluminum + HDPE + Bimetal
OR
Eligible Containers B = (PET + Glass) / 10%

CalRecycle compares Eligible Containers A to Eligible Containers B and uses the lowest value

Handling Fee = Eligible Containers x Current payment per container

*To determine the current payment per container rate CalRecycle conducts a handling fee survey to collect the actual cost incurred for redemption of empty beverage containers. (Historically CalRecycle hires a contractor to conduct the in-person survey using a random selection process[viii].) From this survey, a state-wide weighted average cost is determined for empty beverage containers. (PRC 14585(f))

Formula to Calculate Current Payment Per Container:

1. CalRecycle surveys handling fee recipients (supermarket sites, nonprofit convenience zone recyclers, or rural region recyclers)
2. CalRecycle obtains actual cost incurred for redemption
3. CalRecycle determines statewide weighted average cost
4. CalRecycle adjusts annually for cost of living

Curbside Recycling Programs Payments - Payment to compensate for the operation of curbside and neighborhood drop off recycling programs that accept empty beverage containers for recycling. This payment is assessed annually by CalRecycle, based on the total volume of beverage containers collected. This payment intends to continue supporting activities related to beverage container recycling. (PRC 14581(a)(2) and 14549.6)

Formula to Determine Payment:

Annual Volume of Beverage Containers Collected x Per-Container Rate

*To determine the per-container rate CalRecycle divides the total volume of beverage containers collected by curbside and neighborhood drop-off programs during 12-month calendar year divided by $15 million.

Formula to Calculate Current Payment Per Container:

1. Processors report containers collected by curbside and neighborhood drop-off programs
2. CalRecycle divides the total collected into $15 million

This statutory requirement also helps to ensure that empty beverage containers collected through curbside and drop-off recycling programs are accounted for in CalRecycle's reporting, as well as incentivizing the containers captured to remain within the state's Bottle bill system instead of being sent to out-of-state processors. Without this provision in California's statute, it would be difficult to capture the impact of the Bottle bill across all recycling programs. *Although not clearly defined in statute, there may be unintended circularity implications from this statutory payment. A local recycling program could choose to keep their collected beverage containers in-state to ensure they collect this fee, instead of selling their containers to an out-of-state market.*

Litter Reduction and Beverage Container Recycling Efforts (Payments to Cities and Counties) - Payments on either a per capita basis or through a flat rate of $5,000 for each participating city and $10,000 for each

participating county. It is up to CalRecycle to decide which of these payments is greater. CalRecycle has a $10.5 million annual cap in the activity payments they can make. These payments support existing litter reduction and beverage container recovery activities, and promote the expansion and addition of new programs. (PRC14581(a)(3))

Formula to Determine Payment:

Flat Payment = $5,000 for city or $10,000 for county

OR

Per Capita Payment = Population of incorporated city or unincorporated county

Whichever is greater

Beverage Container Recycling Grants - Payment to nonprofit, other legal entity, public agency or tribal government. The purpose of the grant is to issue up to $1,500,000 annually in the form of grants for beverage container recycling and litter reduction programs to promote increased recycling of beverage containers throughout California and reduce beverage container litter in the waste stream. Funding must have a direct connection to the California Redemption Value of beverage containers and the overall program. (PRC 14581(a)(4))

Formula to Determine Grant:

$75,000 is minimum and $275,000 is maximum

Processing Payment - Payment to processors for any beverage container type with a scrap value less than the cost of recycling. The processor pays the processing payment to the recycling center. The processing payment is based on the difference between the scrap values for a given material and the actual costs of recycling modified for cost of living and a reasonable financial return. The processing payment fluctuates based on market conditions. They are intended to fill the gap between the cost of recycling and the scrap value, thus as global scrap values increase, the amount of processing payments decreases. Processing payments are adjusted at the beginning of each calendar year based on the previous 12-month period average scrap value for reach material.

This payment also helps keep track of the beverage containers redeemed through the California Bottle bill system, ensuring that containers are recycled and that recycling byproducts are used in manufacturing processes in-state. (PRC 14581(a)(5) and 14575)

Formula to Determine Payment:

Processing Payment = ((Actual Cost of Recycling and Cost of Living) x Fixed Reasonable Financial Percent)) – Scrap Value

Processing Payment per Pound Redeemed = Processing Payment / 2000 pounds/ton

*Formula applies to each material. CalRecycle may adjust the processing payment once every three months based on the 12-month or preceding 3-month average scrap value, whichever is lower. The actual cost of recycling is determined by:

Formula to Calculate Actual Cost of Recycling:

1. CalRecycle surveys recycling centers (operation which is certified by the department and which accepts from consumers, and pays or provides the refund value)
2. CalRecycle obtains actual cost for certified recycling centers
3. CalRecycle determines statewide weighted average cost to recycle each beverage type
4. CalRecycle adjusts annually for cost of living

Statewide Education and Information Campaign - Up to $5 million may be expended annually for a statewide public education and information campaign aimed at promoting increased recycling of beverage containers. GT found no formula for calculating the funds to expend. (PRC 14581(a)(6))

Quality Incentive Payments - The goal for these payments is to ensure a certain standard of quality in the materials captured and later sold for use in manufacturing processes. These payments are to curbside recycling programs, drop-off, or other certified entities that sort and clean glass beverage containers to quality incentive payment standards. Statute states glass needs to be substantially free of contamination and be used for manufacturing glass beverage containers in the state. Up to $15 million may be expended annually. Collection sites are eligible for a $60/ton payment for glass. (PRC 14581(a)(7) and 14549.1)

Formula to Determine Payment Glass Quality Incentive Payment:

Tons Qualifying for Payment = Tons of Mixed Glass Received from Processor x Statewide Average Quality Incentive Payment Rate

Tons Qualifying for Payment = Tons of Mixed Glass Received from Curbside Program x Statewide Average Curbside Quality Incentive Payment Rate

*The statewide average quality incentive payment rates are estimates, determined by CalRecycle annually, of California Redemption Value material collected from curbside and drop-off or collection programs in a load of commingled material from all recyclers.

Market Development Payments to Reclaimers and Manufacturers – Payments to reclaimer and product manufacturer. Intended to support the use of plastic resins in in-state manufacturing and reclaiming processes. This support of the in-state plastic recycling and manufacturing market is to encourage the use of reclaimed plastic resins captured from the Bottle bill system in new products. California has a minimum recycled content requirement for plastic products manufactured for use in the state, as well. (PRC 14581(a)(8) and 14549.2)

Formula to Determine Payment:

Qualifying Eligible Material = ((Total PET or HDPE Weight) – Nonqualifying Materials) x Market Development Payment Rate

Manufacturer Payment
Payment = Qualifying Eligible Material x Manufacturer Payment Per Ton Rate

Reclaimer Payment
Payment = Qualifying Eligible Material x Reclaimer Payment Per Ton Rate

*July 1, 2024, the manufacture and reclaimer payment structure both allots $18.25 million for claims. Manufacturer and reclaimer rate structure is tiered. The tiered rate structure pays $75 per ton to reclaimers processing A-grade bales of deposit PET containers, $50 per ton for any other grade of PET container bales and $25 for "other" deposit container bales. It pays $150 per ton to manufacturers producing RPET bottles that exceed state-mandated recycled content requirements (currently 15% post-consumer resin), $75 per ton to producers of RPET bottles with less recycled content and $50 to producers of all other RPET products (all RPET must be sourced from eligible CRV deposit material).

Formula to Calculate market development payment rate:

1. CalRecycle annually calculates a new statewide average to ensure only California Refund Value beverage containers are eligible
2. The market development payment rates are calculated using the received weight divided by the redeemed weight as reported by certified recyclers
3. CalRecycle calculates a market development payment rate as a percentage rate for PET and HDPE

Pilot Projects – Grant program provided to jurisdictions working with recycling center operators. With an annual limit of $5 million, the intent is to bolster and expand consumer redemption opportunities. This fund is available to support up to 10 recycling pilot projects that improve redemption opportunities for container in unserved convenience zones across the state, including rural areas. The intent is to provide ample recycling opportunities and increase consumer redemption options in jurisdictions that are underserved or unserved. This fund is set to expire after June 30, 2025. (PRC 14581(a)(9) and 14571.9)

Formula to Determine Grant:

Funding is subject to change based on staff approval of the pilot project proposal

Glass Processing Incentive Grant – Grants provided to applicants who demonstrate the ability to expand glass cullet processing in the state. Includes private, for-profit and non-profit (except for schools) entities. Up to $4 million annually may be expended. Grant purpose is to stimulate the increased use of glass cullet in making new glass beverage containers in the state. (PRC 14581(a)(10) and 14543)

Formula to Determine Grant:

$1 million minimum per applicant
$4 million maximum per applicant
Applicant matches an amount equal to or greater than grant award amount

Empty Glass Beverage Container Grant – Grants provided to local governments, qualifying tribal, private for-profit, and non-profit entities. Up to $4 million annually may be expended. Grant purpose is to assist in funding regional pilot programs furnishing bins for collection of empty glass beverage containers from restaurants and on-sale retail licensed establishments. (PRC 14581(a)(11) and 14544)

Formula to Determine Grant:

$500,000 minimum per applicant
$2 million maximum per applicant
Applicant matches an amount equal to or greater than grant award amount

Facilitate Transportation of Empty Glass Beverage Container Grant – Up to $1 million annually may be expended. This grant is in the development phase. (PRC 14581(a)(12) and 14545)

Glass Market Development Payments – Payment to glass beverage container manufacturer who purchases recycled glass collected within California for use in manufacturing new beverage containers in the state. Up to $60 million annually may be expended. (PRC 14581(a)(13) and 14549.7)

Formula to Determine Payment:

Post GMD Rate Amount = ((Total Glass Weight) – Nonqualifying Materials) x Market Development Rate

If Weight of New Manufactured Glass Beverage Containers > Post GMD Rate Amount, then Post GMD Rate Amount = Amount Eligible for Payment

If Weight of New Manufactured Glass Beverage Containers < Post GMD Rate Amount then Weight of New Manufactured Glass Beverage Containers = Amount Eligible for Payment

Payment = Amount Eligible for Payment x Payment Per Ton Rate

*CalRecycle determines the payment, but it shall not exceed $50 per ton. The glass market development rate is subject to change annually.

