

Improving California's Beverage Container Recycling Rates:  
A Case for Structural Program Changes

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## Introduction

California is one of ten states with bottle bill laws requiring retailers to charge their customers a deposit on beverages sold in their stores (Container Recycling Institute [CRI], 2000). Deposits are refunded to a customer once the container is recycled. Theoretically, the deposit serves as a financial incentive for the customer to return the empty container for the refund of deposit instead of discarding the container. Yet, each year Californians discard billions of beverage containers that should be recycled. They are tossed as litter along roadways, left behind as garbage in recreational areas, and sent to landfills (Conti, 1993).

When the Legislature enacted California's Beverage Container Recycling and Litter Reduction Act in 1986 (Act), it established a recycling rate goal of 80% for all beverages sold in the state (Act, 2002). The recycling rate for beverage containers peaked at 81% in 1995, when 9.7 of the 12.2 billion beverages sold annually were recycled. The recycling rate has steadily declined since then, falling to 74% in 1999 (California Department of Conservation, 2000).

California ranks 4th among the 10 bottle bill states in its recycling rate. Michigan, Oregon and Vermont report higher recycling rates for their beverage containers (CRI, 2000). The purpose of this research is to identify what factors contribute to higher recycling rates in these three states, and what possible changes could be made to California's program which could lead the public to recycle more of their beverage containers.

This research effort explores how California's program could be changed to increase recycling by its residents. To do so, the research focuses on seeking answers to the following questions:

1. Are Oregon, Michigan and Vermont appropriate benchmark states for comparing bottle bill programs?

2. When compared to California's bottle bill program, what program features are different in the benchmark states, and which ones contribute the most to their higher recycling rates?
3. If California changed its program to adopt any of these features, resulting in an increase in recycling rates, would the public embrace these changes?

The research methodology was comprised of primary and secondary research methods. The secondary research included interviews with key program officials from Oregon, California, Michigan and Vermont. A literature review was also conducted, focusing primarily on government documents and relevant publications and studies prepared by consulting firms, industry organizations, and special interest groups. The secondary research served as a basis for comparing the program features of all four states to determine which features had the most significant effect on recycling rates. Those key features that were absent from California's beverage container recycling program were then selected for primary research testing in Sacramento, California. A written questionnaire was developed and mailed to 420 Sacramento County residents. The questionnaire was designed to elicit the respondents' willingness to accept new program changes, and evaluate whether the changes could result in achieving higher beverage container recycling rates.

#### Literature Review

No two bottle bill programs are alike in either the provisions of their enabling statutes or how they are structured and implemented. The purpose of the literature review is two-fold. First, the secondary research materials will be analyzed to establish whether Oregon, Michigan and Vermont are appropriate benchmark states for comparing California's beverage container recycling program. Its second purpose is to identify resources that have already established the

key program differences among the 10 bottle bill states, and specifically, the four states under review in this report. Once identified, these key differences, or independent variables, are examined to determine their validity and/or reliability for comparison purposes among the four states. The question of validity is important in establishing whether the research hypothesis (i.e., question 3, previous page) can be answered with confidence. The literature review focuses on:

1. Providing background information on how and why bottle bills were enacted;
2. Establishing what assumptions were included in the calculation of statewide beverage container recycling rates of the four states;
3. Identifying the primary statutory provisions and differences among the recycling programs in Oregon, Vermont, Michigan and California;
4. Acknowledging other independent variables present among the four states that could have an effect on beverage container recycling; and
5. Selecting those program differences that appear to have the most bearing on the higher recycling rates in Oregon, Vermont and Michigan.

### Background

Until the 1950s, beverage manufacturers sold beverages in refillable glass bottles that could be returned for deposit refunds at local grocery stores. These bottles were collected from stores by the local beverage manufacturer and distributor, then refilled and sold. However, after World War II, when urban populations began shifting to the suburbs and neighborhood grocery stores gave way to supermarkets, the beverage industry began a nationwide consolidation of its distribution system (California Department of Conservation, 1996). It was no longer profitable to maintain beverage manufacturing and distribution plants (bottlers) in all locales. As a result of this regional consolidation, the infrastructure for collecting bottles at the retail site for eventual

return to the bottler was no longer economical and the returnable glass bottle, therefore, all but disappeared by the mid-1960s (California Department of Conservation, 1996; United States Environmental Protection Agency (USEPA), n.d.).

The introduction of the aluminum can in the 1950s, and later the plastic bottle in the 1980s, also added to the market shift away from the refillable glass container (Oregon Department of Environmental Quality, 2001c). Unlike the returnable glass bottle, California's aluminum and plastic beverages did not require a deposit. Their light weight, unbreakable features soon became a favorite of retailers and consumers alike. By 1988, the percentage of California's beverage sales in refillable glass bottles had slipped to just 3.5% (California Department of Conservation, 2000). Without a recycling infrastructure in place, bottles and cans across the nation became one-way containers, often landing on the roadside or in the local landfill (California Department of Conservation, 1996; USEPA, n.d.).

The aftermath of this new throw-away culture attracted public attention, becoming part of a grassroots environmental movement that began to sweep the nation in the 1970s. Nationwide, environmental issues were elevated to policy agendas, opening a vital "policy window" during the 1970s and 1980s to address the beverage container litter and waste problem (California Department of Conservation, 1996; Kingdon, 1995, p. 165). Bottle bill recycling programs were viewed as a solution to roadside litter as well as a partial remedy for the looming landfill crisis of the 1970s (CRI, n.d.c; Kingdon, 1995). "Recycling catapulted into the mainstream through the vocal support and political involvement of thousands of grassroots activists across the country" (Garfield, 2000, p. 5). Over the next two decades, 10 states enacted bottle bills, with Oregon first to enact its law in 1972, and California last in 1986 (CRI, 2000; CRI, n.d.a). A common performance indicator of each state's bottle bill is its beverage container recycling rate.

### Recycling Rates

The private and not-for-profit sectors have utilized benchmarking for a number of years as a way to improve their effectiveness and efficiency, but it is much more rare for public organizations to use this tool (Osborne & Plastrik, 1997). To embark on a benchmarking project, comparing performance statistics is an acceptable approach. “Undoubtedly, the most common type of benchmarking in the public sector...is the compilation and comparison of performance statistics of several organizations” (Ammons, 1998, p. 406). Comparing recycling rates among the bottle bill states is thus a good first step in the selection of appropriate benchmark partners. It initiates the discovery process of what features in other bottle bill programs make them more successful. The Container Recycling Institute (2000), a renowned not-for-profit organization which studies the progress of bottle bill programs, reported the top four recycling rates among the 10 bottle bill states as follows:

Table 1

#### Beverage Container Recycling Rates

State	Year	Rates
Oregon	1997	90%
California	1998	76%
Michigan	1999	95%
Vermont	1999	95-98%

One of the challenges recognized among colleagues in the recycling field is a lack of consistency in how state and local agencies calculate their recycling rates. This makes it difficult

to compare or benchmark one program to another (Goldstein & Madtes, 2001). “Most states and municipalities across the country define recycling in different ways, use different approaches for measuring recycling rates, and include different materials in those rates...comparing data among different states...can be difficult” (Pillsbury, 1997). This proved true in comparing the beverage container recycling rates of the four states in this study.

While CRI’s rates are reported as a snapshot in time, “historical data are used to establish a baseline for various target benchmark measures” (Ammons, 1998, p. 393). Historical recycling rates were obtained from Oregon, Michigan and California (Table 2).

Historical Beverage Container Recycling Rates

State	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Avg.
Oregon	93%	--	--	--	--	--	--	90%	--	--	87%	--	84%	88%
Michigan	--	--	98%	97%	100%	98%	99%	99%	98%	97%	97%	95%	94%	98%
California	52%	56%	70%	80%	82%	81%	79%	81%	76%	76%	74%	74%	61% <sup>c</sup>	73%

Sources: P. Spendelow, personal communication, November 26, 2001; M. Flechter, personal communication, November 28, 2001; A. Martin, personal communication, February 19, 2002; California Department of Conservation, 2000).

*Note:* Dashes represent years in which data are not available. Oregon does not calculate a recycling rate each year. Due to litigation, Michigan did not report data prior to 1990.

c 61% was eliminated from the calculation of the historical average because of the effects of a major legislative change in 2000 to the program which added new beverages subject to deposit

Obtaining data from Vermont proved problematic for reasons discussed in more detail later in this report. Nonetheless, even as California's 14-year old beverage container recycling program has matured, the recycling rate data show that its rates historically lag behind those of Oregon and Michigan.

The first issue to address is how each of the four states calculates its recycling rate. This question is of key importance in establishing the appropriateness of comparing California's recycling program to other states. Because the recycling rate is being used as the primary performance statistic to select benchmarking partners, it is critical to establish if the comparison states' recycling rates use the same or similar criteria in calculating their rates (Ammons, 1998). If different assumptions or unreliable data are used, then benchmarking their programs to California's would be inappropriate.

#### California's recycling rate.

California's annual recycling rate is a function of tallying the total annual number of beverage containers recycled (i.e., redeemed containers), divided by the total annual beverage sales reported by beverage distributors. California's is the only bottle bill which established a state oversight agency, and as a result, beverage container recycling in California is a rather complicated, public-private partnership (Act, 2002; McCarthy, 1993; NewPoint Group Management Consultants, Global Futures, Scarlett, L., 1997). The Department of Conservation, Division of Recycling (henceforth, "the Division") tracks beverage container sales and redemptions statewide. Beverage distributors are required to report and pay deposits each month on all beverages that are sold to retail establishments. These deposits are paid to the Division based on the distributor sales volumes reported on special forms which accompany payment.

