Plastics White Paper

Optimizing Plastics Use, Recycling, and Disposal in California

"Issues and Solutions"

Workshop Presentation

June 24 and 25, 2002
Sacramento, California

NewPoint Group®
Management Consultants

1.a. Introductions

NewPoint Group	CIWMB	DOC
■ Wendy Pratt Senior Associate	■ Calvin Young Staff, Plastics Recycling Technologies	■ Cyndy Young Staff, Market Research Branch
■ Jim Gibson Director	■ Bill Orr Branch Manager, Recycling Technologies	■ Zenny Yagen Manager, Market Research Branch
	■ Executive Staff	■ Executive Staff
	■ Board Members	

1.b. Overview of Module 1 - Introduction

- Plastics White Paper Goals
- Goals and Scope of Workshop
- Other Selected Existing and Pending Initiatives and Legislation Affecting Plastics
- Background of Workshop
- Rules of Workshop
- Questions and Answers
- Attendee Introductions

1.c. Plastics White Paper Goals

Optimizing Plastics Use, Recycling, and Disposal in California

- Define current California plastics issues and provide a menu of policy options for the CIWMB and the DOC
- Help optimize plastics use, recycling, and disposal in California
  - Provide a balanced, overview assessment of the current state of plastics
  - Assess current goals and programs affecting plastics
  - Identify long-term plastics policy options

1.d. Goals and Scope of Workshop

Goals of Workshop

- Analyze and prioritize the broad and complex range of plastics issues
- Provide an opportunity for hearing the perspectives of all interested key stakeholders
- Begin a long-term dialog and collaboration between Government, Industry, and Environmental leaders on plastics “Issues and Solutions”

Scope of Workshop (and White Paper)

- Includes all types of plastics:
  - Rigid plastics packaging containers
  - Plastics beverage containers
  - Film plastics
  - Polystyrene plastics
- Not focusing on electronic, or E-waste, plastics

Scope of Workshop (and White Paper) *(continued)*

- Includes both plastics products and packaging
- Includes plastics:
  - Resource conservation in the manufacturing and use cycle
  - Source reduction
  - Recycling
  - Disposal

Scope of Workshop (and White Paper) *(continued)*

- Focus on broad (macro), long-term plastics issues and solutions

  (Not focusing on narrow (micro), short-term plastics issues and solutions, or resin specific solutions)

- Focus on reengineered, or clean-sheet of paper ("White Paper"), policy options, for long-term fundamental plastics issues

  (Not necessarily emphasizing specific improvements to existing plastics legislation, but will entertain them)

1.e. Other Selected Existing and Pending Initiatives and Legislation Affecting Plastics

National Initiatives

- Plastics Redesign Project – is a coalition of government agencies and regional associations dedicated to strengthening the economics of local plastics recycling programs. Recent reports by the Project on new plastics packaging innovations and PET barriers and tints evaluate the potential impacts of these technology changes on recycling, particularly the economic feasibility of recycling plastics. The Project focuses on the potential increased recycling costs and identifying voluntary solutions with industry to keep plastics recycling costs down

National Initiatives *(continued)*

- Businesses and Environmentalists Allied for Recycling (BEAR) – is a unique alliance of businesses, recyclers, environmentalists, and other stakeholders working to maximize the recycling of beverage containers. BEAR recently published a controversial report on beverage container recovery that deposit systems result in the highest level of recovery, and that the California redemption system has low system operating costs. BEAR's goal is to achieve an 80 percent beverage container recycling rate in the U.S.

National Initiatives *(continued)*

- Product Stewardship Institute (PSI) – the mission of the Institute, based at the University of Massachusetts, is to "assist state and local government agencies in establishing cooperative agreements with industry and developing other initiatives that reduce the health and environmental impacts from consumer products. PSI has identified electronics, paint, mercury, pesticides, and carpet as priorities for product stewardship initiatives. PSI is currently facilitating the NESPI effort to develop a product stewardship system for electronics

National Initiatives *(continued)*

- APC All Bottle Collection – the American Plastics Council (APC) has been promoting curbside collection of all types of plastic bottles as a way to increase total collection of plastics. Because 90 percent of the plastic bottles generated are PET and HDPE, the less-recyclable plastics can be sorted out of the recycling stream. There are concerns that this approach also increases PVC contamination in the recycling stream

National Initiatives *(continued)*

- Grass Roots Recycling Network (GRRN) – the Grass Roots Recycling Network's mission is to eliminate the waste of natural and human resources – i.e. Zero Waste. GRRN is an activist organization, working on campaigns for Coke and Pepsi, electronics, DOW Chemical (herbicides in compost), Staples, and recycling in Congress
- National Electronics Product Stewardship Initiative (NEPSI) – this E-waste initiative is bringing stakeholders together to develop solutions on the issue of electronic products management. The group has agreed to work towards establishing a financing system to include the costs of managing used electronic products in the overall initial purchase price

California Signed Legislation

- SB 1127, Karnette – signed in 2001, this legislation requires the CIWMB to conduct a study of the use and disposal of polystyrene (PS and EPS) in the State. The report, which is being drafted by NewPoint Group as part of the Plastics White Paper will:

  1. Analyze how PS/EPS is used, recycled, and disposed, including related environmental and public health implications
  2. Recommend methods for source reducing, reusing, recycling, and diverting PS/EPS from the state's landfills
  3. Address the cost of PS/EPS disposal
  4. Examine and identify current and potential markets for recycled PS/EPS products

California Signed Legislation *(continued)*

- From discussions with Senator Karnette and Tim Shelley (from the Senator's office) an impetus for the bill was litter issues related to food-service expanded polystrene (Styrofoam), mostly disposable cups and food packaging. The original bill submitted by some cities in Karnette's district would have phased out Styrofoam (with a substitution of paper and other water soluble products) over a ten-year period. An original main intent of the law was to address the storm water problem of floating Styrofoam in bays, beaches, rivers, lakes, etc.