Grants – Local Conservation Corps – Annual $20,974,000 plus cost of living less $15 million set aside. Grants to community conservation corps to perform litter abatement, recycling, and related activities. Not more than 75% of a community conservation corps annual budget may be granted. (PRC 14581.1)

Formula to Determine Grant:

$10 million total available
$7 million equally distributed
$3 million allocated per the Criteria RFA formula:

1.2 Iowa

Who Keeps The Unclaimed Deposits

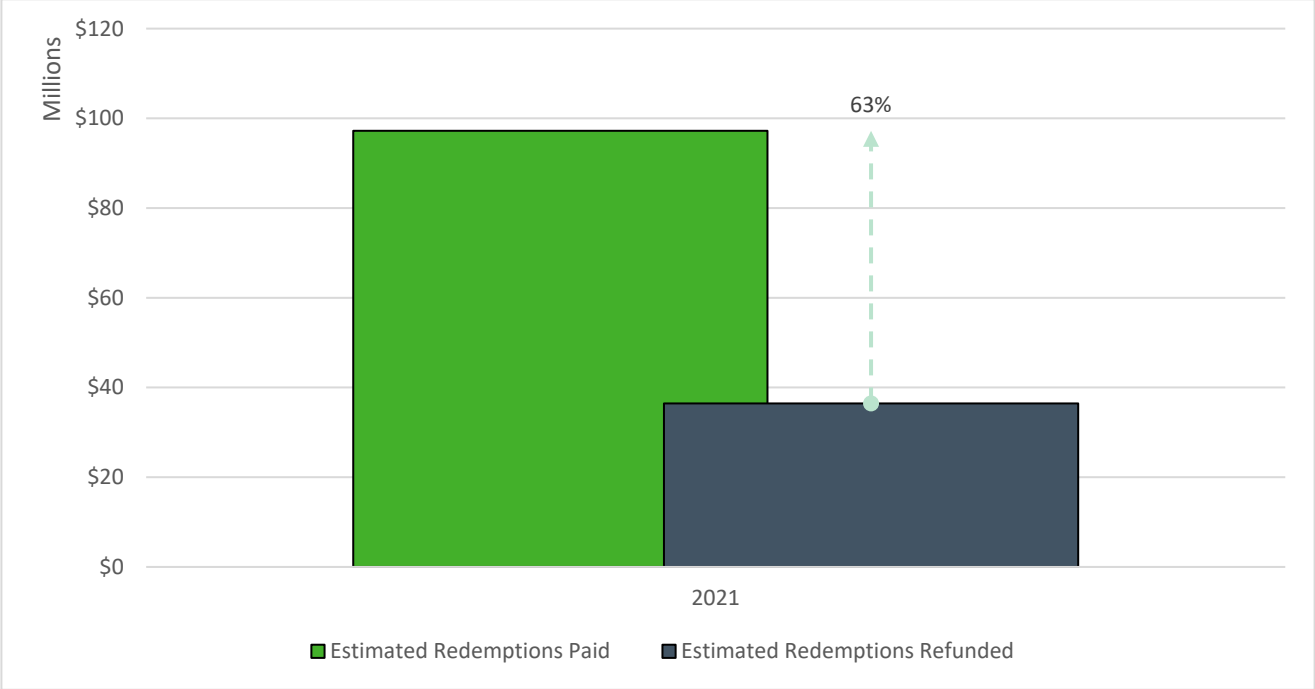
The Iowan Beverage Containers Control Law, enacted in 1978, was intended to control litter and promote recycling in Iowa. Iowa is a completely private system with respect to the transfer of funds and no unredeemed money ever flows to the state treasury. The consumer pays the deposit to the retailer, who passes that to the beverage distributor. When the empty beverage container is returned the beverage distributor pays the deposit refund value plus a handling fee to the retailer. The retailer refunds the deposit to the consumer. Any unredeemed deposit monies are retained by beverage distributors.

From GT's communications, it appears beverage distributors may choose to contract with Material Recovery Facilities (MRFs) for final processing and marketing of beverage containers[ix]. From Iowa's Department of Natural Resources study, "Iowa Recycling Facility", it appears a small portion is sent to MRFs. In this report, MRFs reported 6% of accepted PET bottle plastic is deposit, 8% of accepted metal is aluminum can deposit, and 27% of accepted glass is glass bottles deposit.

In Iowa, beverage distributors are not required to report beverage container sales or redemption data except for wine and liquor containers, which are reported annually to the Iowa Alcoholic Beverages Division. In addition, MRFs are not required to declare the amount of beverage containers they receive from distributors. This makes Iowa the only state in this study where calculating a redemption rate is not straightforward.

In 2022, Iowa DNR worked with the CRI to estimate the number of containers sold and recovered for calendar year 2021 (no other years were included). CRI relied on the state's material characterization study to estimate the weight of landfilled deposit beverage containers disposed. CRI used this data and CRI's Beverage Market Data Analysis to estimate the weights of deposit beverage containers sold. Using the percentage of deposit beverage containers landfilled statewide and sold, CRI calculated a recovery rate of 49%. In Iowa, recovered is a combination of containers processed at MRFs that are collected through curbside and drop off recycling programs, and returned to distributors. Using the recovery rate (49%[x]) and CRI's estimate of containers captured through curbside and drop-off (11.5%[xi]), GT calculated an estimated number of redeemed containers. GT recognizes that a portion of these containers went directly to MRFs, but this estimated calculation gives us some understanding of the dollars flowing through this program given the five-cent deposit.

Figure 2: Iowa Unclaimed Deposits 2021



Year	Estimated Deposit Fees Paid	Estimated Deposit Fees Refunded	Estimated Unclaimed Deposits	Estimated Unclaimed Monies
2021	$97,212,806	$36,454,802	62.5%	$60,758,004

While available data is limited, estimates from 2021 show that 37.5% of all bottle bill funding was spent on redemption payments, leaving 62.5% of redemptions unclaimed in Iowa.

How Are Unclaimed Deposits Used

Iowa statute requires distributors to pay a dealer, dealer agent, or redemption center five cents per bottle returned (see Appendix A for Iowa statutory definitions of each). Additionally, distributors must pay the dealer agent one cent and the other entities a three-cent per bottle container handling fee. This is separate from the deposit fee[xii].

Payment Calculations

Formula to Determine Annual Disbursements to Dealer and Redemption Center:

Handling Fee = Total Containers Returned x 3 cents

Formula to Determine Annual Disbursements to Dealer's Agent:

Handling Fee = Total Containers Returned x 1 cent

Formula to Determine Annual Unclaimed Deposits Retained by Distributors:

Unclaimed Deposits = (Total Containers Sold x 5 cent deposit) - 5 cents for every Redeemed Container
- Both Handling Fees

1.3 Michigan

Who Keeps The Unclaimed Deposits

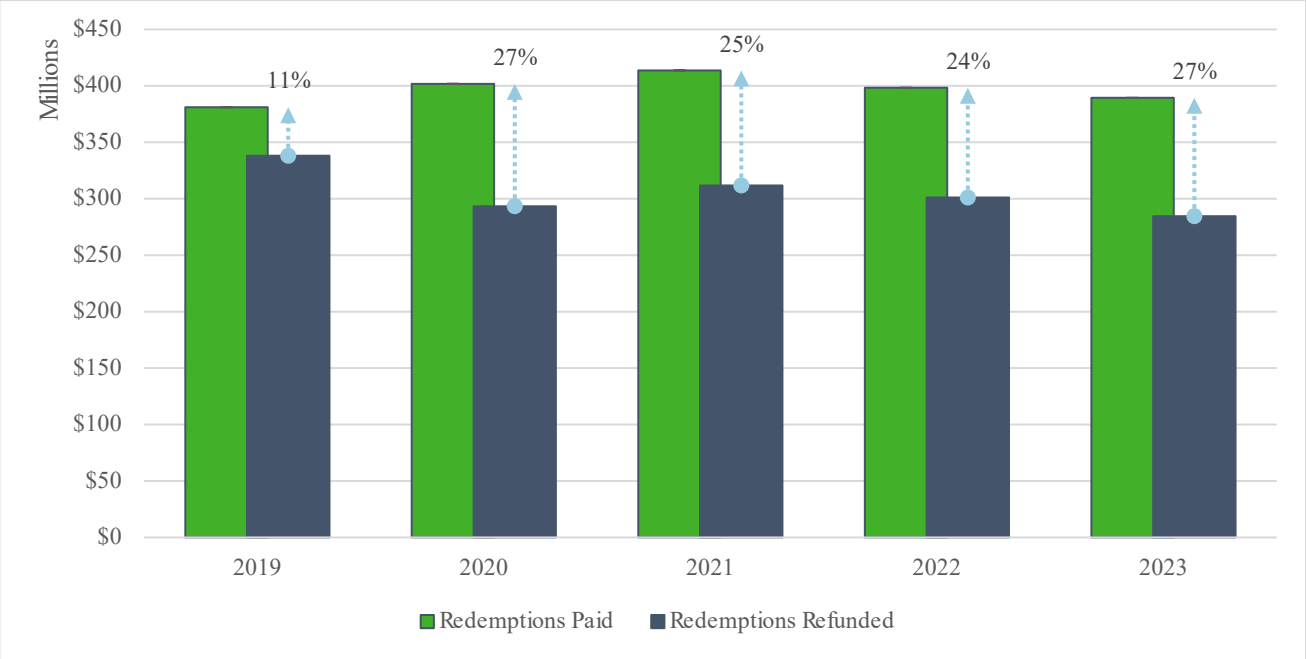
The Michigan Beverage Container Law, Michigan's Bottle bill, was enacted in 1976. The original intent of the bottle bill was to reduce litter along Michigan's roadways.

Michigan's system is designed where the private sector is responsible for most financial transactions. Beverage retailers are required to accept returned containers. Consumers pay the container deposit to retailers, who pass that onto the distributors. When containers are returned, distributors refund deposits to the retailers. Because not all used beverage containers are returned to the distributor from which they originate, some distributors refund less than the deposits they receive from retailers, others refund more. Distributors remit unredeemed deposits to the state treasury. The state treasury then administers all outflow payments from the treasury fund. Per statute, unclaimed deposits are disbursed to retailers, Michigan State Police, and the state EPA (known as Environment, Great Lakes and Energy (EGLE)).

Michigan's law imposes certain record-keeping requirements, calling for distributors or manufacturers who originate a deposit on a beverage container to file annual reports with the state treasury. The reports must include the dollar value of both the total deposits collected and the total refunds made upon the beverage containers. Based on this and any previously available credits, beverage distributors and manufacturers are determined to be an "underredeemer" or an "overredeemer." The underredeemer would owe the state the value of the underredemption. "Overredeemers", beverage distributors or manufacturers who refund more money in bottle deposits than they receive from beverage sales, can request a refund of the difference.

Michigan's bottle bill treasury fund is a revolving fund, and its investments are directed by the state treasurer. These monies do not lapse to the general fund if unspent at the end of a fiscal year. The fund is structured to collect unredeemed deposits from distributors and allocate payments to various organizations. However, the fund allows bottle distributors to request a refund if that distributor received less deposits returned than paid. It also allows bottle distributors to pay the state treasury if the deposits and refunds exceeded the refunds paid.

Figure 3: Michigan Unclaimed Deposits



Year	Deposit Fees Paid	Deposit Fees Refunded	Unclaimed Deposits	Unclaimed Monies[1]
2019	$381,100,000	$338,100,000	11%	$43,000,000
2020	$401,800,000	$293,400,000	27%	$108,400,000
2021	$413,700,000	$311,800,000	25%	$101,900,000
2022	$398,300,000	$301,100,000	24%	$97,200,000
2023	$389,500,000	$284,600,000	27%	$104,900,000

[1]Calculated value.