The Division deposits these monies into a central fund, where they remain until claims are made by recyclers once the public redeems the containers (Act, 2002). Recyclers who pay deposits to their customers redeeming empty beverage containers must be certified by the Division before the Division will allow payment of their claims from the central fund. The volume of redeemed containers is captured on the recyclers' claim forms. With this system, the Division is able to capture both beverage sales and redeemed containers in order to calculate the recycling rate.

#### Michigan's recycling rate.

Michigan's annual recycling rate is also a function of total redeemed containers divided by total beverage sales. Michigan's manufacturers and distributors report their sales on special forms each March to the Michigan Department of Treasury (A. Martin, personal communication, February 13, 2002). Similar to California's program, the manufacturers and distributors forward their deposits to the Department of Treasury where they are deposited into a central fund.

Michigan does not have a redemption system of certified recyclers; instead, retailers collect the deposits on beverages at the point of sale and pay them to their customers when the containers are returned to the store for deposit refunds (Gilbert & Stutz, 2000). Retailers claim refunds from the central fund via the Department of Treasury each June. The volumes of their redemptions are reported to the Department of Treasury from either the retailer's cash register receipts which show deposits paid to their customers, or receipts the retailer is given when the distributors collect the empty beverage containers (A. Martin, personal communication, February 13, 2002).

#### Oregon's recycling rate.

Oregon approaches the calculation of its recycling rate quite differently, although it too is a function of determining annual redemptions divided by annual beverage sales. Like

Michigan's program, only retailers redeem empty beverage containers. However, Oregon's bottle bill law is entirely privatized and does not require annual reporting of beverage sales and redemptions; therefore, the data must be captured in a different manner altogether. To gather the data necessary for calculating the recycling rate, Oregon's Department of Environmental Quality (DEQ) performs a waste composition study and estimates the number of beverage containers disposed. Annual beverage sales figures are estimated from sales of beer reported to the Oregon Liquor Control Commission, which are then coupled with national and regional soft drink sales, prorated to Oregon's population. The DEQ calculates Oregon's recycling rate by subtracting the number of beverage containers disposed of in landfills from the beverage sales estimates, which provides the number of beverage containers redeemed. This number is then divided by the total beverage sales estimate to arrive at the recycling rate. The DEQ validates the calculated recycling rate by comparing their estimated redemption volumes to the volumes of what the distributors claim they recycle. The DEQ indicates the numbers match fairly well (P. Spendelow, personal communication, November 26, 2001).

#### Vermont's recycling rate.

Vermont's recycling rate is not calculated by a state agency. Like Oregon's program, distributors and redemption centers are not required to report data to any governmental agency. Instead, the rate is calculated by special interest groups, which rely on industry-provided data. Separate rates are calculated for soft drinks and liquor, which is why Vermont's recycling rates are reported as two numbers (CRI, 2000). Vermont's Department of Environmental Conservation relies on the Vermont Public Interest Group's (VPIG) information about Vermont's recycling rates (C. Stacy, personal communication, December 17, 2001). Phone calls to VPIG were not returned, and no information was available through a VPIG

website. CRI was also contacted for historical information on Vermont's recycling rate, but it, too, did not have this information (P. Franklin, personal communication, February 12, 2002).

While there is a degree of equivalence in comparing California's recycling rates to those of Oregon and Michigan, research could not substantiate the reliability of Vermont's reported recycling rates.

In addition to the importance of establishing how the recycling rate is calculated, it is also important to understand what factors drive the rate. This requires a closer look at each state's bottle bill statutes and program features.

#### Comparison of Statutory Program Features

Most bottle bill programs have similarities in how they function (CRI, 2000). The retailer charges a deposit at the point of sale and the consumer returns the empty container to a return-point where the deposit will be refunded. While bottle bills may appear simplistic, the literature revealed several important operational variables among the four states in this study. They include statutory provisions which govern: (1) how much of a deposit is charged; (2) where people recycle their empties to receive their deposit refund; and (3) which beverages are subject to deposits (CRI, 2000; R.W. Beck, 2002; Tellus, 1996).

#### Amount of deposit.

The amount of deposit a state charges on its beverages could be a significant motivational factor affecting recycling rates. It is therefore important to examine the deposits charged in each of the comparison states.

Oregon retailers charge a 5-cent deposit for each beverage sold, while Michigan's deposit, at 10 cents, is the highest among the ten bottle bill states. Neither state makes a deposit distinction regarding the size of the container (Oregon DEQ (1999); CRI, n.d.a; Granholm, n.d.).

California charges 2.5 cents for beverages under 24 ounces, and 5 cents for beverages 24 ounces or more (Act, 2002), which are the lowest deposit amounts of the ten bottle bill states (CRI, 2000). Vermont retailers charge a deposit of 5 cents for beverages except distilled spirits over 50 ml., which carry a deposit of 15 cents (CRI, n.d.b). There is a significant body of literature which links the amount of the deposit to recycling rates. Financial incentives are frequently cited as a specific source for motivating people to recycle, especially when the economy is weak. This is not inconsistent with various motivational theories. Abraham Maslow's hierarchy of needs theory can help explain why container deposits motivate recycling. The bottom of Maslow's needs hierarchy ties behavioral motivation to the individual's need for comfort, security, shelter and protection, and money can help provide these, especially when the economy is weak (Jreisat, 1999; USEPA, n.d.). Vroom's 1964 expectancy theory complements Maslow's work, indicating that motivation is "a process governing choices among alternative forms of voluntary activity" (Halachmi & van der Krogt, 1998, p. 572). In order for pay to motivate performance, the pay must be valued as a reward (Perry, 1995). Lawler also indicates that the size of the payout is a critical factor in motivating behavior, "From the perspective of individual motivation, the size of the pay award is a critical consideration...small rewards that are perceived...as trivial are not likely to encourage high performance" (O'Sullivan & Rassel, 1999, p. 123).

The literature revealed that across the nation, the average beverage container recycling rate in states without bottle bills is dramatically lower at 44%, an indication that deposits may provide some motivation to recycle (The Bottle Bill at 30..., 2001; Gitlitz, 2001; USEPA, n.d.). R.W. Beck (2002) cited an increase in the deposit amount as one of four methods to increase recycling for bottle bill states. Lieberman Research Worldwide's 1998 telephone survey in California found that while 30% of the survey population was motivated to recycle because of

the deposit alone, another 28% did not recycle because the deposit was too low to motivate recycling. In 1997, Farrand Research found that Californians who did not recycle would be more likely to if financial incentives, more convenient recycling center locations, and more curbside programs were available. Pat Franklin, Executive Director of the Container Recycling Institute, suggested that even when the economy is strong, deposits need to be raised higher to provide adequate incentive to maintain high recycling rates (*Beverage Container Waste...*, 2000). On the other hand, the Tellus Institute (1996) found while that economic incentives motivated recycling in the short term, over the long term they proved less effective. R.W. Beck also pointed out that the correlation between higher deposits and recycling rates may have a point of diminishing return, demonstrated by Canadian provinces which have much higher deposits, yet no extraordinarily-high recycling rates.

Michigan's high recycling rates are frequently attributed to its 10-cent deposit, the highest among the bottle bill states. "There is evidence that the size of deposits does affect the return rate of containers. Michigan, which has a minimum 10-cent deposit, has the highest return rate..." (Oregon DEQ, 2001c). Recycling rates in all bottle bill states except Michigan have declined in recent years. This trend has been linked to the diminished value of the nickel deposit caused by inflation and also the perceived lack of a monetary incentive to recycle during the booming economy in the late 1990s (Gitlitz, 2001).

#### Where people recycle to receive deposit refunds.

Bottle bill states all require a redemption system to provide consumers an opportunity to return their empty containers for a full deposit refund. However, the redemption systems differ among the states, which could affect the volumes of beverage containers recycled.

California's redemption system. California's program is fundamentally different in its beverage container redemption system from any other bottle bill state. The last of the bottle bill states to pass such legislation, California wrote a statute that was a unique compromise among all stakeholders (NewPoint et al., 1997). The Act provides the framework for using a public-private approach for accomplishing program goals, all negotiated by the iron triangle of lobbyists, legislators and the Executive Branch (Denhardt, 1999). Concerned that the absence of a statewide recycling program would prompt California voters to use the initiative process to adopt a traditional bottle bill like the other nine states, the players among the iron triangle were motivated to arrive at a compromise (Conti, 1993). The negotiations resulted in a major concession to the retail industry by eliminating the requirement for in-store redemption of empty beverage containers, a prominent feature of all other bottle bill states. The California Department of Conservation (1991) estimated that Californians avoided costs of \$245-390 million annually by shifting recycling out of the stores. Instead, empty beverage containers are redeemed at Division-certified, privately-owned recycling centers which operate within a convenience zone and receive \$23.5 million annually in handling fee subsidies from the central fund. A convenience zone is the area within a half-mile radius of grocery stores that gross \$2 million or more in annual sales. There are 3,005 convenience zones in California, and 2,042 certified recycling (redemption) centers statewide, serving California's 33.9 million people (M. Wildman & J. Panenka, personal communication, February 19, 2002; California Department of Finance, n.d.). While the intent of the convenience zone system is to provide a means for customers to get their deposit back, there are fewer places on a per-capita basis to redeem containers than in Oregon and Michigan, and probably Vermont. In California, the ratio of population to redemption centers is 19,099:1. The Department of Conservation, using retail

store categories defined by the U.S. Census Bureau, estimates that if retail stores selling beverages were also required to also redeem them, there would be at least 24,381 places the consumer could redeem their beverage containers (J. Panenka, personal communication, February 19, 2002). The California Resource Recovery Association indicated the number should be even higher, estimating the number of retailers selling beer and soft drinks at 40,000 (n.d.).