California Signed Legislation *(continued)*

- State Agency Buy Recycled Campaign (SABRC) – the SABRC is a joint effort between the CIWMB and the Department of General Services (DGS) to implement state law requiring State agencies and the Legislature to purchase products with recycled content.
  - The SABRC requires that every State agency must require that all suppliers certify the recycled content of their products, purchase products that contain recycled materials, attain recycled-content product (RCP) procurement mandates, and submit an annual report on products purchased

California Signed Legislation *(continued)*

- State agencies must purchase products that contain recycled materials instead of those that do not, whenever price, quality, and availability are comparable
- State agencies must spend 50 percent of all the funds the agencies spend in 11 reportable product categories (including plastics products) that meet the minimum recycled content requirements
- For plastics products (includes toner cartridges, diskettes, carpet, office products, plastics lumber, buckets, waste baskets, airplanes, containers, benches, tables, fencing, clothing, mats, packaging, signs, posts, binders, building products, garden hoses, trays) the minimum recycled content requirement is 50 percent overall, and 10 percent post-consumer

1.e. Other Selected Existing and Pending Initiatives and Legislation Affecting Plastics

(continued)

California Pending Legislation

- SB 1857, Sher – this pending legislation would require the DOC to annually expend $10 million, until January 2006, to issue grants for market development and expansion-related activities regarding the recycling of beverage containers. This legislation was an outcome of a DOC/CIWMB working group. One intent is to emphasize plastics in the grant allocation
- SB 1733, Sher – this pending legislation would allow the DOC to establish a plastics beverage container recycling incentive payment to be paid to certified recycling centers, and/or increase processing payments made to certified recycling centers. This bill also establishes a graduated processing fee payment, so that container types with lower recycling rates pay a larger percentage of the total processing fee payment

California Pending Legislation *(continued)*

- SB 1970, Romero and Chesbro – this pending legislation would modify the RPPC program to increase compliance options, modify the definition of RPPC to eliminate loopholes, and increase incentives to use California PCR

CIWMB Administrative Actions

- Recycled Content Trash Bags – the recycled content requirements for trash bags become effective in 1993 at 10 percent, were incresed to 30 percent, and then were reduced by legislation in 1998 to 10 percent. In the last year there have been efforts to increase the recycled content levels, as well as to eliminate the requirements. Changes in the market, primarily the demand for post-consumer film resin by the plastic lumber industry, have provided an alternative end-market for film plastics and made it more difficult for many companies to comply with the law. The CIWMB at the May 14-15, 2002 Board meeting deferred this item until completion of the Plastics White Paper. We will discuss this more this afternoon

CIWMB Administrative Actions *(continued)*

- Conversion Technology – over the last few years the CIWMB has been evaluating the potential of conversion technologies to divert plastics and other materials. Initiatives included a May 2001 forum, "Conversion Technologies for Municipal Residuals", and a January 2002 workshop, "Regulation of Conversion Technologies". The CIWMB is also conducting and supporting research and education on conversion technologies. The CIWMB, legislature, and stakeholders are working on a definition for conversion and an approach that would potentially allow local governments to receive some diversion credit for conversion. While there is now consensus on the definition of conversion, these groups are still discussing the level of diversion credit that will be allowed

CIWMB Administrative Actions *(continued)*

- E-waste – there are many CIWMB initiatives, as well as pending legislation, focused on keeping electronics waste out of California's landfills. The CIWMB is participating in the NEPSI effort, and recently initiated a Product Stewardship Support Project to conduct workshops for local governments to determine their E-waste problems and needs and to support the State's efforts in the NEPSI process. In addition, the CIWMB is conducting two studies: (1) an E-waste baseline study (including CRTs, computers, and peripherals) to evaluate the existing infrastructure, throughput from manufacturers, and storage, and (2) new State procurement guidelines for electronics
- PVC Risk Assessment – this recently approved study will be conducted by the Office of Environmental Health Hazard Assessment (OEHHA) for the CIWMB

DOC Administrative Actions *(continued)*

- DOC commingled rate – the DOC is currently working on establishing new commingled rates for mixed bales of numbers 3 to 7 plastic resins

1.f. Background of Workshop

- The Plastics White Paper project started in mid-2001
- We have performed literature reviews and analyses of existing information and data related to plastics
- We have held eleven (11) individual small meetings (framing sessions) with industry stakeholders from July 2001, through December 2001. The framing sessions were as follows:

1. Plastics Industry (July)
2. Local Governments (August)
3. Interested Parties (August)
4. Waste Haulers (September)
5. Recycles and Processors (September)
6. Environmental Groups (September)
7. CIWMB Staff (October)
8. Market Development Zones (October)
9. Containers (November)
10. Polystrene (December)
11. Film (December)

- In mid-February 2002, we requested formal industry input on plastics issues (with responses due mid-March 2002). We received written responses from the following ten (10) parties:

  1. Alliance of Foam Packaging Recyclers
  2. Delta Plastics
  3. F.P. International
  4. American Plastic Council
  5. Allan Company
  6. Clorox
  7. Polystrene Packaging Council
  8. Darin Hunt-Berry Plastics Corporation
  9. California Advocates
  10. Ventura County

- A draft Plastics White Paper will be presented to CIWMB and DOC staff in mid August 2002

1.g. Format of Workshop

- Two full day workshop

- Morning sessions – 8:30 am to 12:30 am (4 hours)
- Afternoon sessions – 1:30 pm to 5:30 pm (4 hours)

- Mid-morning 20-minute break – 10:30 am to 10:50 am
- Mid-afternoon 20-minute break – 3:30 pm to 3:50 pm

- Coffee and plastic bottled water, provided each day

1.g. Format of Workshop
(continued)

- NewPoint Group will introduce each workshop module with a PowerPoint background presentation
- Workshop attendees then will be asked who will speak on the module topic
- The remaining amount of time for that module will be prorated to each of the attendee presenters (speakers will be time-boxed to their specified allotments). NewPoint Group may ask questions at the end of an attendee presentation

1.g. Format of Workshop
(continued)

- Keypoints of each attendee will be summarized by NewPoint Group at the end of each module. Attendees may comment on the NewPoint Group summary

- After the workshop, all attendees will have until Friday July 12, 2002, to e-mail, mail, or telephone any additional workshop comments to us

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  - Jim Gibson
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  - (916) 442-0189

1.h. Rules of Workshop

- All attendees to sign-in at the beginning of each day
- All speakers complete a 3X5 card identifying name, organization, telephone number, and topic
- One person speaks at a time
- Be courteous and constructive
- All positions and opinions are welcomed and encouraged
- Want outside-the-box thinking, make no value judgment on other opinions
- Stay on the module topic
- Speaker time limits based on number of individuals who request to speak on the module topic
- Workshop evaluation form provided at the end of the second day

- Questions/Answers
  - Concerns
  - Comments

In the Graduate, the young hero Ben,
contemplating his future, is soberly informed:
*"Ben—I want to say one word to you—just one word—plastics."**
This late '60s bit of advise proved visionary.

*Calder Willingham penned these words in the 1967 screenplay.

1.j. Attendee Introductions

- Brief introductions of workshop participants
  - Name
  - Organization
  - What would you like to achieve at this workshop?