As shown, in more recent years, roughly 73% was deposit payments refunded, leaving 27% of deposits unclaimed.

How Are Unclaimed Deposits Used

Unredeemed deposits are distributed into three separate Bottle Bill treasury funds: the Bottle Bill Enforcement Fund, the Cleanup and Redevelopment Trust Fund ("Trust Fund"), and the Community Pollution Prevention Fund. Unredeemed deposit distributions begin with the first $1 million distributed towards the Bottle Bill Enforcement Fund, then the remaining 75% is distributed to Michigan EGLE, the state's EPA, for environmental programs, and 25% to beverage retailers.

For every 10-cent deposit that comes into the state treasury, the statute requires annual disbursement as follows:

- First $1M towards Bottle Bill Enforcement Fund (Implemented January 1, 2023)

  This is directed to the Michigan State Police Department. However, if the Bottle Bill Enforcement Fund is greater than $3 million the disbursement is suspended until the balance falls below $2 million. The intent is to investigate fraud and violations of the bottle bill. This amendment was implemented January 1, 2023, so its impacts are still not well-known. According to state statute, the Michigan State Police must submit a report to the Legislature by January 1, 2026, indicating the effectiveness of this fund. This report will include, at a minimum, the number of beverage and deposit containers seized as well as the deposit value of those containers in the State of Michigan.

- 75% to EGLE

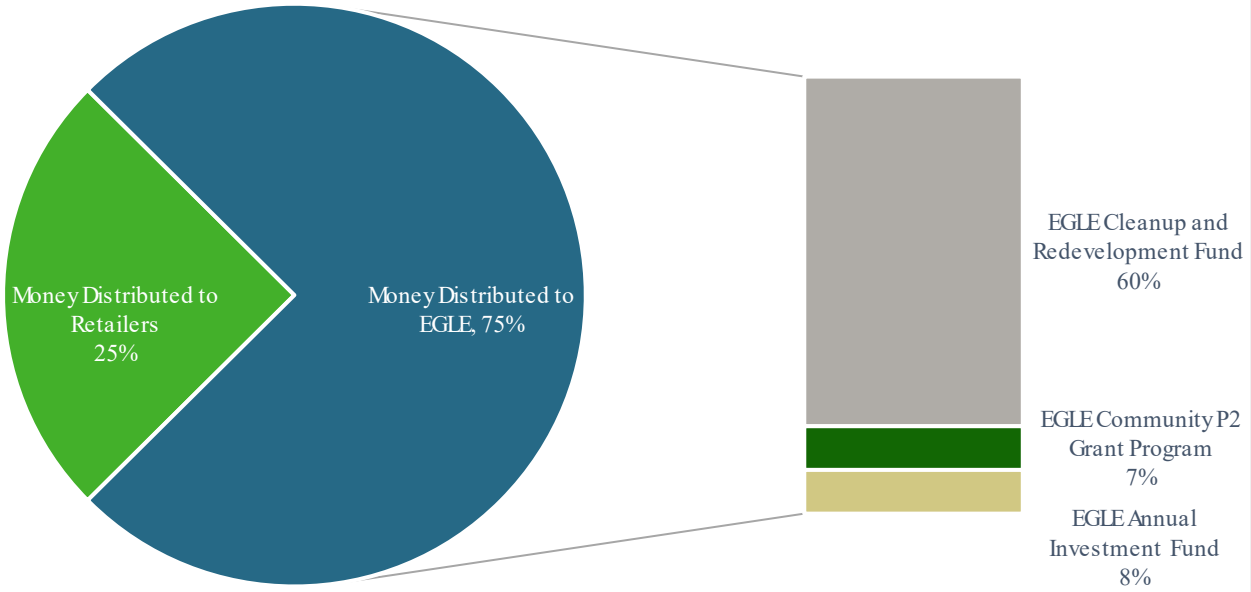
  EGLE's unclaimed deposits are split into two funds: the Cleanup and Redevelopment Trust Fund and the Community Pollution Prevention Fund.

  - 80% of EGLE's monies flow into the Cleanup and Redevelopment Trust Fund. The fund is used to help pay for cleanup and brownfield remediation projects, as well as to fund staffing costs for the remediation and redevelopment department.
  - 10% of EGLE's monies flows into the Community Pollution Prevention Fund. EGLE issues grants to support drinking water wellhead protection, identify and plug abandoned wells other than oil and gas wells, as well as developing programs to educate the general public and businesses that use or handle hazardous materials on pollution prevention methods, technologies, and process, with an emphasis on the direct reduction of toxic material releases or disposal at the source[xiii]. This grant was last awarded in fiscal year 2022. Statute does not require annual disbursements; though EGLE needs to report annually on what was done with the money, if anything.
  - 10% of the annual available EGLE monies are to remain in the Cleanup and Redevelopment Trust Fund as investment monies until the Fund balance reaches $200 million. The intent behind this statutory requirement is to continue growing the unredeemed deposits to provide additional funding for cleanup projects.

- 25% to Retailers

  Retailers must submit a request for reimbursement from the Bottle Bill treasury fund on or before June 1st annually to be reimbursed. This reimbursement is based on the actual number of empty containers handled by an individual retailer or dealer in a calendar year. These payment amounts are determined by treasury once the total amount of unclaimed deposits within the Bottle Bill treasury fund are known/calculated.

Figure 4: Michigan Unclaimed Deposit Distribution



Excludes 2023 Bottle Bill Enforcement Fund payment
Average payments 2018 - 2023

Payment Calculations

Formula to Determine Annual Disbursements of Unclaimed Deposits:

Available Unclaimed Deposits = Total Annual Unclaimed Funds - $1 million

Formula to Determine Annual Disbursements to Michigan EGLE:

Michigan EGLE monies = Available Unclaimed Deposits x 75%

Cleanup and Redevelopment Trust Fund = 80% x Michigan EGLE monies

Cleanup and Redevelopment Trust Fund investment = 10% x Michigan EGLE monies

Community Pollution Prevention Fund = 10% x Total remaining unclaimed monies

Formula to Determine Annual Disbursements to Retailers:

Available Unclaimed Deposits x 25% = Available Retailer money

Retailers Payment = Available Retailer money / Number of empty returnable beverage containers handled annually

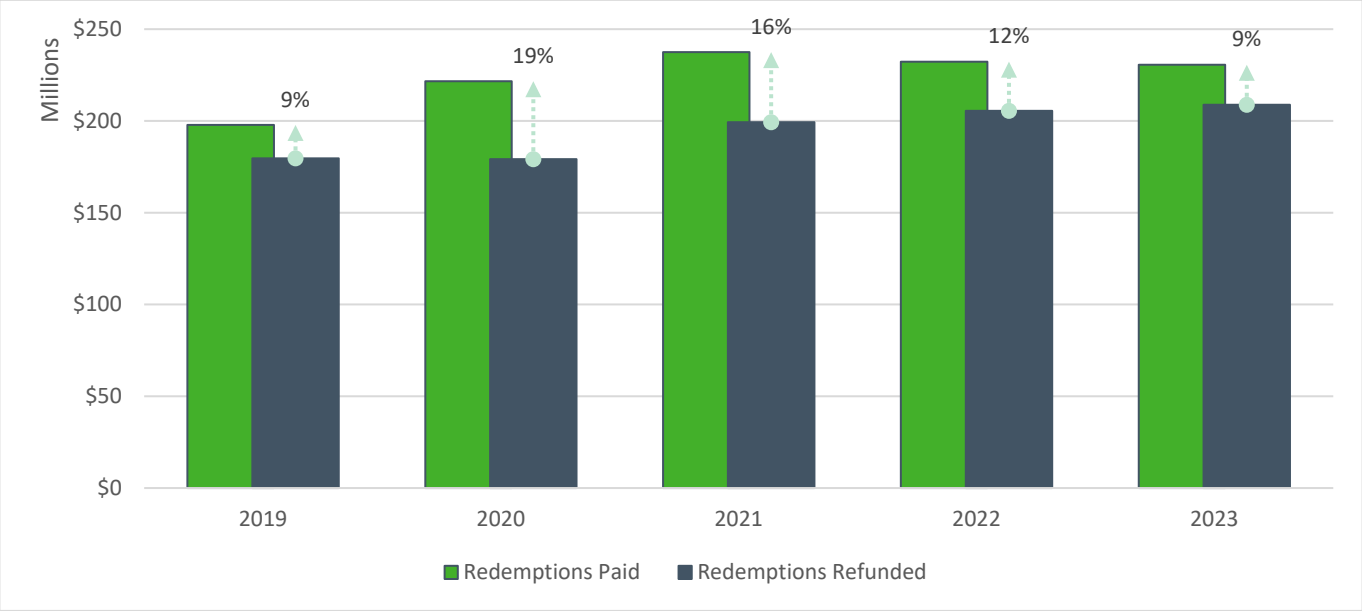
1.4 Oregon

Who Keeps The Unclaimed Deposits

The Oregon Beverage Container Act, enacted in 1971, was intended to address a growing litter problem along Oregon beaches, highways and other public areas. Per statute consumers are entitled to receive a refund when they return redeemable containers.[xiv] Statute does not require a deposit to be charged but does require distributors to pay the refund value. Distributors and retailers charge a deposit to build a fund to pay the refunds out of. Distributors charge beverage retailers the deposit, beverage retailers in turn charge the consumer the deposit value. When consumers return the deposit, they receive a refund from the retailer. When the distributor picks up the empty beverage containers they pay the deposit refund to the retailer. Any unclaimed deposits remain with the beverage distributors.

The Oregon Liquor and Cannabis Commission (OLCC) is the agency responsible for administering and enforcing the bottle bill. Oregon's system is privately operated by the beverage distributors. How the system worked is that distributors were responsible for redeeming the containers in their area. Franchise areas exist for beer and soft drink distributors but not water distributors. With the expansion of water beverage containers in the bottle bill in 2009, the distributors banded together to form the Oregon Beverage Recycling Cooperative (OBRC). The OBRC created a unified system for redeeming containers around the state.