One convenient and unique aspect of California's existing program is that it does not require the consumer to sort empty beverage containers by brand before the deposit is refunded from a certified recycler (R.W. Beck, 2002; NewPoint et al., 1997). The beverage distributors in California are not involved in the collection of empty beverage containers from retail stores as they are in the nine other bottle bill states, and therefore no brand sorting is necessary.

Oregon's and Michigan's redemption systems. While the Oregon and Michigan bottle bill laws allow for the establishment of recycling centers, their laws do not provide a financial mechanism to offset the costs to the recycler for handling, storing and maintaining recycling center sites. Without a handling fee subsidy, such as California pays to the recycler from unredeemed central fund deposits, the recycled containers cost more to manage than the revenues obtained from their sale on the scrap market. In traditional bottle bill states, these costs are instead borne by the retail stores. Therefore, the recycling center infrastructure prevalent in California has never caught on in Oregon and Michigan. As a result, all retail stores in Oregon and Michigan are required to redeem the product containers they sell either in their store or through reverse vending machines on the store's premises, which issue deposit refunds to consumers when they insert their empty beverage containers into these machines (Oregon DEQ, 2001b; Granholm, n.d.).

Oregon does not have a reliable count for the total number of retailers that sell beverages subject to deposits. The Oregon Liquor Control Commission estimates there are 3,000 retail stores on its list that sell alcoholic beverages, but this would not include any retail stores that do not have a liquor license and only sell soft drinks (P. Spendelow, personal communication, February 22, 2002). The U.S. Census Bureau (1998) estimated that Oregon has 1,396 food and beverage stores and 293 gasoline stations with convenience stores selling beverages, but the data did not include other retail stores, such as drug stores, that commonly sell beverages. For comparison purposes, then, this analysis relies on the Oregon Liquor Control estimate of 3,000, with the assumption that it is very conservative estimate (P. Spendelow, personal communication, February 22, 2002). With a state population of 3.4 million, the ratio of population to redemption locations is at most 1,157:1 (Portland State University, 2001).

Michigan also does not have a reliable count for the number of retail sites. The annual redemption claims forwarded to the Department of Treasury by retailers appeared to be good starting place; however, claim forms are frequently consolidated at the corporate level, and small retail outlets may not claim refunds at all (A. Martin, personal communication, February 19, 2002). The Department of Treasury reports that retail outlets with liquor licenses and alcoholic beverage sales number 3,000, which does not include stores that sell soft drinks only. The National Soft Drink Association was contacted, but they do not have soft drink sales available by state (personal communication, February 25, 2002). Acknowledging that 3,000 retail outlets serving a population of 9.9 million is likely to be significantly underestimated, the ratio of population to redemption centers is at most 3,300:1. (U.S. Census Bureau, 2000; A. Martin, personal communication, February 19, 2002).

Vermont's redemption system. Vermont's recycling program includes a combination of in-store redemption, reverse vending machines, and certified recycling centers. To help offset the costs of handling empty containers, 20% of the deposit value is provided by the beverage manufacturer or distributor to the retailer or recycling center, whichever redeems empty containers from consumers (Vermont Statutes, Title 10, Chapter 53, 2002). No information could be obtained regarding the number of places available to a consumer for recycling, but Vermont's system appears to provide optimal convenience through a combination of both in-store recycling and recycling centers. However, the bottle bill statute allows the retailer to refuse to refund deposits if there is a redemption center nearby, so it is unclear how this might affect redemption (CRI, n.d.b).

In summary, California has far fewer per-capita redemption locations than either Oregon or Michigan. With fewer places to redeem their containers for a cash refund, this could have a significant impact on the redemption of beverage containers.

#### Which beverages are subject to deposit

The types of beverages that are subject to deposit vary by state and affect the recycling rate, so it is important to establish whether the comparison states of Michigan, Oregon and Vermont include similar beverages in their programs. The effect of different beverages on a recycling rate can be most recently observed from the bottle bill law change in California in 2000, which added deposits for the first time on juices, sport drinks, coffee and tea drinks, and noncarbonated waters (Act, as amended by Chapter 815, Statutes of 1999). In the first year of implementation, California's recycling rate plummeted from 74% to 61%. While the California Department of Conservation anticipated a preliminary drop in the recycling rate due to an initial lack of consumer awareness of what was newly redeemable, it was more severe than expected

(California Department of Conservation, 2001a, 2001b). Given the effects that the composition of beverages has on the recycling rate, it is important to make sure that the comparison states include the same types of beverages.

The statutes of each state were examined, and following is a synopsis of the types of beverages included in each program through 1999, before California's law changed to add new beverages.

Table 3

Beverages Subject to Deposit  
(1999)

Beverages	California	Oregon	Michigan	Vermont
soft drinks	√	√	√	√
carbonated waters	√	√	√	√
beer and malt beverages	√	√	√	√
wine and distilled spirit coolers	√	√	√	√
distilled spirits	--	--	--	√
wine	--	--	--	--

Sources: Act, 2000; Granholm, n.d.; Oregon DEQ (1999); Vermont Stat. Ann., Title 10.

With the exception of Vermont, which includes distilled spirits as a component within its reported recycling rate, all other beverages covered by the bottle bill laws are identical. This further substantiates the greater reliability of Oregon and Michigan serving as more appropriate benchmark states for California because the beverages included in each of the three state's bottle bill programs are identical.

At this point in the literature review, the researcher eliminated Vermont as a benchmark state. This decision was made because of a lack of reliable information, its dissimilarity to the other three state programs in how its recycling rates are calculated, and the inclusion of different beverages in its bottle bill laws.

#### Statutory program features contributing to higher recycling rates

Research question 3 hypothesizes that if California adopts select program features from bottle bill states that have higher recycling rates, then California's recycling rates will increase. R.W. Beck (2002) cites four options for increasing participation in deposit systems, which include: (1) increasing the deposit; (2) increasing the number of redemption locations; (3) expanding types of bottles covered (which California accomplished in 2000); and (4) increasing promotion and education. The report states that California's dwindling recycling rates "...are to be expected in a state with [a] strong curbside infrastructure and a relatively low deposit amount to encourage redemption" (R.W. Beck, 2002, p. 2-13). Money, convenience, and personal commitment to environmental ethics are cited by R.W. Beck (2002) and Lieberman Research Worldwide (1998) as key motivation factors contributing to increased beverage container recycling. Pat Franklin of the Container Recycling Institute agrees: "We see a need for new incentives and collection systems to stem the growing beverage container waste problem" (*Beverage Container Waste...*, 2000, p. 3).

Peter Spendelow, Waste Reduction Specialist with Oregon DEQ, attributed Oregon's successful recycling program to a combination of factors. He acknowledged the community pride and popularity among Oregon's residents at having the first bottle bill in the nation, combined with a long-sustained culture of redeeming containers at retail stores that began with the refillable glass bottle. Mr. Spendelow also acknowledged the motivational factor that the

nickel deposit value has on recycling, notwithstanding its reduced value due to inflationary effects since their law was introduced thirty years ago (P. Spendelow, personal communication, February 21, 2002).

Matt Flechter, Recycling and Compost Coordinator with Michigan DEQ, stated that “people have grown up with the system and it is now part of our culture to return containers. The 10-cent deposit is surely another main reason why the deposit system has had success. People see the money they get back as a substantial bonus” (personal communication, February 22, 2002).

As discussed in the next section, there are other variables which affect recycling rates. While the focus of this research is to identify features within the existing bottle bill statutes that can be changed, there are other factors whose influence on recycling rates are notable. Each variable is discussed so the reader will know these factors were considered in the literature review and analysis to validate the appropriateness of using Oregon and Michigan as benchmark states. These factors included: (1) curbside recycling, (2) redemption fraud, (3) commodity prices for recycled beverage containers, (4) landfill tipping fees, (5) public education programs, and (6) personal motivation and cultural factors.

#### Comparison of Non-statutory Variables Affecting Recycling Rates

##### Curbside recycling and drop-off centers.

Michigan, Oregon and California all have curbside recycling and drop-off programs that collect beverage containers. When residents utilize these two types of recycling programs, they forfeit their deposit. Understanding what volumes are collected through curbside programs, and how their volumes are captured in each of the states’ recycling rates, are important considerations to determine if these programs materially affect the recycling rates. They can also

shed light on why residents are donating their empty beverage containers instead of redeeming them for a deposit refund.

California curbside recycling. California has 534 curbside programs, whose operators estimate they serve 61% of the state's population (M. Wildman, personal communication, February 20, 2002). The curbside operators and drop-off centers send claim forms to the Division with their reported beverage container volumes so that they can receive deposit monies for the containers collected (California Department of Conservation, 2001b). Curbside programs collect 9% of the deposit containers statewide. There are 241 drop-off centers and community service programs, whose volumes are also captured through claim forms, which collect another 3% of the empty beverage containers (California Department of Conservation, 2001b). Therefore, 12% of the volumes captured within California's recycling rate calculation are containers for which the public forfeited their deposit refund.

Michigan curbside recycling. Michigan does not collect curbside recycling information on beverage containers, so these volumes are not captured in Michigan's recycling rate (M. Flechter, personal communication, November 26, 2001). There are 748 curbside and drop-off programs in the state, serving 88% of Michigan's population (Michigan Recycling Coalition, 2001). Because of their 10-cent value, deposit containers are likely a minor component of these programs (M. Flechter, personal communication, November 26, 2001). Still, adding in containers collected by these entities would push Michigan's recycling rate even higher.