2.a. Overview of Module 2 - Plastics Industry Conditions

- Plastics Policy Goals
- Plastics Production
- Plastics Recycling
- Plastics MSW Generation and Discard
- Plastics Status versus Other Secondary Material Types
- Plastics Collection, Markets, and Market Development
- Plastics Environmental and Economic Issues
- Strawman Plastics Fundamental Issues

Current State (CIWMB, RPPC, and DOC) Goals, Objectives, and Guiding Principles

CIWMB

- Resource conservation – focusing on the most efficient use of natural resources – increase participation in resource conservation, integrated waste management, waste prevention, and product stewardship to reduce waste and create a sustainable infrastructure
- Zero-waste – promote a zero-waste philosophy where the public, industry, and government strive to reduce, reuse, or recycle all municipal solid waste materials back into nature or the marketplace in a manner that protects human health and the environment and honors the principles of California's Integrated Waste Management Act
- Sustainability – meet the needs of the present without compromising the ability of future generations to meet their own needs

Current State (CIWMB, RPPC, and DOC) Goals, Objectives, and Guiding Principles *(continued)*

CIWMB

- Product stewardship – ensuring that all parties involved in producing, selling, or using a product take responsibility for the full environmental and economic impacts of that product
- Reduce waste, promote the management of all materials to their highest and best use, and protect public health and safety and the environment, in partnership with all Californians
- Promote environmentally sound and financially viable waste prevention and materials management practices among all actors in the life cycle of products and services
- Divert waste from landfills based on a hierarchy that prioritizes waste reduction and recycling over all other options

Current State (CIWMB, RPPC, and DOC) Goals, Objectives, and Guiding Principles *(continued)*

CIWMB

Selected Strategies

- Identify, develop, and maintain partnerships to reduce waste and promote resource conservation and product stewardship, including participating in national efforts on materials such as carpet, electronics, and paint
- Encourage each actor in the life cycle of all products and services to voluntarily commit to sustainability and stewardship principles
- Promote sustainable management practices for businesses with the purpose of helping them make efficient use of resources, reduce waste, and minimize impacts on human health and the environment
- Enact policies and programs to distribute responsibility for the full cost of products and services over their life cycle to ensure that any one party does not bear any undue costs

Current State (CIWMB, RPPC, and DOC) Goals, Objectives, and Guiding Principles *(continued)*

CIWMB

Selected Strategies

- Foster and maintain partnerships to accelerate the development, evaluation, and implementation of innovative waste management technologies
- Partner with other State agencies to create cross-media approaches to working with businesses to assist in achieving zero waste
- Partner with trade associations to promote cost-beneficial source reduction, recycling, and related manufacturing opportunities (technologies, packaging efficiencies, best business practices, etc.)
- Create models that are self-sustaining and transferable to others

Current State (CIWMB, RPPC, and DOC) Goals, Objectives, and Guiding Principles *(continued)*

RPPC

- Spur markets for plastic materials collected for recycling by requiring manufacturers to utilize increasing amounts of postconsumer recycled materials in their rigid plastic packaging containers and to achieve high recycling rates for these plastic packaging containers

Trash Bag Law

- Encourage the diversion of polyethylene (HDPE, LDPE, and LLDPE) from California landfills by establishing a market for it in plastic trash bags

Current State (CIWMB, RPPC, and DOC) Goals, Objectives, and Guiding Principles *(continued)*

DOC

- Reduce litter, save resources, and promote a conservation ethic
- Recycle aluminum, glass, plastic, and bimetal beverage containers sold in California
- Encourage increased, and more convenient, beverage container redemption opportunities for all consumers
- Ensure that every container type proves its own recyclability

Current State (CIWMB, RPPC, and DOC) Goals, Objectives, and Guiding Principles *(continued)*

DOC

- Make redemption and recycling convenient to consumers and promote/site recycling locations as necessary for consumer convenience and the overall success of litter abatement and beverage container recycling in the State
- Promote markets for recycled materials – ensure that diverted materials return to the economic mainstream, and that materials that are collected get recycled, as opposed to their disposal
- Reduce beverage container litter in the State

California's Quantitative Waste Management and Recycling Goals

AB 939 – California Integrated Waste Management Act of 1989

Goal:

- Requires cities and counties to reduce the amount of waste disposed in landfills by 50 percent by 2000 through source reduction, recycling, and composting.

Actual:

- The statewide diversion rate was 42 percent in 2000 and 2001

California's Quantitative Waste Management and Recycling Goals
(continued)

SB 235 – Rigid Plastic Packaging Container Act

Goals:

- Rigid plastic packaging must have a recycling rate of 25 percent, based on annual reports published by the CIWMB
- PET rigid plastic packaging must have a recycling rate of 55 percent, based on annual reports published by the CIWMB

Actual:

- The RPPC recycling rate was 23.8 percent in 2000
- The PET recycling rate was 36.1 percent in 2000

California's Quantitative Waste Management and Recycling Goals
(continued)

AB 2020 – California Beverage Container Recycling and Litter Reduction Act

Goals:

- All beverage containers must have a recycling rate of 80 percent
- Each beverage container type must have a recycling rate of 65 percent

Actual:

- The all beverage container recycling rate was 60 percent in 2001
- The PET beverage container recycling rate was 36 percent in 2001

Summary Goals

- The State is interested in increasing:
  - Plastics resource conservation in the manufacturing and use cycle
  - The use of recycled plastics/resin
  - The plastics recycling rate

Plastics Production Consistently Increases Every Year

- Production of all plastics resin types continues to increase
- The average annual compound rate of growth in plastics production for the 27 years, between 1973 and 2000, was 4.9 percent
- Approximately 25 percent of plastics resin sales are for packaging (All percentages used here are by weight, unless otherwise noted)
- Approximately 28 percent of plastics packaging resin sales are for bottles, with an increasing number of single-serve bottles consumed "on the go" (making it more difficult to get into recycling bins)
- The relative market share of plastics packaging (including bottles) has increased over time

Plastics Packaging

- Packaging has made up about one third of the MSW generated over the last 40 years
- The share of plastics in the total packaging generated has increased from less than one percent in 1960, to 14.7 percent in 1999 – the percent has increased steadily each year
- The share of plastics in the amount of packaging waste discard has also increased – from less than one percent in 1960, to 21.1 percent in 1999
- The share of plastics in the amount of packaging waste recycled has also increased, but to a lesser extent – from 0.1 percent in 1980, to 3.8 percent in 1999, and 1980 was the first year with any significant plastics recycling