Figure 5: Oregon Unclaimed Deposits



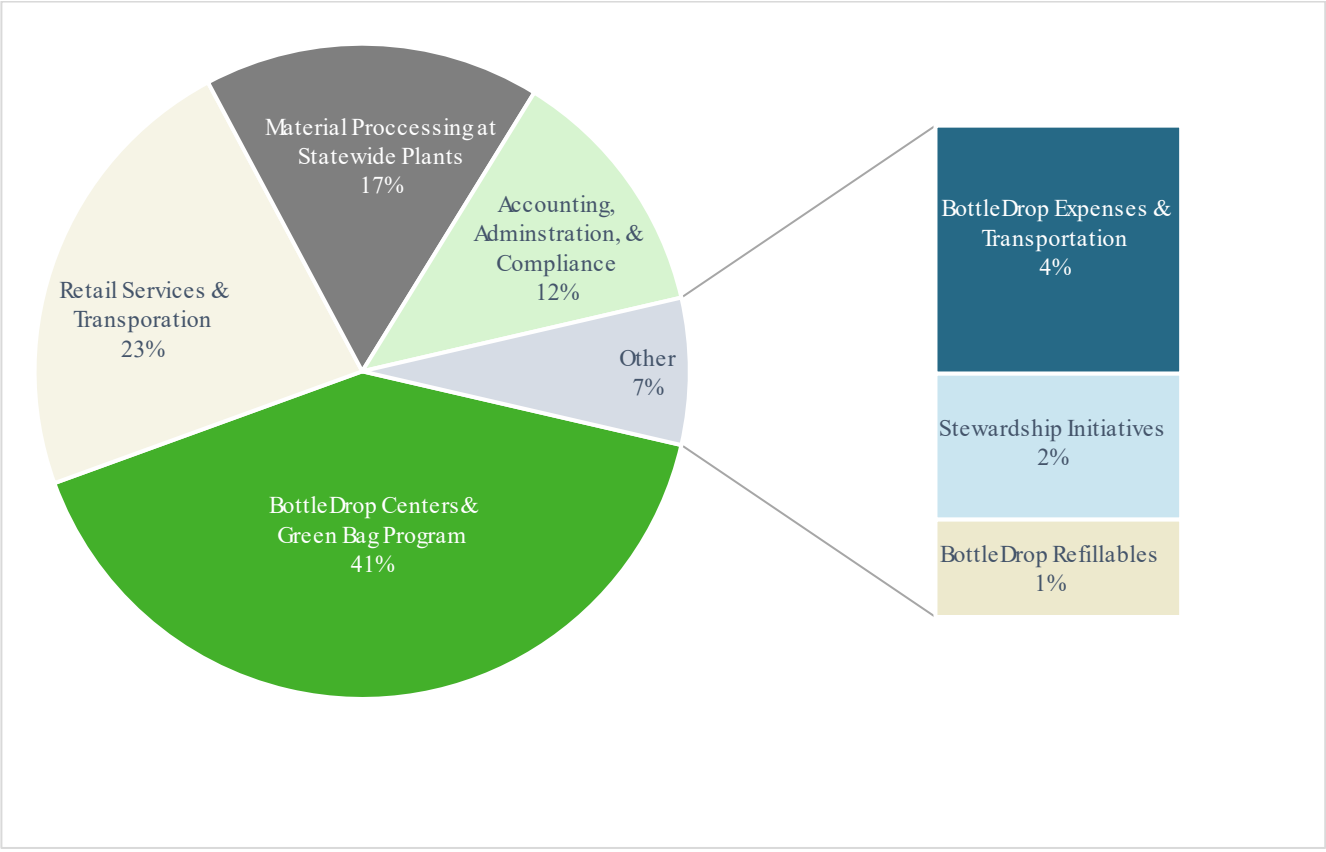
Year	Deposit Fees Paid	Deposit Fees Refunded	Unclaimed Deposits	Unclaimed Monies
2019	$197,826,087	$179,626,087	9%	$18,200,000
2020	$221,640,000	$179,150,000	19%	$42,490,000
2021	$237,500,000	$199,300,000	16%	$38,200,000
2022	$232,300,000	$205,500,000	12%	$26,800,000
2023	$230,600,000	$208,800,000	9%	$21,800,000

The flow of unclaimed deposits in Oregon is calculated based on OBRC's annual report.

How Are Unclaimed Deposits Used

Unclaimed deposits are retained by the system operator, OBRC, and reinvested back into the expansion of the redemption system. OBRC supplements their annual operating budget with distributor membership fees in addition to receiving unclaimed deposit monies from OLCC.

Figure 6: OBRC Annual Budget (Average 2018-2023)



OBRC decides the allocation and appropriation of unclaimed deposits, which is not written into statutes. Based on a six-year (2018-2023) OBRC annual operating budget historical average, GT calculated that for every 10-cent deposit, the unclaimed deposits were distributed as follows:

- 41%: 4.1 cents invested into the expansion of BottleDrop redemption centers and Green Bag Program
- 23%: 2.3 cents invested into route operations (transportation & staffing costs associated with maintaining redemption system)
- 17%: 1.7 cents invested into in-state material processing costs
- 13%: 1.3 cents invested into operations, management, and overhead costs
- 4%: 0.4 cents invested into BottleDrop program expenses and transportation costs
- 2%: 0.2 cents invested into stewardship initiatives (community and nonprofit grants)
- 1%: 0.1 cents invested into development and expansion of BottleDrop Refillable program (collection, cleaning, processing, and distribution costs)

Accounting, Administration, and Compliance

Historically accounting for 13% of operational expenditure, this expense category focuses on general management and operational costs. Accounting includes costs associated with tracking, managing, and reporting on the financial activities of the bottle bill program while Compliance refers to expenses associated with adhering to the legal and regulatory requirements as outlined in Oregon Law. Administration is a catch-all term referring to expenses to cover the general management necessary to oversee OBRC such as payroll, supplies, overhead, etc.

Stewardship Initiatives

This expense category refers to initiatives within the OBRC focused on supporting local non-profits, communities, community groups, and more. Historically, this expense category accounts for 2% of the annual budget.

Retail Services and Transportation

This expense category reflects the cost required to service more than 2,100 retail stores across Oregon. OBRC's Route Operations team collects containers from retail stores and bag drop locations. OBRC employs 71 team members with a fleet of 60 trucks and 250 trailers to provide efficient and reliable services to retail members and BottleDrop account holders. This expense category accounts for 23% of the annual budget on average.

Material Processing at Statewide Plants

OBRC processes nearly two billion pounds of glass, metal, and plastic bottles annually. This expense category refers to the costs associated with processing materials collected domestically within Oregon and accounts for 17% of the annual budget.

BottleDrop Centers and Green Bag Program

OBRC operates 27 full-service BottleDrop Redemption Centers across Oregon which serve as the primary stream of consumer returns. In addition, OBRC offers bag programs for residents and non-profits where customers drop off special bags at redemption centers rather than individual bottles. This expense category includes all costs associated with the onsite management of these programs, historically comprising 41% of the annual budget.

BottleDrop Expenses and Transportation

Includes miscellaneous expenses and transportation costs associated with the BottleDrop program. Accounts for 4% of the annual budget on average.

BottleDrop Refillables

OBRC provides the nation's only refillable bottle program in the country. This expense category includes all costs related to supporting the program such as collection, cleaning, processing, and distribution. Historically this program has accounted for 1% of the annual operating budget

Payment Calculations

OBRC is a private operated system. GT was unable to located formulas showing how unclaimed monies flow through the redemption system in Oregon.

2.0 Beverage Container Circularity

In bottle deposit states beverage containers are either collected through redemption or other (curbside and drop-off) collection programs. Both systems return the beverage containers into the recycling system which typically flows in the following stages.

- Sorter – Beverage containers entering the system through curbside and drop-off collection programs are mixed with other recyclables and need to be sorted. A material recovery facility (MRF) is a specialized manufacturing sorter that receives, separates, and prepares recyclable materials for the processing or manufacturer stage.
- Processor – Beverage containers entering the system through redemption are pre-sorted by the consumer or redemption center and directly sent to the processor or manufacturer. A processor performs further separation, contamination removal, size reduction and aggregation to transform these materials into marketable grades for the manufacturer. Processors may also process material from sorters.
- Manufacturer – The manufacturer uses the recycled beverage container as feedstock for production of recycled content materials.

Some beverage container recycling chains follow all these stages and others may combine some of these stages into a single vertically integrated recycling chain.

2.1 Impacts to Redemption and Recycling

Convenience to Return Containers

The states researched have varying levels of convenience for redeeming or returning deposit beverage containers. Research was conducted to identify the number of redemption locations available in each state. In some instances, it was not possible to identify the number of redemption locations and because tracking is fluid, the number of redemption locations are approximate at the time of the research. Table 1 summarizes the variety of places eligible containers can be redeemed in each state.

Table 1 Redemption and Recycling Opportunities

State	Redemption locations	Other Ways to Return Containers (consumer does not receive deposit)
California	• Certified recycling centers[1] 1,299 recycling centers statewide[xv] • Participating retailers 3,601 retailers • Convenience zones 4,889 listed on status report	• Curbside programs • Drop-off sites
Iowa	• Redemption centers[2] 133 approved redemption centers statewide[xvi] Number of unapproved redemption centers is not publicly listed Mobile redemption centers (8)	• Curbside programs • Drop-off sites

State	Redemption locations	Other Ways to Return Containers (consumer does not receive deposit)
Michigan	• Retail stores[3] Number unknown. Research shows over 11,000 grocery stores.	• Curbside programs • Drop-off sites
Oregon	• Green and Blue Bag drop locations (~100 select retailers) • BottleDrop redemption centers (27) • BottleDrop express sites • Retailers (self-serve machines ~2,500 stores) • Dealer redemption center	• Curbside programs • Drop-off sites

[1]Certified recycling center can be individuals and businesses, supermarkets, and retailers.

[2]Any facility can become a redemption center, but only those who apply for and receive approval from Iowa DNR can be considered "approved redemption center". Unapproved redemption centers rely on private agreements and contracts with distributors. Stores may opt out of being a redemption center depending on certain criteria.[xvii]

[3]Any person who sells or offers consumers beverage containers must offer a means to return the beverage container.[xviii]

Under Iowa's original Beverage Container Deposits law, both redemption centers and retailers such as grocers and convenience stores were required to redeem containers and refund deposits to all Iowans returning eligible beverage containers at their establishments. Iowa allows for both approved and unapproved redemption centers. Approved redemption centers refer to those establishments that choose to register with the Iowa DNR as a redemption center. According to the original law, no person is prevented from establishing a redemption center or registering with the department. If unregistered, a redemption center can still accept containers and process refunds; however, these establishments would not be eligible for handling fees paid by distributors in exchange for redeeming empty deposit containers at their establishment.[xix]

Iowa's law changed in 2022, allowing retail and grocery stores to discontinue redemption of beverage deposit containers, "opting out" under certain provisions. Senate File 2378 was signed into law, with relevant changes to redemption requirements going into effect on January 1, 2023. Prior to the passage of this law, all retail stores were required to redeem beverage deposit containers and provide refunds. Senate File 2378 now allows grocery and convenience stores to opt-out of the bottle deposit program if their establishment has a food license and it is located in a county with more than 30,000 people and operating within10 miles of an approved redemption center. Retailers may also opt-out if the store is located in a county with less than 30,000 people and located within 15 miles of an approved redemption center.[xx]

As of 2024, 133 state-authorized redemption centers were operating in the State[xxi]. The data shown in the table only includes certified redemption and mobile redemption centers, not including the approximately 3,100 grocery stores in the state. It is reasonable to assume the 2022 amendment to Iowa's bottle bill has impacted the retailers opting in to participate in container redemptions.

All four states allow beverage containers to be collected in curbside and drop-off collection systems.

Beverage Containers Eligible for Redemption and Deposit Value

As shown in Table 2 below, not every state includes all beverage container bottles and cans as eligible for redemption. California recently (effective January 1, 2024) expanded to include wine, spirits, wine and spirit coolers, and fruit and vegetable juices.