Oregon curbside recycling. Oregon also does not have a reporting mechanism on beverage container volumes collected at the curb or at drop-off centers. However, Oregon captures these volumes in its recycling rate because of the way it is calculated. Oregon starts its

recycling rate calculation by identifying the number of beverage containers that are landfilled. This number is then subtracted from the estimated beverage sales volumes to arrive at the volumes recycled (P. Spendelow, personal communication, November 26, 2001). Beverage containers that are collected by curbsides and drop-off centers are presumed to be recycled, and would therefore be captured in the recycled volume calculation. The DEQ estimates that 75% of Oregon's population lives in areas where there are curbside recycling services.

To summarize, Oregon and California capture in their beverage container recycling rates the amounts recycled through curbside operations while Michigan does not. If Michigan captured curbside recycling data, the annual recycling rate would be even higher, setting it even further apart from Oregon and California than it is now. Therefore, for purposes of benchmarking based on recycling rates, curbside recycling does not have a material effect.

#### Redemption fraud.

California, Oregon and Michigan all acknowledge the existence and potential for program fraud. If fraud among the three states is significantly different, this undermines the ability to compare states based upon their reported recycling rates. Fraud occurs when beverage containers whose deposits have not been collected are redeemed for a cash refund. The most common occurrence is the importation of beverage containers from outside the state for a deposit refund. The effect is to artificially increase the recycling rate because the numerator in the rate calculation, or redemption figure, increases while the denominator, or total statewide beverage sales, does not since the beverage was not sold in the state and was never captured in distributor-reported sales.

California fraud. California estimates its annual fraud ranges between \$5-40 million, signifying a recycling rate which could be artificially high by as much as 6% (Department of Conservation, 2001a). Because California does not require recyclers to sort containers by brand to be picked up by a distributor, commingled loads of beverage containers increase the chances for fraud. Out-of-state, ineligible containers can be easily mixed in with containers that are legally eligible for deposit refund and sold to certified recyclers. Consumers who redeem beverage containers receive their deposit refund and any applicable scrap value. The deposit refund and scrap value are enough to cover any labor and transportation costs associated with trips across California's borders, and result in a profit. In Oregon and Michigan, a consumer receives a deposit refund but no scrap value because redemption takes place at the retail store instead of at a recycling center.

Michigan fraud. Michigan's fraud estimate is \$10-15 million a year, or 100-150 million containers redeemed illegally (Gilbert & Stutz, 2000). Michigan's annual recycling rate could therefore be artificially high by as much as 3%. Michigan's statute allows for a retailer to refuse a refund to a person redeeming more than \$25 in deposit containers in a single day (Granholm, n.d.). In addition, since stores require the customer to sort beverage containers by brand, it is less conducive to fraudulent activity than California's program, which allows payment on truckloads of mixed beverage containers. On the other hand, there are many retail outlets selling beverages in Michigan, so there are more potential venues for fraud in Michigan, albeit in smaller volumes.

Oregon fraud. Oregon's rough estimate of annual fraud ranges between \$1.4 - \$5.6 million, for an overall effect on the recycling rate between 2 - 8% (P. Spindel, personal communication, February 22, 2002; Oregon DEQ, 2001a).

All three states indicated these numbers are difficult to substantiate and quantify; yet the estimates appear to fall within a reasonable range of 2 - 8%. Based on these estimates, the presence of fraud does not appear to be a factor which sets one state's recycling rate substantially apart from the others.

Commodity prices for recycled beverage containers.

The scrap prices paid for recycled materials drive their demand in the marketplace and could have a material effect on the recycling rate when compared to other factors. If there are particularly weak or strong end-use markets in the regions near the three states, this must be taken into consideration. Critics of bottle bills frequently point out that these laws introduce market imperfections, especially supply side imperfections when commodities like plastic and glass are collected for which there is very little market demand (Kettl, 1993). In fact, beverage container materials such as green glass and steel cans in some regions in the U.S. have a negative scrap price, meaning the owner of the material pays to have it hauled away. The major metropolitan commodity markets are New York, Miami, Atlanta, Houston, Chicago, Denver, Los Angeles, and Seattle (Truini, 2001). For this analysis it is assumed that Oregon's recycled beverage container regional marketplace is Seattle, California's is Los Angeles, and Michigan's market is in Chicago. According to *Waste News'* December 24, 2001 commodity pricing report, the markets for beverage container materials in these three regions are fairly comparable, except for glass (Truini, 2001):

Table 4

Regional Commodity Prices per Ton

Commodity	Seattle	Los Angeles	Chicago
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Aluminum	\$616	\$550	\$616
Glass	\$15	\$25	\$15
Plastic	\$154	\$154	\$154

Between January, 1996, and June, 2000, the historical average market prices for aluminum, glass and plastic in Los Angeles were \$614, \$30 and \$186 per ton, respectively, indicating the December 24, 2001 prices have been fairly stable, at least in the Los Angeles market (Goldman & Ogishi, 2001).

Glass commodity prices in Los Angeles, though, are 67% higher than in Chicago and Seattle. The glass prices in California are affected by a processing fee assessed on all glass beverage container sales in California (McCarthy, 1993). This fee is unique to the California bottle bill, and has been very controversial (R.W. Beck, 2002). The fee is charged to the beverage manufacturers to cover the costs of recovering glass beverage containers because it is not profitable to recycle them. The fees are paid to the Division of Recycling and are used to subsidize the operations of recyclers who recycle glass. In theory, the processing fees seek to internalize the cost of recycling and enable beverage containers to be recycled at higher rates than the commodity market would otherwise support (NewPoint et al., 1997). Some say the glass processing fees artificially drive up the price of glass (McCarthy, 1993), introducing market imperfections which interfere with the natural fluctuations of supply and demand (Kettl, 1993). Because California subsidizes the recycling of glass containers, one might expect California's recycling rate to exceed those of Oregon or Michigan. Even with processing fee subsidies, which have been in place in California since 1991, California's recycling rates still lag those of Oregon and Michigan. Therefore, regional commodity prices do not appear to vary enough to have any appreciable bearing on the recycling rates in the three-state comparison.

### Landfill tipping fees.

Tipping fees are the costs per ton to dispose of waste in a landfill. If the costs to landfill waste are high, this acts as a marketplace incentive to either reduce waste or recycle it, and can affect beverage container recycling rates. Presumably, the higher the tipping fee, the higher the beverage container recycling rate. To ensure there were not extreme differences in tipping fees among the three states which could have an effect on the beverage container recycling rate, tipping fees were examined. The average tipping fees in California and Oregon are \$35 and \$25 per ton, respectively (Goldstein & Madtes, 2001). Michigan's average tipping fee per ton is \$35 (Gilbert & Stutz, 2000). If anything, one might expect that with Oregon's lower average tipping fee, its recycling rate might be lower than either California's or Michigan's because it might be considered less expensive to landfill beverages containers rather than recycle them. Because Oregon's recycling rate is higher than California's and its tipping fee lower, the tipping fee does not appear to be a variable which materially affects the recycling rates for beverage containers in these three states.

### Public education campaigns.

R.W. Beck (2002) addresses the positive effect that public outreach and education campaigns can have on increasing beverage container recycling. Both Oregon and Michigan officials were contacted to see if their states sponsored educational campaigns to encourage recycling. Neither state has an ongoing public education component. Unlike California, neither state has sponsored public opinion surveys which could help to focus educational outreach efforts for the purpose of achieving higher recycling rates (P. Spindelow, personal communication, November 11 & 26, 2001; M. Flechter, personal communication, November 13

& 26, 2001). The California Department of Conservation has spent approximately \$25-30 million in the last 14 years on a variety of educational programs, including radio, television and billboard campaigns in its four major metropolitan areas (C. Birkinshaw, personal communication, February 20, 2002). Notwithstanding these educational outreach efforts, California's recycling rate still lags those of Oregon and Michigan. This points to other motivational factors which may have a greater effect in achieving high recycling rates.

#### Personal motivation and cultural factors.

Not all individuals are motivated by the monetary rewards attached to recycling. As found in the search of literature, at least 12% of Californians donate their empty beverage containers to curbside or drop-off programs. Schuler & Jackson (1996) describe that "a total reward system includes both monetary and nonmonetary compensation" and that in some cases nonmonetary rewards are more important motivators (in Halachmi & van der Krogt, 1998, p. 575).

The research teams of R.W. Beck (2002), Lieberman Research Worldwide (1998), and Farrand Research (1997) all found that a significant motivational factor for the recycling of beverage containers was the intrinsic reward associated with saving the environment. For this group of individuals, the "sense that doing something for its own sake...typically declines when a reward is attached for doing the task" (Halachmi & van der Krogt, 1998, p. 576). This could be an explanation for R. W. Beck's observation that increased deposits at some point no longer serve as a motivational tool (2002).

The officials from Oregon and Michigan linked their high recycling rates to long-standing cultural behavior. Schein (1992) describes this cultural phenomenon as a pattern of

shared beliefs that “begin to operate outside spheres of awareness” (p. 12). Emotional investment and value become attached to these beliefs to the point that they are no longer discussed and are taken for granted. Whether recycling is good for the environment or not, it is an example of a shared belief. As an element of cultural behavior, recycling supplies an intrinsic reward that reinforces and satisfies the underlying assumption that recycling is good for the environment (Schein, 1992).

California’s program is younger than either Michigan’s or Oregon’s beverage container recycling program, suggesting perhaps that California’s shared values and assumptions in support of a culture of recycling are the least stable or well cultivated. All of the public survey research performed by the California Department of Conservation on the beverage container recycling program has focused on studying how to motivate Californians within the confines of the existing statutory framework. This study assumed there were no such limitations, and focused research efforts for the first time on what the possible effects would be of changing the existing law.