Plastics Packaging *(continued)*

- Plastics packaging resin sales are increasing about four times faster than plastic packaging (i.e., bottle) recycling – Since 1995, U.S. plastics packaging resin sales (millions of pounds) have increased at an average annual rate of 5.9 percent, while plastics bottles recycled (millions of pounds) have increased at an annual average rate of 3.4 percent – this is an increase in packaging resin sales of about 200 million pounds, and an increase in recycling of about 50 million pounds each year
- Total containers and packaging recycled have been relatively stable over the last five years, while total containers and packaging generated have increased – the amount of plastics packaging has likewise increased, with relatively little increase in the total amount recycled

Plastics Packaging *(continued)*

- Plastics as a percentage of containers and packaging discarded is rapidly increasing

Plastics as a Percentage of Containers and Packaging	1980	1990	1999
Generation	6.5%	10.7%	14.7%
Discard	7.7%	13.9%	21.1%
Recycling	0.1%	1.5%	3.8%

Plastics Recycling Quantities Consistently Increase Every Year, but Plastics Recycling Rates Struggle to Keep Pace

Plastics Recycling Quantities

- Total plastics recycled was negligible until 1980, and has increased from 370,000 tons in 1990, to 1,350,000 tons in 1999
- Total plastic bottles recycled increased from 205,500 tons in 1990, to 755,500 tons in 2000 – almost a four-fold increase (although most of this increase occurred between 1990 and 1995)

Plastics Recycling Quantities Consistently Increase Every Year, but Plastics Recycling Rates Struggle to Keep Pace *(continued)*

Plastics Quantities

- The number of PET bottles recycled in the California beverage container program increased significantly for the twelve years between 1988 and 2000, from 26.4 million to 1.3 billion containers.
- Total volumes of RPPCs recycled in California increased modestly for the five years between 1995 and 2000, from 82,000 tons to 102,000 tons
- Total volumes of all PET rigid containers recycled in California increased for the five years between 1995 and 2000, from 38,000 tons to 59,000 tons

Plastics Recycling Quantities Consistently Increase Every Year, but Plastics Recycling Rates Struggle to Keep Pace *(continued)*

Plastics Recycling Rates

- After a large relative increase in plastics recycling rates from the mid 1980s to the mid 1990s, the total percent of plastics recycled from the U.S. waste stream has been relatively constant at just over five percent (the total percent of all materials recycled in the waste stream has followed a similar pattern, but is stabilizing at a much higher rate of 28 percent)

Plastics Recycling Quantities Consistently Increase Every Year, but Plastics Recycling Rates Struggle to Keep Pace *(continued)*

Plastics Recycling Rates (continued)

- For all PET Bottles: there has been a dramatic drop in the recycling rates, from almost 40 percent in 1995, to 22.3 percent in 2000
- For soda PET Bottles: from 30 percent in 1990, to a high of 49 percent in 1994, and to 35 percent in 2000 (the lowest the rate has been since 1991)

Plastics Recycling Quantities Consistently Increase Every Year, but Plastics Recycling Rates Struggle to Keep Pace *(continued)*

Plastics Recycling Rates (continued)

- RPPC recycling rates in California dropped each year between 1995 and 1999, from 24.6 percent to 17.9 percent, and increased between 1999 and 2000, to 23.8 percent (still below the rate for 1995)

- PET rigid container recycling rates in California dropped each year between 1995 and 1999, from 38.8 percent to 24.8 percent, and increased between 1999 and 2000, to 36.1 percent (still below the rate for 1995)

Plastics Recycling Quantities Consistently Increase Every Year, but Plastics Recycling Rates Struggle to Keep Pace *(continued)*

Plastics Recycling Rates (continued)

- The recycling rate for PET beverage containers in California reached its highest value in 1994, at 71 percent – this rate dropped into the high 50 percent range until 1999, when it rose back up to 65 percent. In 2000, the rate dropped to 34 percent, due to the addition of new containers to the program. Finally, this rate rose very slightly to about 36 percent in 2001

2.e. Plastics MSW Generation and Discard

Plastics Disposal Consistently Increases Every Year (Both Absolute and Relative Quantities)

- In 1999, 10.5 percent of the MSW generated (includes both recycling and discard) was plastics, a total of 24.2 million tons – in 1960, just 390,000 tons of waste generated was plastics (0.4 percent of the MSW generated)
- Plastics in the total MSW discard has increased dramatically in the last 40 years – from .5 percent in 1960, to 2.6 percent in 1970, to 5.0 percent in 1980, to 9.7 percent in 1990, to 13.8 percent in 1999 (22.8 million tons) – it has increased in total and relative terms each year
- Paper has been the dominant material generated in MSW, however plastics in MSW has grown rapidly, displaced other types, and is now the fourth largest MSW generation category, just behind yard trimmings and food waste

Plastics Disposal Consistently Increases Every Year (Both Absolute and Relative Quantities) *(continued)*

- Waste is divided into four categories with the following percent of the total waste stream: Durable Goods (15.4%), Non-durable Goods (27.1%), Containers and Packaging (33.1%), and Other Wastes (food, organics) (24.5%)
- Plastics are found in three categories, and make up the following percent generated and recovered, of these categories:
  - Durable Goods: appliances, furniture, battery casings, carpets (20.3%; 3.8%)
  - Non-durable Goods: disposable diapers, trash bags, cups, eating utensils, sporting equipment, household items (9.4%; negligible)
  - Containers & Packaging: bottles, containers, bags, sacks, wraps, lids (14.7%; 9.7%)

Plastics Disposal Consistently Increases Every Year (Both Absolute and Relative Quantities) *(continued)*

- Plastics in the MSW discard has increased in relation to total resin sales – in the 1970s, plastics in MSW discard was about 20 percent of the total resin sales per year – since 1995, plastics in the MSW discard has been equal to over 45 percent of the total resin sales – i.e. an amount of plastic equal to almost one-half of the total resin sold each year ends up in the MSW discard

California Waste Disposal Data *(continued)*

- California waste generation data appears to be significantly higher than the amount that would be estimated from the US EPA data, using population – 1999 generation estimated from the EPA for California would be about 28 million tons, while the 1999 figure from the CIWMB is 37.5 million tons
- Plastics made up 8.9 percent of the total disposed California waste, with film plastic the largest category, 3.9 percent of the total California waste stream, and almost 44 percent of the California plastics waste disposed
- Durable plastic items were the next largest category, making up 20 percent of the total California plastics waste
- However, combining plastics containers – HDPE, PET, and others, resulted in a total of over 21 percent of California plastics waste