Table 2 Beverage Containers Covered

Container	California	Iowa	Michigan	Oregon
Carbonated Soft Drinks	X	X	X	X
Beer & Malt Drinks	X	X	X	X
Sparkling Water	X	X	X	X
Non-Sparkling Water	X			X
Sports Drinks	X			X
Energy Drinks	X			X
Juice	X			X
Tea & Coffee	X			X
Wine	X	X		
Mixed Spirits	X	X	X	X
Spirits (Liquor)	X	X		

Source: "2021 Beverage Market Data Analysis," Container Recycling Institute, 2024.

Likewise, the value of the deposit is also state specific, as shown in Table 3.

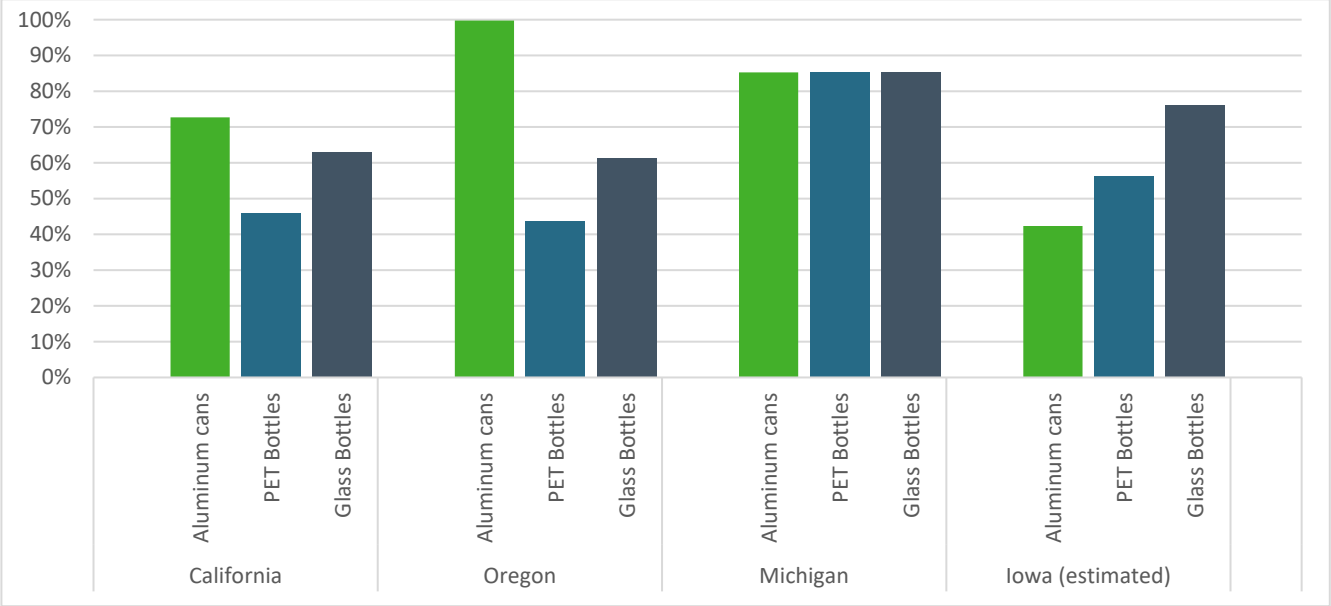
Table 3 Amount of Deposits

California	Iowa	Michigan	Oregon
5¢ for beverage containers less than 24 ounces, 10¢ for 24 ounces or larger, and 25¢ for wines and distilled spirits in a box, bladder or pouch	5¢	10¢	10¢

2.2 Recycling Rate and Commodity Pricing

Deposit beverage containers recycling rates shown in Figure 7 include containers recycled through redemption centers and curbside and drop-off programs. The recovery rate is derived from the deposit beverage containers sold and recycled, as reported in CRI's 2021 Beverage Market Data Analysis. The analysis is based on the latest data openly available. The recycling rates may not align with other published recycling rates because of calculation methodology or contamination and processing losses.

Figure 7: Deposit Beverage Container Recycling Rate (2021)



Source: "2021 Beverage Market Data Analysis", Container Recycling Institute, 2024. Recycling Rate is deposit beverage container units recycled divided by beverage container units sold.

Iowa's calculation to determine a recovery rate uses a methodology based on the deposit beverage containers measured in the landfill and estimated sales data, which is not how the other three states rates are derived. Iowa does not require reporting of total beverage containers sold by material type. The methodology developed by CRI is an estimate for deposit containers. Two other studies[xxii], conducted by different groups, found varying beverage container recycling rates (including deposit and non-deposit) as shown in the table below with their methodology.

	2021	2023
Aluminum cans	76%	62%
PET bottles	30%	68%
Glass bottles	66%	38%

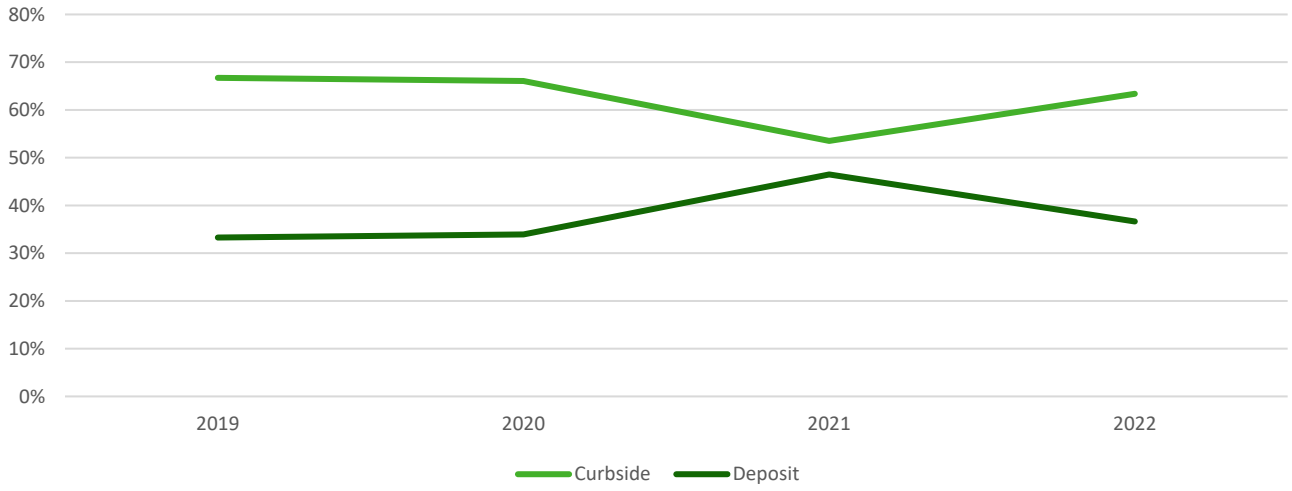
This illustrates data gaps resulting in various deployed methodologies and thus, variances in calculated metrics. This report bases deposit beverage container recycling rates on the CRI methodology.

A limitation to achieving circularity is the ability to capture as many beverage containers as possible. The recycling rates presented in Figure 7 focus on deposit beverage containers only. The deposit beverage containers that are not returned through either collection systems of bottle redemption system, curbside, or drop-off; the unaccounted for is wasted. As shown in Figure 7, in Michigan, the data shows most deposit beverage containers are being recycled.

The Aluminum Association reports that the national average of aluminum beverage containers recycled back into aluminum beverage containers is approximately 96.7%. States measuring lower aluminum can deposit recycling rates demonstrate higher amounts of deposit containers wasted in the system.

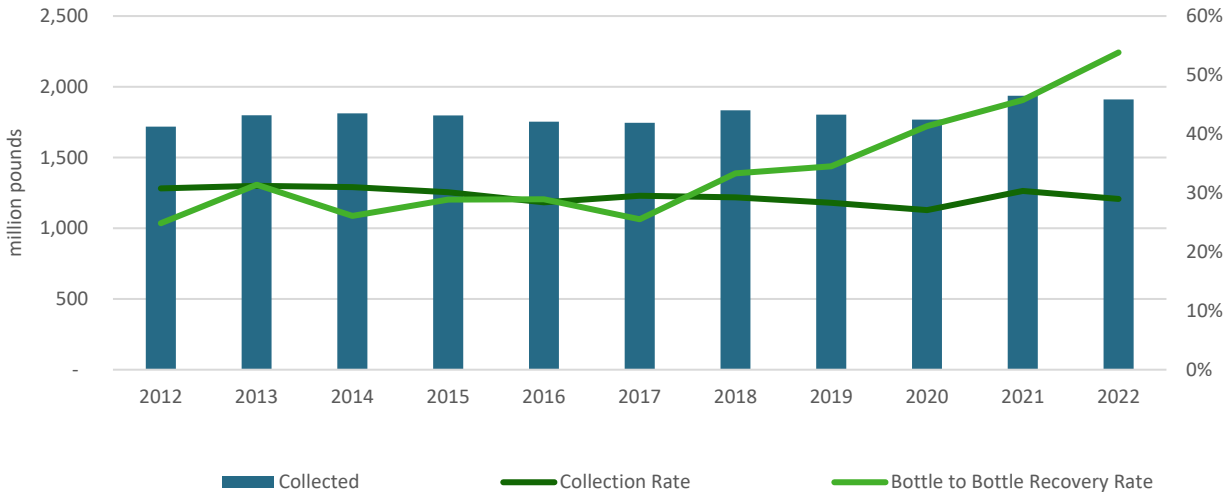
The National Association for PET Container Resources (NAPCOR) reports a 68% national average of the PET bottles that are recycled back into food grade PET beverage containers. The trend shows reclaimers mostly source bales and dirty flake purchases, as shown in Figure 8, from curbside programs. The spike in 2021 is assumed to be related to the COVID 19 pandemic. Figure 9 shows the bottle-to-bottle recovery trend for PET is accelerating.

Figure 8: Reclaimer Purchases of Postconsumer PET



Source: NAPCOR PET Recycling Report 2022

Figure 9: Historic PET Collected and Recycling Rate



Source: NAPCOR PET Recycling Report 2022

The key terms in Figure 9 are defined as follows:

- **Collection Rate** is the total weight of U.S. post-consumer bottles collected and sold, divided by the total weight of PET containers (including non-food/beverage) available for recycling. NAPCOR refers to this as the Collection Rate.
- **Collected** refers to the total weight of post-consumer bottles collected for recycling in the U.S.
- **Bottle to Bottle Recovery Rate** is a formula used to determine the total rPET (recycled PET) used in both food and non-food and beverage bottles in the U.S. This is calculated as follows, using data provided in the 2022 NAPCOR PET Recycling report:

  (Food & Beverage Bottles + Non-Food Bottles) / Total rPET = Bottle-to-Bottle Recovery Rate

The bottle-to-bottle recovery rate has increased steadily since 2012, with a significant increase starting in 2017. NAPCOR attributes increases to new legislative requirements and voluntary corporate commitments to utilize higher levels of post-consumer content in manufacturing product packaging. NAPCOR also states that the increases in the recovery rate are due to the increased trade between U.S. and Mexico markets for rPET.