Based upon the comparison of California’s statute and operational program features to Oregon’s and Michigan’s bottle bills, coupled with opinions and analyses by experts in the field of recycling and research, the two features that merited the most attention with regard to their effect on recycling rates were the (1) amount of deposit, and (2) where people redeem containers; i.e., retail stores. These two statutory features were selected for primary research testing in Sacramento, California.

## Methodology

### Overview of Methodology

This study's objective was to discover whether changing the statutory features of California's beverage container recycling program would result in higher recycling rates. To date, no study has been performed which exclusively compares California's program to other, more successful bottle bill programs for purposes of adopting statutory changes to improve the effectiveness of the California's Beverage Container Recycling and Litter Reduction Act. To examine what changes could be made, a descriptive design was employed to collect and analyze both qualitative and quantitative data.

The first qualitative task was to establish appropriate benchmark states for California's program. This involved choosing a common performance indicator — the recycling rate — to use as the basis for the initial selection of viable benchmark bottle bill states. Second, it was necessary to establish the key statutory differences among the benchmark programs, and to assess which of these features had the greatest potential for affecting recycling rates. To perform these two tasks, a comprehensive literature review was conducted, which included documents from governmental agencies, industry publications, scientific studies and consultant reports. Information and opinions were also solicited from personal interviews with key state officials and special interest group representatives, which helped to confirm or clarify information discovered during the course of the literature review. The information gathered was analyzed and resulted in the selection of Michigan and Oregon as benchmark partners. Vermont, one of the three target benchmark states, was eliminated because data was either unavailable or too inadequate to support Vermont as a reliable benchmark partner.

Utilizing a case-study approach, the program features from all three states were examined using relevant literature, interviews, and the personal knowledge of the researcher to identify their key statutory program differences. The information pointed to two key statutory provisions

with the greatest potential for effecting recycling rates: (1) change in deposit amount, and (2) where people redeem containers; i.e., retail stores.

Cross-sectional studies employing survey research work well in soliciting the opinions, attitudes, and behavior of people as a snapshot in time (O'Sullivan & Rassel, 1999). Therefore, a cross-sectional design was chosen to answer whether structural changes to the beverage container recycling program might be ripe. A descriptive survey was developed to gather data and opinions by Sacramento residents about beverage container recycling, and specifically about the two chosen statutory changes involving the amount of deposit and where people redeem containers.

#### Limitations of the Research

Time was a significant factor in planning the overall research design, as well as choosing the primary research tool. Heavy emphasis was placed on the available literature and interviews with government officials and not-for-profit group experts in the recycling field. A more balanced perspective among industry members might have added more depth to the analysis. Nonetheless, attempts were made to provide a good measure of internal validity with regard to the many variables that affect recycling, whether based in statute or not. While the literature review and personal interviews supported the conclusion that the deposit amount was a key factor affecting recycling, none of the literature or interviews concluded that California's lagging recycling rate could specifically be a function of fewer redemption centers on a per capita basis. This was a unique finding when comparing the number of redemption centers to total state populations in California, Oregon and Michigan.

Also not taken into consideration were differences in weather, demographic differences, location of manufacturing plants which buy recycled beverage containers, the higher quality of

redeemed beverage containers resulting from store redemption, or any unique economic conditions or circumstances affecting California, Oregon and Michigan. These factors also could have an impact on recycling rates, but due to time limitations, they were not examined.

Ideally, the descriptive survey would have been mailed to a sample of California's population representing a demographic cross section, with follow-up postcards reminding nonrespondents to complete the survey. Time constraints and limited access to mailing lists confined the development of the sample population from public records in Sacramento to which the researcher had access. There was also no time for a follow-up postcard to be mailed to the sample population to increase the chances for a greater response. When taking these factors into consideration, it compromises the ability to generalize findings to a larger population.

#### Characteristics of the Research Sample and Sampling Bias

The USEPA (n.d.) indicated in their 1999 report that 55-65% of the total waste generated in the U.S. is composed of residential waste that includes beverage containers. R.W. Beck (2002) stated that 73% of beverages are consumed in the home, placing the bulk of the responsibility to recycle beverage containers on the resident. Because a vast majority of empty beverage containers are generated from households, a sample population which targeted households was developed.

The population targeted was all property owners among Sacramento County's population of 1.2 million (U.S. Census Bureau, 2001). The sampling frame chosen was all residential property owners and/or occupants in Sacramento County. The most current data available was from the county property tax assessment rolls on microfiche titled: "County of Sacramento Monthly Assessment Roll - Owner as of January 7, 2002."

The unit of analysis was the single-family homeowner/resident. Because Sacramento County's population stands at 1.2 million (i.e.,  $N \geq 5,000$ ), a sample population of 400 was deemed adequate (Leedy & Ormrod, 2001).

The January 7, 2002 tax assessment rolls were contained on 223 microfiche (fiche), with 298 names/property addresses on all but the last fiche, listed in alphabetical order by owner surname. Two names were chosen at random from each fiche, which assumed the compilation of a final sample population of 446 names and their property addresses (2 names x 223 fiche). This allowed an equal chance for all residential homeowners or residents to be chosen so that no fiche would be eliminated from the sample frame once 400 names had been compiled. At the time the two-per-fiche was chosen as a random selection process, it was not known that 13 fiche consisted entirely of properties owned by limited liability corporations, commercial entities, government-owned properties (city, county and state), or trust properties. Names were not chosen from those fiche because it was assumed these properties were unlikely to be single family homeowners or occupants of residential property, a generalization which introduced sampling bias. After one complete pass through the entire batch of 223 fiche, 420 names and addresses had been keyed into a Microsoft Word label-making program as the final sample population and mailing list.

#### Data Collection

A written questionnaire was developed to test the readiness of Sacramento residents' preferences to support a higher deposit on beverages and also their opinion on the location and number of recycling centers or opportunities. A first and second draft of the questionnaire was piloted in small groups of four and five, respectively, before it was finalized. The average completion time to complete the questionnaire was seven minutes.

The questionnaire (Appendix B) was designed as a one-page document, and included an introduction describing the purpose of the survey, a definition of the term “beverage container”, and the randomness with which the respondent had been chosen. The questionnaire was designed to be as easy to read as possible, with all seven questions highlighted in yellow. The 420 questionnaires, including postage-paid, self-addressed return envelopes, were mailed on February 16, 2002, and respondents were requested to return their responses by March 1, 2002. There was no requirement for respondents to identify themselves on either the questionnaire or the return envelope in hopes that responses would be answered as candidly as possible. By March 7, a total of 167 responses had been completed and returned by Sacramento residents and an additional 11 were returned due to an incorrect or no forwarding address. The response rate was 41%.

#### Summary of Research Process

The questionnaire was designed with a specific progression, beginning with more general questions establishing recycling habits and leading to questions requiring greater specificity and more thoughtful responses on the part of the resident.

The first question asked Sacramento residents to rate themselves using a percentage scale of 0% - 100% on how often they recycled their beverage containers. The question was designed to prepare the resident to begin thinking about those occasions when they did not recycle.

Question 2 asked residents where they most often recycled, and was intended to prepare the resident to begin thinking about what options were available for recycling in their community in preparation for answering question 3. There were three available choices for answering question 2 from which the resident was asked to select one answer. Because both Sacramento City and County provide curbside recycling, this was featured as the first available choice,

followed by the choice of the residents' local recycling center. An "other" category was added as a third choice, asking the respondents to specify where they recycle, if not through either curbside or their local recycling center.

Question 3 was designed to find out the top two reasons why Sacramento residents did not recycle 100% of their beverage containers. Six choices were provided, which included the testing of the two selected research variables. To diminish the possibility of bias, other viable alternatives to this question were developed from the findings from the literature review and knowledge of the researcher. The six choices also included an "other" category which asked the residents to specify why they did not recycle their beverage containers.

The all-important question of what would motivate Sacramento residents to recycle more was asked in question 4. Residents were asked to circle the top two reasons among five options that would result in their recycling more beverage containers. Question 4 was directly related to the underlying hypothesis of the research, which speculated that if certain changes were made to the beverage container recycling program, this would increase beverage container recycling. The two variables (deposit amount and grocery store redemption) were included as choices in this question, as well as options conforming to the lack of knowledge of places to recycle. An "other" category was also included to allow for a write-in option.

Question 5 asked residents to circle what they believed the deposit amount on beverages should be, with a selection range between 0 and 15 cents. Residents circling 3 cents or greater were then asked if they would be willing or not to pay this amount if they believed it would increase beverage container recycling. California's existing 2.5 cent deposit on beverages was not stated, to avoid any influence on or bias in the response. This question was directly related to the research hypothesis and was designed to determine if residents believed the deposit amount

was too low, and if so, if they were willing to pay more of a deposit if they believed it would increase beverage container recycling.

Question 6 asked the residents whether or not they believed a deposit of at least 3 cents would encourage others to recycle. The question explored the research assumption that higher deposits would motivate Californians to recycle more of their beverage containers.

The final question asked residents if they would or would not support a change in law to require grocery stores to redeem containers. This question tested the research assumption that residents would like to redeem containers at their grocery store, and would support a change in law to enact the change.

For purposes of quantifying the questionnaire results, a separate Excel spreadsheet was established for each question, for a total of seven spreadsheets. As the questionnaires were received, they were numbered sequentially so that the results on all the seven questions could be recorded and tracked individually. The rows in the spreadsheets for each question represented the sequential numbers from 1 - 167, corresponding to each completed questionnaire. The columns for each of the seven spreadsheets represented columns for all multiple choice answers possible for each question. For example, for the first question there were 11 possible answers on a Likert scale from which respondents could choose. A value of one was placed in the correct column to record the results of the particular questionnaire. Totals were summed for each possible answer. Formulas were applied to calculate percentage amounts, where applicable. Results were converted to graphic forms, using Microsoft Windows 2000 Chart Wizard program.