2.f. Plastics Status versus Other Secondary Material Types

Recycling Rates

- In 2000 in California, comparing CIWMB disposal data and DOC container recycling data, recycling rates and total volumes recycled for aluminum and glass were higher than for PET and HDPE plastic. Aluminum was the only material with greater than 50 percent recycling rate, at 62 percent. Glass was at a 43 percent recycling rate – however a larger tonnage of glass was disposed and recycled than the other two material types. PET containers were at a 26 percent recycling rate, with 66,000 tons recycled, and HDPE was at a 13 percent recycling rate, with 43,600 tons recycled

2.f. Plastics Status versus Other Secondary Material Types

Recycling Rates *(continued)*

- While California's recycling rates are higher than the U.S. due to AB 2020, container recycling rates for plastic are lower than for glass and aluminum, both in the U.S. and in California. In California, aluminum recycling rates in 2000 were about 75 percent, glass at 55 percent, and PET plastic at 35 percent (a drop from 65 percent due to adding containers). In the United States, the aluminum recycling rate in 2000 was 55 percent, glass was about 35 percent, and PET plastic containers were at 22 percent

2.f. Plastics Status versus Other Secondary Material Types *(continued)*

Recycling Rates *(continued)*

- In comparing generation and recycling in the U.S. over a 39 year period for four material types – paper, glass, metals, and plastic – plastic has the greatest growth in generation and the smallest relative gains in recycling
  - Paper generation has gone up significantly in the last 40 years, as has paper recycling, at a 42 percent rate in 1999
  - Glass generation is lower than it was in the 1980s, while glass recycling during that time has increased, and is now relatively stable at just under 25 percent
  - Metals generation is growing at a moderate rate, while recycling grew significantly in the early 1990s, and is now relatively stable at over 35 percent
  - Plastics generation has a sharp upward growth curve, while plastics recycling is increasing slowly, but is relatively insignificant when compared to generation, at only 5.6 percent in 1999

2.f. Plastics Status versus Other Secondary Material Types *(continued)*

Recycled Content

- The majority of recycled plastics are used in products other than bottles – closed-loop recycling is less common in plastics than other material types for a variety of reasons:
  - There are strong markets for recycled plastics (particularly PET) in fiber, including carpets, clothing, and strapping, as well as markets for (particularly HDPE) in other applications such as furniture, buckets, bins, drums, lumber, cassette cases, and drainage pipes
  - The potential for contamination in the PCR can make it more costly to use recycled content at the same rates as other materials, including risks of equipment shut-down, if contaminants such as PVC, grit, dirt, and metal impede the production process

Recycled Content *(continued)*

- Virgin plastics prices fluctuate, and tend to be low relative to the cost of recycled plastics, thus there is little economic incentive to use potentially contaminated PCR if virgin is available for a similar or even lower price
- Although there have been a number of non-objection letters from the FDA allowing food-contact in PCR plastic containers, there is still concern about potential contamination from PCR
- When PCR is used in a middle-layer to avoid food-contact, the container may be thicker than would be necessary if the container was made of only virgin resin, counter to source reduction goals

Recycled Content *(continued)*

- There are technical issues related to the use of PCR for some products. For example, PCR at levels above 25 percent can lead to chemical reactions between the product and the container. In addition, it is difficult to use PCR in injection molded containers such as butter tubs and cream cheese containers because of differences in the melt flow index of virgin and recycled resins

- It is not clear that closed-loop recycling is inherently superior to open-loop recycling with plastics, however the advantage of bottle-to-bottle recycling is that it creates a high-value market for the recycled plastics, improving the economics of recycling the material

Recycled Content *(continued)*

- Recycled content levels are relatively high for several other material types:
  - For comparison, there are strong economic incentives to use recycled aluminum in new aluminum cans, and the recycled content rate is typically between 50 and 75 percent. Using recycled aluminum in can production results in a 95 percent energy-savings compared to using virgin material
  - Scrap steel is typically 28 percent of the mix in furnaces, resulting in a recycled content rate of that level in most steel products
  - Certain papers also have high recycled content levels, for example 37 percent recycled content for corrugated boxes produced in US and 26 percent for fiber in American newspapers from ONP
  - Glass has a relatively high recycled content rate nationally at about 25 percent. In California, the glass recycled content program requires that glass be at 35 percent

2.f. Plastics Status versus Other Secondary Material Types *(continued)*

Recycled Content *(continued)*

- Nationwide, 7.2 percent by weight of PET recycled is used in making new food and beverage containers, with another 5.4 percent going to other containers
- Only 94 million pounds of recycled PET were used to produce 3,445 million pounds of PET bottles in 2000, an average recycled content of 2.7 percent
- 36 percent of HDPE recycled is used in containers, primarily non-food packaging such as detergent and shampoo bottles, resulting in an estimated average recycled content rate of 8.6 percent

Recycled Content *(continued)*

- There are many examples of successes in plastics recycled content containers, that would indicate that this option should still be considered and encouraged in order to stimulate markets for PCR:
  - Recent commitments by Coca-Cola to use 10 percent recycled content by 2005 could increase the potential bottle market for RPET by 13 percent if uncontaminated, bottle-quality supplies of RPET can be maintained
  - Coca Cola has been gradually increasing their use of PCR. In 1998 Coke used 1 million pounds of recycled PET in its bottles, in 1999, about 8 percent of Coke's bottles contained PCR. In 2000, 25 percent of the bottles contained PCR, and by late 2001 Coke was using 10 percent recycled content in 3 out of 4 of its bottles in North America. Gatorade (Pepsi) has been using recycled content for years

Recycled Content *(continued)*

- Pepsi also plans to use 10 percent recycled content in PET by 2005, and according to Gary Rodden, Pepsi NA President/CEO in a letter to bottlers: "We currently use recycled content in both aluminum and glass containers, so it makes sense that we explore the potential of using recycled content in our growing line of plastic bottles." Also, "We know that it is technically and economically feasible to produce a food-grade container made with 10 percent recycled content, so we believe achieving that rate is a reasonable action."
- These decisions by Coke and Pepsi have been enabled in large part by improvements in recycling technology over the last ten years, including supercleaning technology, that allows recyclers to market cost-effective, post-consumer PET, improvements by bottle suppliers that have figured out methods to use PCR in both monolayer and multiplayer injection molds, as well as pressure from the environmental community

Recycled Content *(continued)*

- Proctor & Gamble Canada by 1998 was using over 30 percent recycled content in laundry detergent bottles, and averaging in the mid-20 percent range for all the company's liquid fabric and home categories (primarily HDPE containers)
- Johnson, North American operations uses almost 50 percent post-consumer content in plastic PET bottles such as Windex brand, and almost all the company's PET and HDPE containers contain an average of 25 percent post-consumer
- Clorox uses 25 percent recycled content in its gallon bleach bottle, primarily from milk jugs
- Most of the companies in compliance with SB 235 in the first round of certifications were using PCR in their materials, at an average rate of 28.2 percent for the 253 containers using PCR