The Glass Packaging Institute reports a national recycling rate of 31.3%, and states that 80% of glass recovered is made into new glass products.

To illustrate each deposit container's circularity, national data on the percentage of materials collected for recycling that get turned back into containers was applied to the estimate of tons collected for recycling.

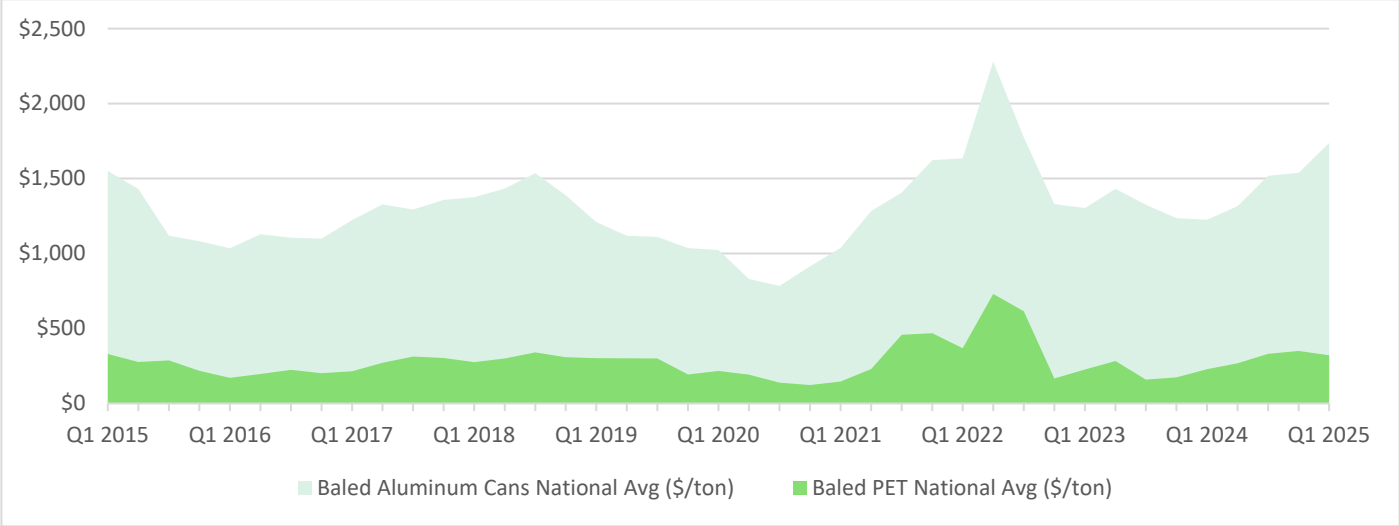
Table 4 Estimated Tons of Deposit Containers Recycled into New Beverage Containers

Material	Aluminum Cans (tons)	PET Bottles (tons)	Glass Bottles (tons)
California	117,022	121,163	210,708
Iowa	8,918	5,246	14,795
Oregon	18,440	5,688	15,033
Michigan	43,125	18,521	26,076

Sources:
"2021 Beverage Market Data Analysis," Container Recycling Institute, 2024.
Container Calculated Recycling Rate: The ratio of deposit containers sold to deposit containers recycled using CRI data
Reported National Average Percent Converted back into Beverage Containers: The ratio of new containers produced from existing containers that were collected to be recycled using national data.
* California's percentage of glass that gets turned back into containers was derived from CalRecycle [xxiii]

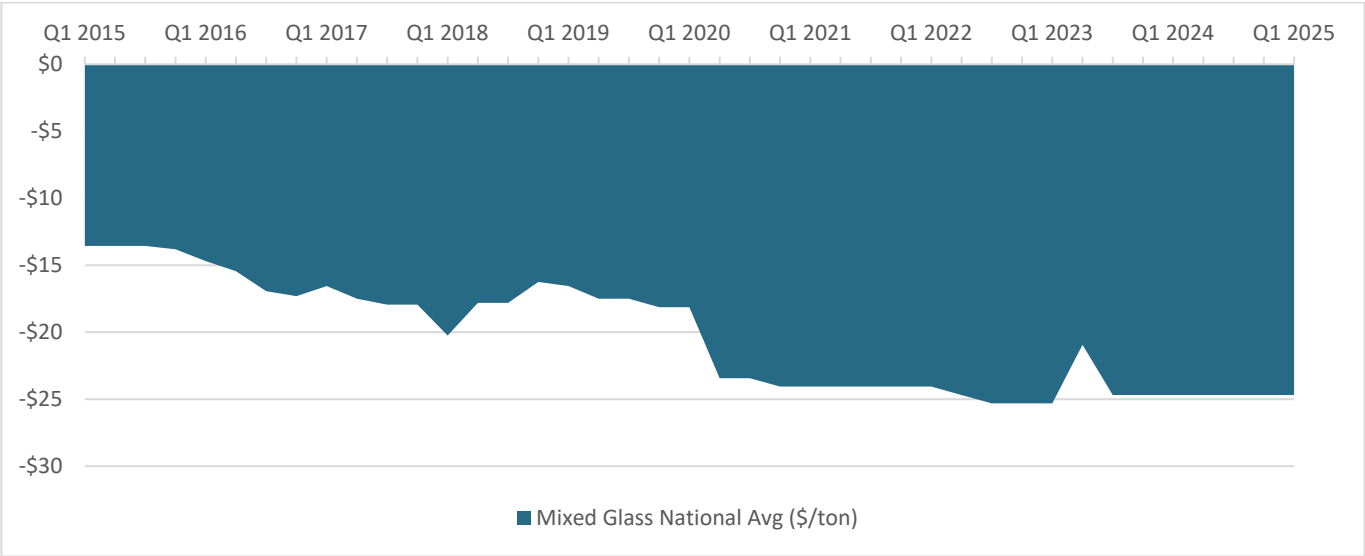
Recycling systems generate economic value through the collection and processing of containers, which are then sold to end markets for remanufacturing into new products. Containers not recovered for recycling are potential economic value lost. Figures 10 and 11 graphically demonstrate the varying economic dynamics of aluminum, PET, and glass commodity value trends over the past decade.

Figure 10: Baled Aluminum & PET National Average Economic Value ($/ton)



The market values of aluminum and PET bales have experienced fluctuations over time, generally following similar trends. Both commodities reached their lowest value in late 2020, reflecting market challenges during that period. However, a subsequent recovery led to a steady increase in their values, culminating in a peak in late 2022.

Figure 11: Mixed Glass National Average Economic Value ($/ton)



Unlike aluminum and PET, glass exhibits an inverse economic trend, becoming costly to process and send to end markets over time. Instead of generating revenue, glass requires processors to incur costs, as they must pay to have it transported to end markets. This negative market value highlights the economic challenges associated with recycling glass compared to other commodities.

Among the beverage containers, baled aluminum has the highest market value, with a national average of $1,377 per ton in 2021, followed by baled PET at $326 per ton (PET deposit baled at $644 per ton for Los Angeles region). However, glass presents a unique challenge, with a negative market value loss of

$24 per ton, reflecting costs incurred by processors to deliver it to end markets. (Based on national averages for materials.)

Table 5 Estimated Value of Unrecovered Containers (includes deposit and non-deposit)

State (2021)	PET Bottles	Aluminum Cans	Glass Bottles
Michigan	$15,153,284	$12,029,901	($4,378,920)
Oregon	$8,149,561	$188,552	($2,558,516)
California	$71,817,397	$62,077,820	($23,840,597)
Iowa	$1,730,350	$13,746,595	($472,779)
Total Estimated Commodity Value (Lost)	**$96,850,592**	**$88,042,868**	**($31,250,812)**

Sources:
"2021 Beverage Market Data Analysis," Container Recycling Institute, 2024.
RecyclingMarkets.net[xxiv]

Table 5 estimates the economic loss of unrecovered containers in each bottle bill state, including unrecovered deposit and non-deposit eligible containers. PET losses totaled approximately $97 million, with California incurring the highest potential market value loss at roughly $72 million from all PET containers not recovered or redeemed, followed by Michigan at $15 million. Aluminum can losses amounted to approximately $88 million, with California again leading at roughly $62 million, while Oregon reported the smallest loss at under $190k. Mixed glass shows a total negative value. This means the mixed glass is currently worth less than zero. If the mixed glass were recovered those would be paying to recycle the glass. Overall, California exhibits the highest commodity losses across each category. This is to be expected as the number of containers bought, returned, and lost is significantly higher in California than in other states.

A detailed analysis was conducted to compare each of the four selected states with their neighboring states. Utilizing national data from RecyclingMarkets.net, along with the most reliable waste disposal, recycling, and generation data published by relevant state agencies, the economic loss associated with wasted containers was calculated. Table 6 examines the economic losses for Michigan, Oregon, California, and Iowa, comparing them to two neighboring states for each.

Table 6 Estimated Market Value of Wasted Containers

Michigan Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
Michigan	$15,153,284	$12,029,901	($4,378,920)
Ohio[xxv]	$43,629,591	$36,058,681	($5,054,268)
Indiana[xxvi]	$26,887,254	$52,822,856	($3,418,149)
Total Estimated Commodity Value (Lost)	**$85,670,130**	**$100,911,439**	**($12,851,337)**

Oregon Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
Oregon	$8,149,561	$188,552	($2,558,516)
Washington [xxvii]	$51,881,771	$89,043,602	($7,672,283)
California	$71,817,397	$62,077,820	($23,840,597)
Total Estimated Commodity Value (Lost)	**$131,848,729**	**$151,309,973**	**($34,071,396)**
California Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
California	$71,817,397	$62,077,820	($23,840,597)
Nevada [xxviii]	$15,154,664	$27,084,974	($2,043,194)
Arizona [xxix]	$23,251,422	$39,800,593	($3,226,761)
Total Estimated Commodity Value (Lost)	**$110,223,483**	**$128,963,386**	**($29,110,552)**
Iowa Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
Iowa	$1,730,350	$13,746,595	($472,779)
Minnesota [xxx]	$12,532,402	$18,000,722	($1,723,259)
Illinois [xxxi]	$43,334,658	$80,823,390	($7,523,081)
Total Estimated Commodity Value (Lost)	**$57,597,409**	**$112,570,707**	**($9,719,119)**

Note: Indiana data uses the reference year of 2023
Note: Illinois data uses the reference year of 2015
Note: National data uses the reference year of 2018

To ensure data consistency, the calculations in Table 6 primarily used 2021 as the reference year whenever possible. In cases where 2021 data was unavailable, data from other years was used. Data for the four selected states was sourced from CRI. Data for the comparison states were derived from their respective state agencies and U.S. EPA data. State-reported waste disposal, recycling, and generation data was applied to U.S. EPA material composition estimates for waste streams (disposal, recycling, and generation) to estimate the quantities of each material for each state.