## Findings

### Overview of Methodology

The underlying hypothesis of this research project assumed that if California changed the statutory program features of its beverage container recycling program, then recycling rates might increase. To determine which features might be changed to stimulate higher recycling rates, the methodology included both primary and secondary research components. A qualitative approach included a review of relevant literature as well as personal interviews with state officials and not-for-profit groups. This secondary research resulted in the selection of Michigan and Oregon as bottle bill states from which to benchmark California's program. From the benchmarking analysis, key program changes were selected for primary research testing. A written questionnaire was developed and Sacramento County residents were asked to convey through a series of questions what their current recycling habits were, and what might motivate them to recycle more often. The results were quantified and then analyzed to determine if California's recycling program could be successfully changed to increase beverage container recycling.

Research Question 1: Are Oregon, Michigan and Vermont appropriate benchmark states to compare bottle bill programs?

Several studies and reports point to the difficulty of trying to compare recycling programs because there is no guarantee their performance indicators, such as the recycling rate, use the same set of assumptions or data. Therefore, published recycling rates alone are not reliable enough to ensure that one program is actually outperforming another. For this study, three other states were considered — Michigan, Vermont and Oregon — all with published recycling rates higher than California's (CRI, 2000). No studies could be found, however, which compare in detail how bottle bill states calculate their recycling rates. The narrow case studies performed within the scope of this project strongly indicate that Oregon, Michigan and California use

comparable data in calculating their recycling rates. While their data gathering techniques may differ, all three states utilize the sales of beverages and their returns in calculating their recycling rates. Vermont reports higher recycling rates than California, but data could not be obtained to substantiate how they calculate their rate, and therefore Vermont's bottle bill program was not used as a benchmark state. During the period between 1988 and 1999, Oregon's and Michigan's average recycling rates were 88% and 93% respectively, much higher than California's 73% over the same period. This suggests that Oregon and Michigan are excellent states for benchmarking program features and recycling infrastructure.

Research Question #2: When compared to California's bottle bill program, what program features are different in the benchmark states, and which ones contribute the most to their higher recycling rates?

A host of literature points to several significant factors that can stimulate higher recycling rates. These include operational features created or governed by the bottle bill statutes themselves and also factors beyond the ability of the statute to control, such as personal motivation, program fraud, curbside recycling, and the fluctuating market value for recycled containers. The three common operational (statutory) features mentioned most often in the literature that can bring about increased recycling are: (1) the amount of the deposit, (2) the types of beverages included in the bottle bill program, and (3) convenience to recycle.

The data show that California's deposit at 2.5 cents is markedly lower than the Michigan's at 10 cents, and Oregon's at 5 cents. The literature from consulting firms, environmental interest groups, government reports, motivational theorists, and interviews with program officials all mention that monetary rewards are key motivational factors in changing

behavior. These findings suggested that the amount of deposit was a viable choice for primary research testing.

The literature also points to the expansion of the types of beverages included in a bottle bill program as having an effect on recycling rates (R.W. Beck, 2002). The bottle bill statutes of Michigan, Oregon and California defined identical types of beverages in their respective programs until 1999. Vermont includes liquor in its deposit program, setting it apart from the other three states. Because California now has a more expansive array of beverages included under its bottle bill law as a result in a change in law effective January 1, 2000, this factor was not included in the primary research testing.

The third element, convenience to recycle, shows that California has a very unique and convenient aspect to its program in that consumers do not have to sort their beverage containers by brand name in order to redeem them for their deposit value. This is a result of the different recycling infrastructure that has established itself around California's law, where retailers are not required to redeem beverage containers. Empty beverage containers are redeemed at privately-owned but publicly-subsidized recycling centers instead of at the retailer's location, as they are in Oregon and Michigan. However, new light is shed on the convenience issue when examined in the context of number of recycling centers compared to total population. On a per capita basis, there are far fewer recycling centers in California than there are retailers in either Oregon or Michigan, suggesting that under the umbrella of convenience is the availability of redemption locations. Therefore, a focus on the number and location of recycling opportunities available to Californians was a logical second choice to include in the primary research component.

Of the 420 mailed surveys, 11 were returned undeliverable and 167 returned by the respondents, for a response rate of 41%. The findings from the completed surveys follow.

Research Question 3: If California changed its program to adopt other program features, would the public embrace these changes, resulting in an increase in recycling rates?

To provide some context to this question, it is important to capture what the current recycling performance and practices are among Sacramento County residents. The first two questions in the mailed survey instrument were designed to explore these aspects.

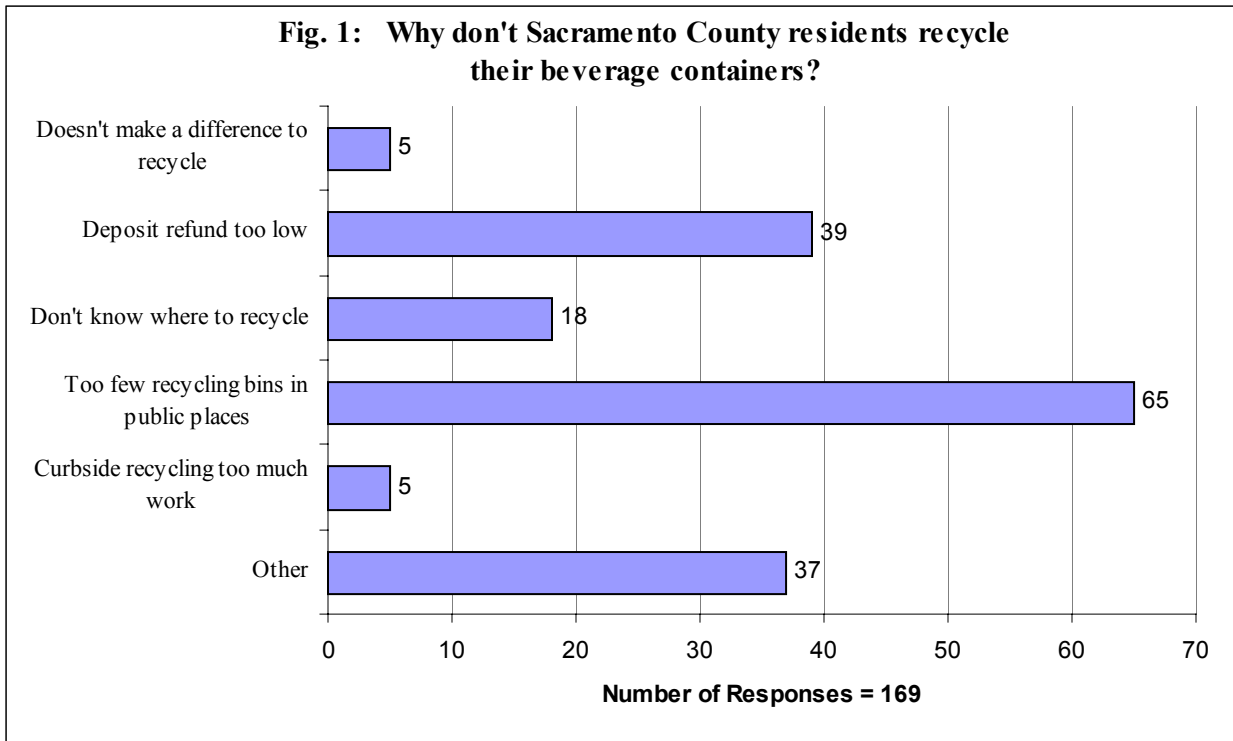
Question 1 asked how frequently Sacramento County residents recycle their beverage containers. Of the 167 responses received, 163 residents completed this question. Forty-two percent responded they recycle 100% of the time, 35% indicated they recycle 90% of the time, and the remaining 33% recycled 70% of the time or less. With a weighted average of 86%, these are particularly high participation rates, for which there may be several explanations. First, even though the questionnaires were completed anonymously, there may have been a tendency on the part of the resident to err on the side of what the resident may have viewed as desired behavior. “People have models of how they should act, and their answers may be more in line with how they think they should act than with how they actually act” (O’Sullivan & Rassel, 1999, p. 221). Second, both Sacramento City and County provide convenient curbside recycling services where recyclables, including beverage containers, are placed in one large bin and wheeled to the curb by the resident, so it is possible that the participation rate is high.

A correlation cannot be drawn, however, between the participation rate expressed by Sacramento County residents (86%) and the average statewide recycling rate. The former is a measure of time, and the latter is a function of calculating volumes. For future survey instruments, this question should be reworded or a new question added so that a validation check can be made between local and statewide recycling rates.

Question 2 was designed to elicit from residents how or where they are recycling. Not surprisingly, of the 159 responses given, curbside recycling was chosen most frequently, with 98 responses, or 62% of total responses given. This group is not motivated to sort, store and redeem containers for their redemption value, instead choosing to donate the deposit value to their curbside operator. It is instructive, however, to note that 34% of the respondents do redeem their containers at a recycling center, so an inference can be made that the current deposit amount of 2.5 cents is an adequate monetary incentive for this group. Only 4% of the respondents marked “other.” Comments about where people recycle in the “other” category included, “save for friend who uses recycling center” and “half recycling center, half curbside.”