2.f. Plastics Status versus Other Secondary Material Types *(continued)*

Recycled Content *(continued)*

- Firms such as HP and Sony are using recycled plastics in electronics. HP has been collecting and processing inkjet cartridges for six years, generating almost 3 million pounds for resin, primarily PET. The PET is used in HP printers and scanners. Sony has been using post-consumer plastics from processing 6 million tons per year of agricultural trays to make speaker boxes for high-end TVs at the company's facilities in San Diego and Tijuana

2.g. Plastics Collection, Markets, and Market Development

Overview

- There are 528 curbside recycling programs in California
- There are over 1, 800 recyclers in the AB 2020 program
- There are 241 plastics processors in California
- Reclaimers: in 2000 there were 53 companies in the US that reclaim plastic bottles, 16 reclaiming PET and 37 reclaiming HDPE

Collection Costs

- Plastic collection and recycling costs cover a wide range:
  - Typical costs to collect plastics range from $140 to over $1,000 per ton depending on the type of program, volume collected, and steps included in the process
  - Costs at a MRF to sort and bale plastics range from $168 to $250 per ton
  - Costs under AB 2020 for plastics recyclers average about $600 per ton
  - The typical prices paid to recyclers for PET and HDPE range from about $120 to $260 per ton – often not covering the costs of collecting the material

Collection Costs *(continued)*

- Costs to process bales of recycled plastics into clean flake range from $440 to $660 per ton
- The typical price paid to a reclaimer for clean flake HDPE is about $400 per ton and for PET is about $600 per ton
- The City of Philadelphia determined that plastics curbside collection was costing $1,200 per ton due to its high volume and low weight – plastics occupied 45 percent of truck volume and only 6 percent of weight. The City stopped collecting plastics

Collection Costs *(continued)*

- The cost of collecting, sorting, baling, and processing plastic is higher than for other materials due to:
  - The low density of plastics relative to other material types. Plastics takes up more room in the truck, which is not offset by higher end-market prices
    - 30 lb per cubic yard of plastic
    - 74 lb per cubic yard of aluminum
    - 150 lb per cubic yard of steel
    - 500 lb per cubic yard of glass

Collection Costs *(continued)*

- Contaminants such as caps, labels, adhesives, and dirt are not volatized during remolding, as they are for other materials, thus requiring manual and mechanical upgrading. This is because the melt temperature for plastics is low – the melt temperature for plastic is 210F, for aluminum is 1,500F, 2,800F for glass, and 3,000F for steel
- Plastics sorting costs could increase further in the future with the increase in single-serving containers and alternative colors and barriers

Collection Costs *(continued)*

- Historic bale prices for clear and green PET have averaged about 8 cents per pound. A minimum viable price for PET is estimated in surveys at 5 to 6 cents per pound (the price for mixed color bales of recycled PET picked up at the shipper's door) – thus there is little room for flexibility or increased costs before recycling PET becomes uneconomic
- The addition of new beverage containers to the California Bottle Bill (AB 2020) has increased the number of plastic containers, the variety of resin types, and the range of container sizes that recyclers are required to collect. The addition of containers further increases the costs of plastics recycling and processing and the potential contamination of PET and HDPE streams

Plastics Collection Constraints/Issues

- In California, the mix of plastics typically collected includes PET, natural HDPE, and mixed bales of everything else (colored HDPE, resins 3 to 7)
- There are many constraints on the collection and processing of plastics for recycling:
  - Quantity of PCR in wastestream (i.e. low quantities of 3 to 7 make them difficult to recycle)
  - Ease of identification and handling of resin types
  - Degree of cross-contamination (nonplastic contaminants and different forms of resin (blow mold vs. injection mold))
  - Contamination from material in containers
  - Processing capacity
  - Resin production and price cycle – virgin resin prices drop during recession and periods of over-capacity, and PCR prices follow
  - Markets for reclaimed materials
  - Consumer environmental concerns

Plastics Collection Constraints/Issues *(continued)*

- Curbside collection is a relatively efficient way to gather materials, but plastics need to be sorted – either by consumers or recyclers/processors. Currently, what is collected isn't always recycled. There is confusion among consumers on what their program takes and programs are not consistent across the State
- Because of the unique high cost of recycling plastics, there are huge costs to just putting everything in the bin and sorting it out later (especially if it is not recycled)
- Some California cities, such as Arcata and Berkeley, are dropping plastics from curbside recycling, partly because of cost

Contamination Concerns

- At a 2001 annual meeting of the Association of Post-Consumer Plastics Recyclers (APR), members discussed processing problems. Of particular concern was the effect of bleeding labels on color of the PCR. NAPCOR and APR are working on testing for acceptable levels of contaminants from labels as well as other residual barrier materials. Three primary processing problems identified were: static cling of film in air elutriation, BOD reduction in wastewater, and bleeding labels
- Examples of problem HDPE and PET containers:
  - Pantene (label won't come off)
  - Moovers (PVC label on a PET bottle)
  - Florida's Best (adhesive on this PET orange juice bottle)
  - Nestle's Quik (sinking label on a PET bottle
  - Gatorade (PVC label on a PET bottle)

Contamination Concerns *(continued)*

- Contaminants in the recycling stream must be removed to produce clean PCR for fiber and bottle uses. Wash plants have demonstrated the ability to remove grit, dirt, and metals from HDPE and PET streams. Color is an issue for HDPE, with mixed color requiring separation and use in certain applications with dark containers. Natural milk HDPE requires additional rinsing to remove the strongly odiferous butyric acid formed by residue milk

Contamination Concerns *(continued)*

- The use of barriers made of non-PET materials in PET containers provides enormous growth potential for the PET market, however there are concerns about the impact of barriers on recycling PET. The packaging industry, as well as organizations such as The Plastic Redesign Project, are working to minimize the impact of the use of barriers on recycling plastics. Issues of concern include: additional sorting costs for colored PET (such as amber beer), and whether the residuals from the barriers will cause hazing, yellowing, or black specs in the clear flake that would preclude it from being used in the high-paying bottle markets.