In cases where states provided specific material composition data, those figures were used directly instead of the broader methodology described above. It is important to note that the methodologies for reporting waste totals vary significantly by state, each with unique limitations. For instance, Illinois reported specific data on aluminum recycling in its state report which was used in the calculations. However, Illinois employs a voluntary reporting system, which likely underrepresents the total recycling activity. Consequently, the estimates for wasted aluminum cans, in this case, may be artificially inflated.

The calculations presented are based on the best available data and should be considered estimates rather than exact figures. They are meant to provide a general understanding of the potential economic loss from wasted materials across the included states.

Table 7 Estimated Per Capita Market Value of Wasted Containers

Michigan Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
Michigan	$1.49	$1.19	($0.43)
Ohio	$3.71	$3.06	($0.43)
Indiana	$3.94	$7.75	($0.50)
Total Estimated Commodity Value (Lost)	**$9.15**	**$12.00**	**($1.36)**
Oregon Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
Oregon	$1.91	$0.04	($0.60)
Washington	$6.70	$11.50	($0.99)
California	$1.83	$1.59	($0.61)
Total Estimated Commodity Value (Lost)	**$10.44**	**$13.13**	**($2.20)**
California Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
California	$1.83	$1.59	($0.61)
Nevada	$4.81	$8.60	($0.65)
Arizona	$3.20	$5.47	($0.44)
Total Estimated Commodity Value (Lost)	**$9.84**	**$15.66**	**($1.70)**
Iowa Comparison			
State	**PET Bottles**	**Aluminum Cans**	**Glass Bottles**
Iowa	$0.53	$4.24	($0.15)
Minnesota	$2.19	$3.15	($0.30)
Illinois	$3.41	$6.36	($0.59)
Total Estimated Commodity Value (Lost)	**$6.14**	**$13.75**	**($1.04)**
National Averages			
United States	**PET Bottles**	**Aluminum Cans**	**Mixed Glass**
Total Estimated Commodity Value (Lost)	**$2.18**	**$2.98**	**($0.28)**

Using the values calculated in Table 6, the table above shows the total commodity value lost per capita. Population estimates for each state and nationally were obtained through the U.S. Census Bureau[xxxii]. The estimated commodity value lost for PET bottles and aluminum cans in three of the four bottle bill states falls below the national average per ton, demonstrating the effectiveness of bottle bills in capturing materials from disposal. In neighboring non-bottle bill states, the potential market value lost for PET and aluminum containers reflects an average of $2–3 per ton commodity value loss greater than in the compared bottle bill states.

Glass containers show a different trend. In each comparative state grouping, except for Iowa, per capita value loss is roughly the same; this demonstrates that glass recovery in the compared bottle bill states is realizing the same economic value losses. The exception is Iowa. While Iowa also shows a less than zero value, the per capita value loss is less, demonstrating that more glass is being recovered back into the market.

Another important exception to note is the potential market value lost from aluminum containers in Iowa. The per capita potential market value lost from aluminum cans is significantly higher than in other Bottle bill states. This may, in part, be due to the unintended consequences of Iowa's bottle bill statute. Without mandatory data reporting on containers redeemed in the State, it is difficult to know exactly how many eligible containers are being wasted instead of recovered.

2.3 What Impacts a Material's Circularity?

Color: The color of beverage containers plays a significant role in their recyclability, particularly for materials like glass and PET. The issue stems from the way color affects the recycling process. Clear and white PET plastics are the easiest to recycle. They can be processed and transformed back into clear or white plastic products without any degradation in quality. This makes clear plastics highly desirable in the recycling stream. When plastics, such as green or blue PET bottles, are recycled, they cannot be turned into the same color material. Instead, they are usually downcycled into darker colors like black. This is due to the challenges in separating and sorting colored plastics, and because different dyes and pigments can affect the quality and appearance of the new material. Black plastics, although recyclable, are less desirable for manufacturers, who may be hesitant to purchase and use them due to aesthetic or functional reasons. This can lead to a situation where a recycled green PET bottle ends up being downcycled into black plastic, which is less marketable and may ultimately end up in landfills.

The challenges are similar with colored glass. Different colors of glass—such as green, amber, and clear—are often not mixed during the recycling process. This is because mixing different colored glass can reduce the quality of the recycled glass. For example, clear glass is in high demand because it can be reused to make new clear glass products, while green or amber glass has limited applications. The need for strict separation of glass by color means that recycling systems must be more careful in sorting and processing, making it more complex and costly. If glass is not properly sorted, the result can be a lower-quality recycled product, which may be less useful for certain applications. In some cases, improperly sorted glass may be downcycled into products that have limited functionality, or it may not be recycled at all, contributing to landfilled waste.

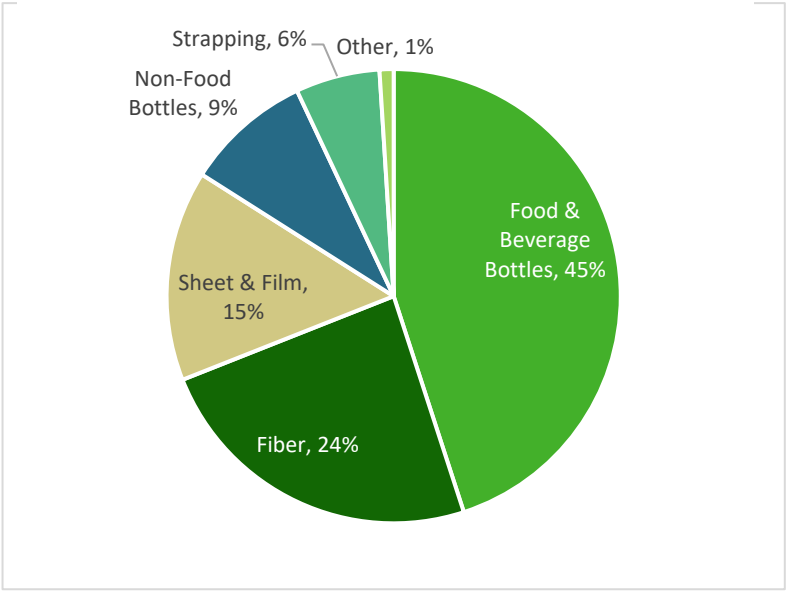
Hard to Avoid Contamination: Contamination is a common issue in any recycling system, with much of it being avoidable, such as improper materials entering the recycling stream or containers with food residue still inside. However, certain contaminants are inherent to the product design of the materials themselves, including bottle caps, glue, and plastic labels, which are challenging to remove or avoid during the recycling process. These items often enter the recycling stream in a way that is extremely difficult to prevent, as they are integral parts of the materials being recycled. This issue is particularly problematic for PET and glass bottles, but aluminum faces fewer challenges in this regard. The recycling process for aluminum is the most straightforward when it comes to difficult to avoid contamination. The only significant contaminant in aluminum recycling is the can sleeve, which is burned off at the start of the process, leaving behind only pure aluminum. In contrast, plastic and glass materials with challenging contaminants require additional sorting and removal before undergoing processing, which can add complexity to the recycling process. The existence of such contaminants also complicates the measurement of circularity. Typically, these contaminants are included in weight metrics, even though they may not be fully recycled, leading to inflated values and misrepresentations of the true circularity of the material. Of the three materials discussed, aluminum experiences the least inflation in recycling numbers, generally making reported numbers closest to the true values regarding circularity.

Material Quality: In a circular system, the ideal scenario is for materials to be recycled back into the same type of product from which they originated. For instance, a PET water bottle can be recycled into a new PET water bottle, and the same concept applies to glass and aluminum containers. However, nuances arise, particularly with PET and glass materials. PET, especially, is highly versatile and is used in a wide range of containers, from cleaning bottles to drinking bottles. Unfortunately, recycling a cleaning spray bottle into a water bottle is not as straightforward as it may seem. The challenge lies in the trace chemicals that are present in cleaning spray bottles, which are strictly prohibited in food or beverage containers. The recycling process for PET involves cleaning and melting the plastic to form a new resin, which is then used to manufacture new bottles. While this process includes extensive cleaning and heat treatment, it does not eliminate all chemicals from the bottles. As a result, a cleaning spray container will always contain trace elements of these prohibited chemicals, making it unsuitable for recycling into a water bottle or any other product intended for food or beverage use.

2.4 Circularity of PET

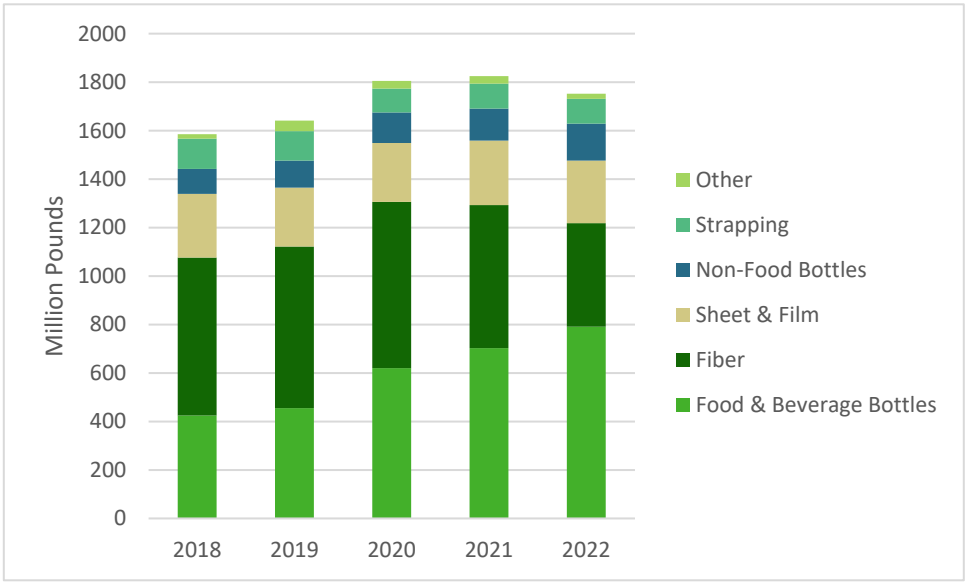
PET bottles account for the vast majority of PET in the recycling stream. Currently, the largest recycled PET end market is food and beverage bottles (45%), followed by synthetic fiber (24%) and sheet and film (15%) which is used in thermoformed packaging. (See Figure 12). Figure 13 shows the historic increase in recycled PET by end market product. The amount of recycled PET into new food and beverage bottles shows growth. Recycled PET usage and incorporation into products is being increased by brand commitments to incorporate recycled resins into products, due to EPR legislation in states such as California.

Figure 12: Recycled PET End Markets



PET is the most widely used material for producing plastic bottles and jars, but its circular nature presents several challenges, particularly in the recycling process for PET bottles. While the recycling process itself and the remanufacturing of PET into new products are feasible, the significant challenge lies at the beginning of the process—collection and sortation. Reclaimers face a variety of issues that hinder PET's recycling efficiency, with contamination and color being major factors. Contamination, both avoidable and unavoidable, complicates the recycling process. Avoidable contamination, such as food or liquid residue, dirt, and other non-recyclable materials, is especially difficult to manage. Every instance of contamination reduces both the quality and quantity of recyclable material. According to the National Association for PET Container Resources (NAPCOR), reclaimers report significant unrecoverable yield loss due to contamination from liquid residue, dirt, and non-recyclable materials. Additionally, NAPCOR identifies "look-alike" contamination, where materials that resemble PET are made from different resin types, further complicating the sorting process.