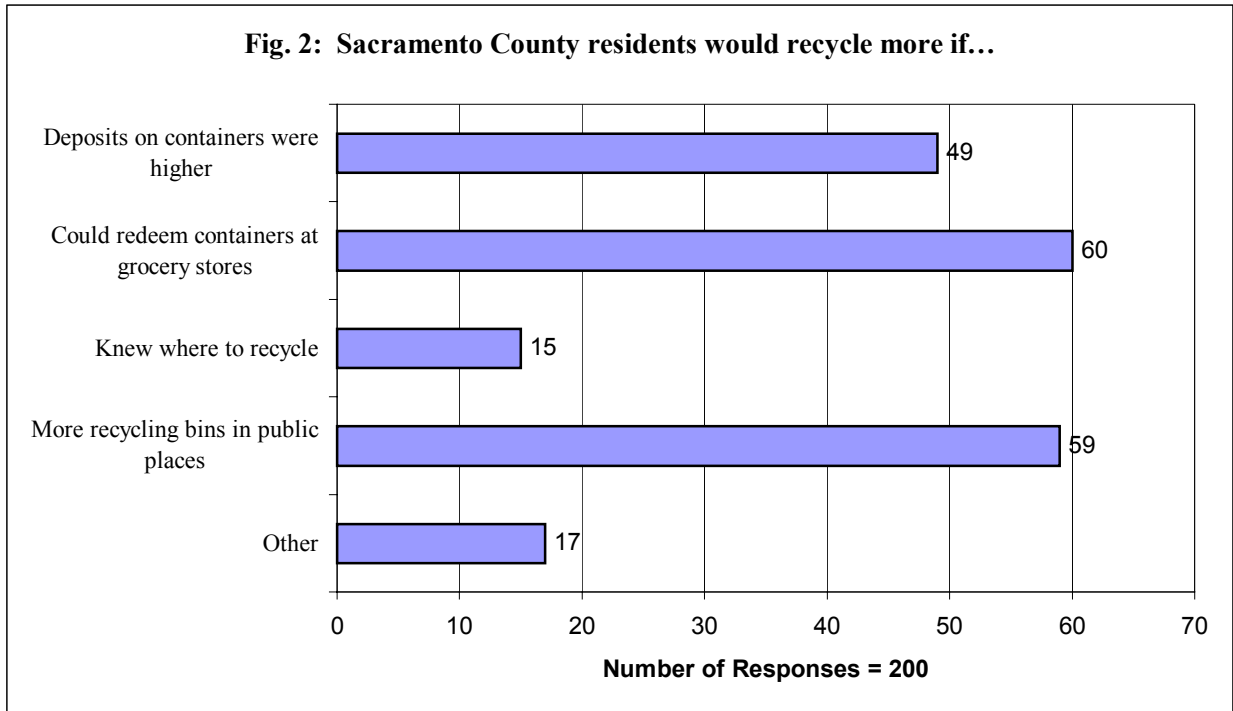
Residents were asked in question 3 to circle the two choices among six that most accurately depicted the reason they do not recycle. The possible number of selections was 334 (2 choices x 167 returned questionnaires). However, only 169 responses to this question were received. One explanation is that if residents had previously indicated they recycle 100%, then this category would not apply. Many did indeed mark this question, “N/A”, with a note that “I recycle 100%.” Another explanation is that a single response, rather than the two requested, was adequate for the respondents. Question 3 was the first to introduce the research hypothesis’ independent variables; that is, that the deposit amount is too low, and lack of recycling centers serve to discourage beverage container recycling. Figure 1 best displays the full results of this question, which indicates a lack of places to recycle and that the refund value is too low to be worth the effort to recycle. Twenty-two percent utilized the “other” category, and a number of comments were received (Appendix C). Many indicated that beverage containers are mixed in with trash, it is too confusing to separate beverage containers, they forget, or that their recycling

bins are too small. Understanding why residents do not recycle led residents to question 4, which asked what specifically would motivate them to recycle more of their beverage containers.



Residents were asked to choose the top two reasons that would encourage them to recycle more, and choices also contained an “other” category allowing for a write-in answer. The greatest possible number of selections was 334, assuming each of the 167 respondents selected two choices. However, some respondents skipped this question as they did question 4 because they had indicated in question 1 they recycled 100% of the time, or simply chose not to respond. Of the 200 selections made, 60 people, or 30%, opted for redemption of containers at the grocery store. For a close second at 29%, residents wanted more recycling bins in public places, while 24% indicated they would recycle more if the deposit amount was higher (Fig. 2). Overall, the comments favor more recycling opportunities, whether at the grocery store or public places, followed by an increase in deposit. The findings also conform to the results of question 3.

Question 5 delves into the amount of deposit, and is a two-part question, consisting of a filter question and a contingency question (O’Sullivan & Russel 1999).



Currently, the deposit on the majority of beverages under California’s bottle bill is 2.5 cents each (2 for a nickel, or 3 cents for an unpaired beverage). To avoid using the current deposit as a starting point and therefore introducing bias, a scale of choices between 0 and 15 cents was given. Only after their selection were the residents then asked if they would be willing to pay an amount greater than 3 cents if they believed it would increase beverage container recycling. There were 147 responses to the amount of deposit. Sixty-one percent of the respondents selected 5 cents, 21% selected 10 cents, and interestingly, 13% selected 0 cents. For all selections, the weighted average of the deposit amount was 5.4 cents. There appears to be strong support for increasing the deposit amount to a nickel, conditional upon the belief by the respondents that it would result in an increase in beverage container recycling. Of those that selected 3 cents or more for this question, they were asked whether they would be willing to pay

the deposit amount they had selected. Only 114 of the 147 responded to this contingency question, but an overwhelming 87% indicated they would be willing to pay 3 cents or more. While this question focused on the respondents' opinions and willingness to pay a higher deposit, it was important to obtain their views on how others might behave if the deposit was raised.

Question 6 sought the respondents' opinion on whether they believed a deposit of 3 cents or more would motivate others to recycle. Of the 148 responses, a large majority (74%) believed others would recycle more if the deposit was 3 cents or more, while 16% believed it would not motivate people to recycle. While there was not a place on the form for making comments to this question, several people made noteworthy remarks. "I live in MI in the summer. Deposit is 10 cents. I recycle!" And, "ease of recycling is most important." The majority opinion, then, of those that responded is that money is a motivating factor behind beverage container recycling. As for convenience, opportunities to recycle, and recycling location, this major question was presented as the last question.

Question 7 was answered by 153 of the 167 respondents. Not surprisingly, 109 respondents (71%) indicated they would support a change in law to require grocers to redeem containers in-store, while 44 (29%) indicated they would not. This compares even more favorably to the preference expressed by residents in question 4, where 60 respondents indicated that they would recycle more beverage containers if grocery stores redeemed them. Several people were compelled to make remarks about this question, also: (1) "Costs grocer \$ which is then passed back to consumer"; (2) "They don't have the time. The bottles & cans are to [sic] dirty for gro. stores to handle"; and (3) "...the extra money at the grocery store isn't worth the effort to me."

In reviewing the results and comments by the respondents, several weaknesses were noted. The 41% response rate, while average for a mailed questionnaire, is not a large enough response to confidently generalize to Sacramento County's population of 1.2 million population (O'Sullivan & Rassel, 1999). Because the survey was only written in English, it introduced a bias. Ideally, the survey instrument would be written in multiple languages.

Additionally, not everyone answered all questions, especially questions 3 and 4. This perhaps skewed the results of the data that were collected, and may indicate the questions were perhaps not properly framed. One major omission from the last question, that definitely should be asked in any subsequent survey, is whether the respondent would redeem containers at their grocery store if they had to sort them by brand. This would elicit valuable information on whether the public would avail themselves of the grocery store redemption option if it meant hand-sorting containers. Also, as noted above, question 1 could be reworded, or an additional question asked about the percentage amount of beverage containers that residents do recycle. One might recycle frequently or infrequently, but this question does not get to the issue of the volume of beverage containers that residents recycle.

### Summary of Key Findings

Sacramento residents that responded to the survey would recycle more of their beverage containers if the deposit amount was raised to 5 cents and there were more places to recycle. Residents preferred to have the option to redeem their beverage containers at their grocery store, and would support a change in law to require it. Interestingly, there was strong sentiment that residents would like more recycling bins in public places, a finding that helps to support the notion that California's existing recycling infrastructure does not provide an adequate number of places for its residents to recycle or redeem their beverage containers.

### Conclusions and Areas for Further Research

What motivates people to recycle depends on a number of factors, but three in particular stand out from this research: (1) monetary incentives, (2) convenience, and (3) culture.

Monetary incentives, such as an increase in the deposit amount, could only be accomplished through legislation. Likewise, any change to the existing recycling infrastructure, such as requiring grocers to redeem beverage containers, would also require statutory changes. These changes would manifest themselves in an increase in the beverage container recycling rate, and would likely be observable in a short period of time. However, cultural changes take much longer.

Efforts by the California Department of Conservation to motivate Californians to recycle have focused only on the cultural change aspect. Public survey research has been performed through the years, and their findings have been used to design educational and public relations campaigns. The campaigns have focused on changing behavior and affirming a culture of recycling. Despite these efforts, California's recycling rates continue to lag those of other states, specifically Oregon and Michigan. This research effort looked beyond this cultural approach and explored the possibilities of changing the structural elements of the Act. Significant changes such as doubling the deposit amount and allowing the public to redeem at the grocery store would have a good chance of unfreezing cultural behavior and refreezing to result in people recycling more of their beverage containers (Schein, 1992).