Contamination Concerns *(continued)*

- Another issue is the total volume of these other containers in the recycling stream. There is typically capability to absorb a certain amount of other containers, such as light blue water PET, but if the percent of these containers increase, there is a potential to increase either of the two problems identified below
- There are two potential negative impacts on recycling of packaging innovations such as barriers and tints
  - First, is the impact of increased sorting costs to remove the materials from the clear recycling stream, and if enough material is available, to sort and store the new colored containers. The potential increase in costs is about 3.5 cents per pound

Contamination Concerns *(continued)*

- The second potential impact is the reduction in the market value of the plastic if there are increased levels of off-colors or PET with barriers – if this material cannot be sold into the higher value markets, such as containers (and it was previously) there is a potential loss of 1 to 2 cents per pound
- There is concern that the combined impact of these potential reductions could be enough to drive the cost per pound of collecting plastic up high enough and/or the cost per pound paid to collectors down low enough that it is no longer economically viable to collect plastics (PET and HDPE). Recyclers can accommodate some fluctuation in price and downturns, but they cannot sustain collection over a long period if they are not getting 5 to 6 cents per pound (under current cost scenarios)
- Some manufacturers are concerned about plastics recyclability. Joseph Bussey of Coors, referring to the new plastic beer bottle said, "Until recycling is proven to work and be cost-effective, we can't consider it for a million-plus-bottle product rollout."

2.g. Plastics Collection, Markets, and Market Development *(continued)*

Markets

- Plastics markets for both virgin and recycled materials are part of a global market, and subject to much greater volatility than markets for many other recycled materials
- Plastics recycling and markets in California are heavily impacted by the export of plastics to the Pacific Rim – however the demand for plastics in Asia is decreasing as virgin PET production capacity in China expands
- A growing number of containers, particularly PVC containers, are being imported (with product) from overseas, increasing contamination and thus costs of recycling

Markets

- Prices for recycled PET and HDPE rise and fall with virgin prices. There are three primary factors influencing virgin resin prices:
  (1) the price of natural gas and petroleum,
  (2) available production capacity relative to demand, and
  (3) general economic conditions
- PET bales, picked up from communities have ranged from 4 cents per pound to 12 cents per pound ($80 to $240/ton)
- On the West coast (i.e. for California), export markets in 2001 were strong, resulting in slightly higher prices than the rest of the country (cents per pound higher) for both PET and HDPE. Prices in 2001, delivered to the pier, averaged 13 cents per pound ($260/ton) for natural HDPE and 10.5 cents per pound ($210/ton) for PET

Markets *(continued)*

- Like glass, tinted or pigmented plastic bottles have limited markets and lower prices, usually by about 19 percent, from the price of clear bottles
- According to Plastics Recycling Update, "History shows that prices in the six to seven cent range are about as low as the market will dip, with consumers realizing that dropping prices much lower than this may lead to the stoppage of collections." (December 2001)
- California is very dependent on the plastics export market, 70-80 percent of the PET is exported; 40 to 50 percent of the HDPE, and all the injection and 3 to 7 resins are being exported – but the export market is very volatile – and doesn't help develop recycling infrastructure

Markets *(continued)*

- For example, as reported in Dec. 2001 Plastics Recycling Update, the maturation of the Chinese PET market is affecting both recycled and virgin PET markets in the US. There is less demand for PET bottles from the US for recycling, but large amounts of PET chip, fiber, and yarn are being sold by China to Western customers at low prices
- The status of markets for mixed and single-resin plastic streams in California are unclear and appear to be quite variable depending on location, resin type, and quality
  - Local governments identify a mismatch between supply and demand, while they sometimes have a hard time finding markets, many manufacturers say they can't find sufficient recycled feedstock

Markets *(continued)*

- "There is no end to the demand for 1 and 2 plastics"
- "No markets for 3 to 7 bales, they are going to landfills"
- "There are markets for 3 to 7, need to sweeten deal for processors to take 3 to 7; there are markets for 2 to 7 bales. Late 2001, got 4 cents per pound for 3 to 7 exports, is $32 for an 800 lb. bale, not too much"
- EPIC will take everything but PVC if it is mixed with HDPE; there is an export market for PVC bales for blisterpack
- Non-container plastics such as film plastics, create unique problems. For film plastics there are few collection systems in place and it is difficult to obtain sufficient material of adequate quality for end uses such as trash bags, that are struggling to compete with markets for plastic timber products

Bottle Markets

- Closed loop recycling (bottle to bottle) provides a large potential market for clean, sorted resins, particularly natural HDPE and color-sorted PET
  - "…the North American end market demand for PET and HDPE bottles from recycling programs far exceeds supply and can easily absorb more recovery." EPIC News and Views, September 2001
- Manufacturers have a difficult time obtaining a reliable supply of recycled resins, particularly PET, and thus use virgin resins. Industry says demand is there if recyclers can get clean material to them
- Nationally, reclaiming capacity is much higher than the amount collected for both HDPE and PET. In 2000 the PET industry was at a 62 percent utilization rate and the HDPE reclamation industry was at a 54 percent utilization rate

Bottle Markets *(continued)*

- Recent commitments by Coca-Cola and Pepsi to use 10 percent recycled content by 2005 could increase the potential bottle market for recycled PET by 13 percent if uncontaminated, bottle-quality supplies of recycled PET can be maintained
- According to industry analysts, decisions by Coca-Cola and Pepsi to use 10 percent recycled content in their PET bottles by 2005 will have an impact on producers and processors, with the biggest challenge being finding enough recycled material to meet those goals. An analyst cited in Plastic News said: "The problem is still collection. Is there enough, and are the economics in place for bottle collection? The U.S. infrastructure is no-where near what you see in places like Germany. It comes down to the mind-set of society and even to things like the location of recycling bins."

Market Development

- There are a number of existing initiatives by the DOC and CIWMB to improve markets for plastics and other recyclable materials:
  - Recycling Market Development Zones are a partnership between local governments and the CIWMB. The 40 zones in the state combine recycling with economic development to promote new business, expand businesses, and create jobs. Recycling-based manufacturers are eligible to apply for low interest loans to acquire equipment, make leasehold improvements, purchase recycled raw materials, and acquire property. The maximum loan is $2 million. Since the program began in 1993, the CIWMB has provided over 60 loans worth $25.5 million. These loans have resulted in 690 jobs and 1.6 million tons per year of secondary materials being recycled, including plastics

Market Development *(continued)*

- R-Team is a CIWMB program that provides assistance to businesses interested in Recycled Market Development Zones, as well as assistance to businesses that are not located within a zone. The goal is to help recycling-based businesses start and prosper in California, through technical, marketing, financial, and business assistance
- State Agency Buy Recycled Campaign is a joint effort between the CIWMB and the Department of General Services to implement state law requiring State agencies to purchase products with recycled content whenever price, quality, and availability are comparable
- CALMAX, the California Materials Exchange, helps businesses and organizations find alternatives to the disposal of materials or wastes. Since 1992, more than 650,000 tons of materials have been diverted from landfills through CALMAX exchanges