Figure 13: Historic Recycled PET End Markets



Contaminants are counted in the input weight of the system but must be removed during the recycling process, which means they do not contribute to the final output. The difference between the input weight and the recovered material is termed material efficiency by NAPCOR, a key metric used to describe the circularity of the material. According to NAPCOR's 2022 data[xxxiii], 1.786 billion pounds of PET were recovered as usable output from an input feedstock of 2.264 billion pounds, yielding a 79% recovered material efficiency rate. In addition to avoidable contamination, reclaimers also face challenges with unavoidable contaminants. PET bottles are often designed with labels, ink, adhesives, and caps that cannot be recycled with the plastic resin and must be removed before recycling. If these items are not properly separated during sorting, they can degrade the quality of the recycled PET. Another front-end consideration is the color of the bottle. Clear plastic bottles can be recycled back into clear plastic bottles, maintaining their original quality. However, colored plastics cannot be recycled back into the same color bottle due to the chemical properties of the material. When melted down, the color shifts to a dark gray or black, which reduces the material's recyclability.

The two most widely utilized methods for recycling PET are mechanical and chemical recycling. Mechanical recycling is the most common, involving the cleaning of PET bottles followed by grinding them into flakes. However, the cleaning process in mechanical recycling does not fully eliminate the chemicals or organic compounds absorbed by the resin during the bottle's lifecycle. As a result, trace chemicals or organic compounds may remain within the resin. This presents a significant challenge for reclaimers, who must separate bottles used for different purposes, such as cleaning sprays and water bottles. For example, a cleaning spray bottle cannot be recycled into a water bottle due to the lingering chemicals. Reclaimers are required by law to rigorously test their products to ensure that no trace chemicals remain, which further impacts the efficiency and circularity of the recycling process.

Chemical recycling, also known as molecular recycling, is the process of converting waste products back into raw plastic materials. Molecular recycling is a complex process and primarily occurs by changing the chemical structure of plastics such as pyrolysis and gasification. This type of recycling is promoted by the plastic manufacturing industry as another way to manufacture new plastic products and keep plastic materials out of landfills.

A final consideration for the circularity of PET is the type of recycling taking place, namely bottle-to-bottle recycling versus bottle-to-fiber recycling (commonly known as downcycling). PET flowing into the recycling system via redemption centers produce high quantities of single resin types to move directly to reclaimers and product manufacturers. Bottle-to-bottle reclaimers invest in more sophisticated technology and processes to produce food-grade rPET. Bottle deposit states produce a feedstock source for the food grade bottles, especially in California where mandates are at play.

2.5 Circularity of Glass

Glass bottles face many of the same circularity challenges as plastics, particularly in terms of contamination and color, which significantly impact recycling efficiency. These challenges arise at the beginning of the recycling process, requiring sorting and cleaning, which can hinder the material's circularity. Contamination further complicates the process. Avoidable contamination, such as food or liquid residue, dirt, and other non-recyclable materials, is especially difficult to manage, much like with other types of recyclable materials. An additional challenge for glass recycling is the material's weight and

fragility, which make it less economically efficient to handle compared to other materials. Moreover, clear and colored glass cannot be mixed during the recycling process, doing so diminishes the quality of the final product and, consequently, its market value. To address this limitation, many glass collection points require the glass to be sorted by color before recycling.

Due to these challenges recycling glass efficiently can be difficult. A 2018 report from the Northeast Recycling Council (NERC), which surveyed material recovery facilities (MRFs) in 11 northeastern U.S. states, revealed that 54% of all glass material collected by MRFs must be sent to glass processors for cleaning. Furthermore, only 0.02% of the reported tonnages of glass were sent directly to manufacturers for recycling into new products. The report also indicated that a significant portion of the glass received by MRFs (38%) ends up in landfills, often being used for alternative daily cover, road base fill, or simply disposed of. The study concluded that the greatest challenges to the circularity of glass are contamination and the need for additional cleaning by processors.

However, glass recycling becomes much more efficient when bottles are collected separately rather than being commingled with other materials. For example, areas with Bottle bills, where consumers return bottles for recycling, generally experience higher glass circularity than regions without such programs. Bottle bill states produce a significant amount of clean, sorted glass that is of higher quality and value, bypassing the need for sorting at MRFs. This source-separated glass is more easily directed to manufacturers for recycling, contributing to more efficient and effective glass recycling.

2.6 Circularity of Aluminum

Aluminum is considered one of the easiest materials to recycle due to its unique properties and the efficiency of its recycling process. It has several factors which contribute to its high circularity.

- **Minimal Quality Loss:** Unlike other materials that have their chemical properties degraded over multiple recycling cycles, aluminum retains its properties allowing it to be reused to make new products with very minimal decline in quality over time.

- **Simple and Efficient Processes:** The process of recycling aluminum is highly efficient. The cleaning process is simple, removing contaminants by burning contaminants off. The pure metal is then melted down and able to be remade into new products.

- **Low Contamination:** Aluminum is less susceptible to contamination compared to materials like PET or glass. While there are some unavoidable contaminants (such as labels and can sleeves), these are easily removed during the recycling process.

- **Minimal Material Loss:** Because of the simplicity of the recycling process, cleaner outputs with minimal material loss occur. The weight of materials going into the furnace is the weight that is tracked and is free of any material that is not fit for recycling.

- **Market Demand:** There is a high market demand for recycled aluminum as it requires a fraction of the energy and cost of using virgin material. Its high circularity creates a positive feedback loop that ensures its economic viability, driving the demand for recycled material.

3.0 Key Takeaways

There will always be unclaimed monies in the redemption system – determining how the money is used if it is unclaimed is critical to the long-term success of the bottle bill.

- California statute distributes accumulated unclaimed deposit money to a network that supports the collection, processing, education, and market development of beverage containers.
- California's bottle deposit system has a complete scope of beverage containers.
- Oregon statute has a trigger to adjust the deposit level if the return rate falls below a threshold.
- Michigan's deposit beverage container recycling rates demonstrate more deposit beverage containers flowing through redemption program than through curbside and drop-off programs.
- Convenience matters – as with any recycling program, redemption rates rise as redemption opportunities for consumers increase.
- The deposit amount matters – higher deposit rates incentivize consumers to return containers.
- Language matters – how a statute is written can determine how effective the redemption system is.
- The adage is true: You can't manage what you don't measure. States with Bottle bills and mandated reporting requirements for beverage and recycling industries allow for program performance metrics. California statute requires total sales and total deposits collected, as well as how the recovered material was recovered for sale to end users from MRFs or other recycling processors.

Appendix A: State Statute Definitions

California Statute Definitions[xxxiv]:

- **"Convenience Zone"** means either of the following:

  (1) The area within a one-mile radius of a supermarket.

  (2) The area designated by the department pursuant to Section 14571.5.

- **"Fund"** means an independent accounting entity with a self-balancing set of accounts, created for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations, restrictions or limitations. It has accounts for assets, deferred outflows, liabilities, deferred inflows, reserves, equities, revenue, and expenditures/expenses.
- **"Processor"** means any person, including a scrap dealer, certified by the department who purchases empty aluminum beverage containers, bimetal beverage containers, glass beverage containers, plastic beverage containers, or any other beverage containers, including any one or more of those beverage containers, which have a refund value established pursuant to this division, from recycling centers in this state for recycling, or, if the container is not recyclable, not for recycling, and who cancels, or who certifies to the department in a form prescribed by the department the cancellation of, the refund value of these empty beverage containers by processing empty beverage containers, in any manner which the department may prescribe.
- **"Recycling Center"** means an operation which is certified by the department, and which accepts from consumers and pays or provides the refund value pursuant to Section 14572 for, empty beverage containers intended to be recycled.
- **"Redemption" and "redeem"** means the return to a recycling center or location of an empty beverage container for a refund of at least the refund value.

Iowa Statute Definitions[xxxv]:

- "**Dealer"** means any person who engages in the sale of beverages in beverage containers to a consumer.
- **"Dealer agent"** means a person who solicits or picks up empty beverage containers for the purpose of returning the empty beverage containers to a distributor or manufacturer.
- **"Distributor"** means any person who engages in the sale of beverages in beverage containers to a dealer in this state, including any manufacturer who engages in such sales.
- **"Manufacturer"** means any person who bottles, cans, or otherwise fills beverage containers for sale to distributors or dealers.
- **"Redemption center"** means a facility at which consumers may return empty beverage containers and receive payment for the refund value of the empty beverage containers.

Michigan Statute Definitions[xxxvi]:

- "**Dealer"** means a person who sells or offers for sale to consumers within this state a beverage in a beverage container, including an operator of a vending machine containing a beverage in a beverage container.
- **"Distributor"** means a person who sells beverages in beverage containers to a dealer within this state and includes a manufacturer who engages in such sales.
- **"Manufacturer"** means a person who bottles, cans, or otherwise places beverages in beverage containers for sale to distributors, dealers, or consumers.
- **"Overredeemer"** means a distributor or manufacturer whose sum of the total value of deposits collected from participating customers on beverage containers sold in this state in a specified period and the refunds received under subsection (5) in the specified period is less than the total value of refunds made to participating customers on beverage containers redeemed in this state in that specified period.[xxxvii]
- **"Unclaimed deposits"** refer to returnable containers; they are considered to be the property of the person purchasing the returnable container and are not the property of the distributor or manufacturer who originated the deposit.[xxxviii]
- **"Underredeemer"** means a distributor or manufacturer whose sum of the total value of deposits collected from participating customers on beverage containers sold in this state in a specified period and the refunds received under subsection (5) in the specified period exceeds the total value of refunds made to participating customers on beverage containers redeemed in this state in that specified period.[xxxix]

Oregon Statute Definitions[xl]:

- "**Dealer"** means every person in this state who engages in the sale of beverages in beverage containers to a consumer or means a full-service redemption center approved under ORS 459A.735.
- **"Dealer redemption center"** means a location that meets the requirements of ORS 459A.741, at which any person may return empty beverage containers and receive payment of the refund value of the beverage containers.
- **"Distributor"** means every person who engages in the sale of beverages in beverage containers to a dealer in this state including any manufacturer who engages in such sales.
- **"Distributor cooperative"** refers to two or more distributors who collect and pay refund value for beverage containers specified in the statute, process beverage containers sold in the state, and maintain a registry of all beverage containers sold and redeemed in this state.[xli]
- **"Full-service redemption center"** means a location that meets the requirements of ORS 459A.737, at which any person may return empty beverage containers and receive payment of the refund value of the beverage containers.
- **"Manufacturer"** means every person bottling, canning or otherwise filling beverage containers for sale to distributors, importers or dealers.
- **"Redemption center"** means a full-service redemption center or a dealer redemption center.

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