### Areas for Further Research

While Sacramento residents responded that on average they recycle their beverage containers more than 80% of the time, there is still a portion of containers that are not getting recycled. It is this portion that needs to be recovered from the waste stream. A significant area

for future research would be to find out under what specific circumstances beverage containers are not getting recycled, and what types of container, i.e., glass, plastic or aluminum. While survey question 3 attempted to discern this point, it is not altogether clear that the beverage containers that are not getting recycled are generated at the primary residence. Given the popularity of the choice for more recycling bins in public places, it could well be that residential recycling is quite high, and that efforts should be focused on recovering containers in the circumstances in which they are being discarded. Examples include purchases away from home, including at the office, through vending machines or concessions at public locations, and at gas station food marts. If recycling bins or convenient redemption centers are not available at these venues, then the containers are likely disposed of (R.W. Beck, 2002).

Future research should also broaden the research pool to a demographically balanced population sample. It is recommended that if questionnaires are used, then the information obtained should be entered into a database so that the results can be more easily manipulated, resulting in much richer data.

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Appendix B

Sacramento Area Recycling Questionnaire

Dear Resident,

The following questionnaire is designed to find out what might motivate Californians to recycle more of their empty beverage containers. Beverage containers include bottled waters, soft drinks, beer, juice, teas, coffees, and sweetened, noncarbonated beverages. Information gained from this study may be shared with decision-makers involved in policy development for California's beverage container recycling program.

You have been chosen as part of a random sample of Sacramento area residents. This survey is being conducted by Carol Nelson as part of a graduate student research project through Golden Gate University, San Francisco. **Your help in answering the following questions would be greatly appreciated, and is very important to the success of this project.** It should only take a few moments.

Enclosed is a stamped, self-addressed envelope for you to return your completed survey. Please return your response by **March 1, 2002**. Your opinion is important - thank you in advance for your participation!

Please *circle* the following answers that best describe your opinions or behavior:

**1. I recycle my beverage containers (circle one):** 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

←---- percent of the time ----→

If you circled "0%", skip to question 3.

**2. I currently recycle my beverage containers: (circle the one that most applies)**

- a. through curbside recycling
- b. at my local recycling center where I get my deposit (California Redemption Value) back
- c. other (please specify): \_\_\_\_\_

**3. When I don't recycle my beverage containers, it is because: (circle the two that most apply)**

- a. I don't think it makes any difference
- b. the deposit refund is too low, and is not worth the effort to store them and recycle
- c. I don't know where to recycle
- d. there aren't enough recycling bins in public places
- e. curbside recycling is a hassle
- f. other (please specify): \_\_\_\_\_

**4. I would recycle more of my beverage containers if: (circle the two that most apply)**

- a. the deposit refund was higher
- b. I could redeem them at my grocery store where I could get my deposit back
- c. I knew where to recycle
- d. there were more recycling bins in public places
- e. other (please specify) \_\_\_\_\_

**5. I think the deposit amount on beverage containers should be: (circle one)**

0¢ 1¢ 2¢ 3¢ 4¢ 5¢ 6¢ 7¢ 8¢ 9¢ 10¢ 11¢ 12¢ 13¢ 14¢ 15¢

**If you selected 3¢ or higher, please answer the following question:**

I would be willing to pay this deposit when I purchase a beverage if I believed it increased beverage container recycling in California: Yes No

6. I believe others would recycle more if the deposit amount was 3¢ or more: Yes No

7. I would support a change to existing law requiring my grocer to redeem my empty beverage containers so that I could get my deposit back: Yes No

*Thank you* for completing this survey. Please mail your response in the self-addressed, stamped envelope.

Appendix C

Verbatim Written Remarks on Questionnaires

Question 1:

(no comments received.)

Question 2: I current recycle my beverage containers [at]:

1. Glass to curbside, but I get \$ for all others.
2. Save for a friend who uses recycling center.
3. At center when it's open (which is only part time) and rest at curbside
4. City of Folsom return to custody program.
5. Sell aluminum cans to recyclers.
6. Some recycling center, some curbside.
7. I have a family member who goes to recycling center.

Question 3: I don't recycle...because: ("other" selection and remarks)

1. In a hurry and don't separate from trash.
2. Forget.
3. Our bin is full and we have to throw it away.
4. When I have company it's too confusing.
5. Away from home. Do not want to carry empty cans.
6. I always recycle.
7. Too much to fit in a given 2 wks.
8. I recycle all the time.
9. Isn't convenient.
10. Curbside container inadequate six for six houses.
11. I have run out of room in my can and don't want to pay for a 2nd recycle can.
12. I always do (curbside).
13. We always recycle.
14. Why should I give the \$ to the State when I can give it to someone else?
15. At someone else's house.
16. Forget, or my recycle bin gets too full.
17. They get mixed up with other trash inadvertently & I don't want to fish them out.
18. I just forget.
19. N/A..
20. Forget.
21. N/A..
22. N/A..
23. I always recycle.
24. Local waste disposal seperates [sic] recyclables (Folsom).

25. Always recycle.
26. Always recycle.
27. I miss very few.
28. I save them till I get home.
29. Not convenient/too messy to carry with me.
30. I am a homeowner so have access to curbside.
31. I recycle all beverage containers.
32. We usually always recycle. I find the recycle bin that is delivered to be very convenient.
33. I always recycle them.
34. Reynolds not open on Sunday or Monday. Hrs open 10: AM to 5: PM & closes for lunch 1 HR
35. I'm out of state.
36. Doesn't apply - I recycle everything I can.
37. Inconvenient.
38. Run out of room in curbside recycle bin.
39. Curbside recycle in Folsom costs extra. Also Folsom prison sorts the recycling [sic].
40. We always do.
41. Recycling is sometimes not available where we travel.
42. (Always recycle).
43. Not always a convenient time and place.
44. I inadvertently place them in the wrong container.
45. Folsom prison recycles our trash.
46. Should be like Oregon - 5¢ deposit.
47. Curbside is not available in our condo complex.
48. Nonrecycle containers.
49. I'm at someone else's house who doesn't recycle.
50. Misplacement of containers.
51. Lazy.
52. I don't have but a couple.
53. My guests put recyclables in trash. Parks and public places lack bins.
54. Recycle home bin full.
55. I always recycle aluminum containers, not glass. Too heavy & not enough refund.
56. Take to my friend's house where they are deposited in his curbside recycling container.
57. Apparently in Folsom, the garbage is sorted at the prison & parts recycled. We have no curbside recycle program.
58. I do recycle my cans.
59. Containers maybe soiled.
60. Mixed in with garbage.

Question 4: I would recycling more...if: ("other" selection and remarks)

1. We don't do it for the money, but it would be nice to get a discount on bill.
2. Parks-campgrounds had handy bins.
3. Doesn't apply.
4. More room in curbside bins.

5. Doesn't apply to me.
6. There was adequate containers for curbside pickup.
7. If they picked up weekly.
8. I do 100% curbside.
9. Hours do not coincide with my work hours. Include Sundays!
10. We recycle.
11. When I put them out I got a discount for the amount recycled.
12. I had a slightly bigger curbside container.
13. N/A.
14. I were more diligent!
15. N/A..
16. N/A..
17. I always recycle.
18. Someone picked up recycles [sic] at my home.
19. N/A.. See above [Always recycle.]
20. Have more room.
21. Always recycle.
22. I really would not recycle more.
23. I already recycle as much as I can.
24. See #3. [I recycle all beverage containers.]
25. I recycle all of them.
26. Recycler in this area needs to stay open 7 days & don't close for lunch.
27. Doesn't apply.
28. More convenient.
29. If it doesn't cost money.
30. More places to [recycle] and recycling of more materials.
31. (Always recycle).
32. Marked more clearly.
33. Curbside was available [condo complex].
34. Already recycle all I can with no deposit back.
35. More careful & dig through my garbage for 100% of recyclable items.
36. It was easier.
37. The condo complex where I live had a centralized deposit place for recyclable materials.
38. We had a curbside program.

Question 5a: I think the deposit... should be:

1. I don't recycle for the \$.
2. I don't get money - it doesn't matter.
3. I don't know what the current deposit is, but perhaps CA should be as high as Oregon to keep the trash off the roads.
4. Which type or kind of container?
5. Pay scrap value or ADF [advanced disposal fee] on artificial scrap value. No tax for DOR to spend.

6. [15 cents] At this point more money wouldn't make a difference.
7. We pay it now - ease of recycling is most imp't [sic].
8. Would but don't want to.
9. ? Don't know.

Question 5b: I would be willing to pay...:

1. I don't get the credit, give me the credit thru my grocer.
2. If people don't recycle now, they never will.

Question 6: I believe others would recycle more if deposit was 3 cents or more:

There are those who just don't care or see what's so important.

Question 7: I would support [grocery store recycling]:

1. Curbside recycling is fine for me. There's no hassle and the extra money at the grocery store isn't worth the effort to me.
2. The processing of cans at each site could be quite costly.
3. Expensive.
4. They don't have the time. The bottles and cans are too [sic] dirty for gro. stores to handle.
5. Leave as is.
6. Costs grocer \$ which is then passed back to consumer.

General Comments:

1. My neighbors who do curbside recycling do it for the environment and my neighbors who don't participate at all are lazy and wouldn't even care to go through more hassle to pull out the items worth \$.
2. I support recycling, but it is a matter of convenience, not money.
3. I recycle because it helps the environment, not because there is some small refund on deposits!
4. Good luck!
5. I have worked in recycling for 18 years.
6. Americans should be educated to understand that recycling is not really optional. The long term consequences are tremendous.
7. I used to return them to the recycling center. Now I'm ok with Sac. Co. getting the \$ through curbside pickup to keep the process going.
8. Would like to see more plastic recycling and less litter in public areas!!
9. I live in MI in the summer. Deposit is 10¢. I recycle!
10. I wish they'd put a stop to unsolicited "mail" & advertisements, so I'd have less paper to recycle.
11. Good luck.
12. Convenience is more important usually.