Market Development *(continued)*

- DOC Market Research and Expansion Group seeks to increase the demand for beverage container materials through the expansion of existing and development of new end-uses for beverage containers. DOC sponsors the bottlesandcans.com web page to promote recycling. DOC also developed a recycled product trailer for outreach at trade shows and other events
- Market Connection, a free quarterly publication, is a database of recycled beverage container products information, including information on recycled product dealers, manufacturers, and industry organizations, and information on brokers, recycling equipment suppliers, processors, and recycling/collection programs
- DOC operates a grant program for projects related to beverage container recycling and litter abatement. A total of $500,000 per year is available in grants for nonprofit organizations and government agencies

Market Development *(continued)*

- SB 1857, Sher – this pending legislation will require the DOC to annually expend $10 million until January 2006, to issue grants for market development and expansion-related activities regarding the recycling of beverage containers. This legislation was an outcome of a DOC/CIWMB working group. The intent is to emphasize plastics in the grant allocation
- RPPC and trash bag recycled content laws – as discussed earlier – these laws are intended to increase markets for recycled plastics

2.h. Plastics Environmental and Economic Issues

- There are many other issues related to plastics that have a bearing on policy decisions related to the use, recycling, and disposal of plastics
- Many of these issues are unresolved – there is not necessarily an agreed upon answer
- We identify key issues, research, controversies, concerns and benefits in several areas:
  - Life cycle analysis
  - Source reduction
  - Health and environment
  - Benefits of recycling

Life Cycle Analysis (LCA)

- LCA is the technical analysis of the impacts of a product or material consisting of three parts, (1) an inventory of the impacts (raw materials acquisition, manufacture, processing, formulation, distribution and transportation, use, re-use, maintenance, recycling, and waste disposal. The inventory includes an analysis of the environmental burdens associated with the process or activity, for example quantifying the energy, raw materials usage, and emissions over the life of the product; (2) an impact analysis characterizes and assesses the effects of chemical releases on human health and the environment, and (3) an improvement analysis to evaluate and implement modifications in the production process based on the findings of the inventory and impact analysis

Life Cycle Analysis (LCA) *(continued)*

- First LCA was conducted in 1969 by Coca Cola Company to determine which type of containers were most environmentally sound
- There is a standard methodology developed by the Society of Environmental Toxicology and Chemistry (SETAC), and over 19 LCA methodologies used in Europe. A number of organizations in the US that have conducted LCAs on products such as beverage containers, bags, diapers, and milk containers
- LCA is seen as a valuable tool for considering the different impacts across the life of a product or package, however, care is needed in interpreting results

Life Cycle Analysis (LCA) *(continued)*

- We do not recommend relying on just LCA for setting public policy for several reasons:
  - The wide range of study results (often depending on who is funding them)
  - For example, a 1988 NAPCOR study comparing soda containers found 2L PET and 12 oz aluminum better than refillable glass at existing trippage rates, found PET and aluminum equivalent on air emissions, found PET and refillable glass about equivalent on water emissions, and PET and refillable glass about equivalent on energy consumption
  - A 1976 study by the Federal Energy Administration evaluating energy consumption of soft drink containers ranked plastic bottles second behind refillable glass, but only assumed a 25 percent recycling rate for aluminum

Life Cycle Analysis (LCA) *(continued)*

- A 1974 study by Franklin Associates for the EPA ranked plastic bottles fourth in the amount of water needed to produce, package, and deliver a beverage to consumers
- A 1991 study by Franklin Associates examined only the energy used to produce plastic packaging and disposable products as compared to alternatives from other materials. They quantified total energy use at each manufacturing stage and found that 336 million fewer Btu were required to produce plastic packaging than would have been required to produce the non-plastic alternatives. The majority of the savings (78 percent) were from energy-savings from the use of film as compared to alternatives such as kraft paper, wax paper, tissue, and foil. Savings were less significant or negative when comparing the energy use of disposable plastics such as cups, and plates to the alternatives

Life Cycle Analysis (LCA) *(continued)*

- Similarly, studies of milk delivery packaging in Europe and Canada found different container types ranked higher or lower, depending on what factors were evaluated and assumptions made about waste, sources of energy, and package design
- LCA does not take into account how the product or package is used or the variation behind the average impacts such as emissions or energy use – taking these into account could lead to entirely different conclusions about the "best" package or product

Life Cycle Analysis (LCA) *(continued)*

- A European packaging industry group states that the differences in LCA analyses between various packaging types are not significant – certainly not significant enough to base public policy decisions: "The difference on environmental grounds between one type of packaging and another is too small to be meaningful – often the difference between the same types of packaging produced in different plants is greater than the difference between types of packaging."

Source Reduction

- Source reduction is an important benefit of plastics as compared to many other material types. The characteristics that make plastics difficult to recycle – its light weight and wide range of resin qualities – also make it an effective material for many applications
- The lighter weight of plastics packaging has benefits in transportation (reduced emissions) as well as reduced material in the wastestream
- There are numerous examples of lightweighting of packaging – both compared to other materials and of plastic containers over time

Source Reduction *(continued)*

- Examples of plastic containers that have been source reduced:
  - The 2 liter PET soda bottle is 30 percent lighter than in 1970. When introduced the bottles were 67 grams, now they are 47 grams
  - An empty one gallon milk jug decreased its weight from 95 grams in the early 1970s to 60 grams today
  - Proctor & Gamble redesigned their oil bottle, reducing its weight by 30 percent, saving 1,130 metric tons of plastic a year. In addition more of the new bottles fit on a truckload, cutting transportation costs and reducing the size of corrugated box shipping cartons by 10 percent, or 590 metric tons
  - Proctor & Gamble has also reformulated and developed concentrated versions of dishwashing liquids Dawn, Ivory, and Joy, reducing packaging by 16.6 percent, or 9.7 million pounds per year – 5.5 million pounds plastic and the rest corrugated

Source Reduction *(continued)*

- The thickness of a margarine tub has been downgauged nearly 30 percent

- Examples of plastic containers that are source reduced as compared to other material types:
  - 11.5 ounce brick of Maxwell House coffee, made of aluminum and LDPE has a product to weight packaging ratio of 30:1, for every 1,000 pounds of coffee in Brick Paks, net discards would be 33.7 pounds. The same 1,000 pounds of coffee in 23 ounce steel cans produces a net discard of 145.6 lb., including a 48 percent recycling rate
  - Comparing 2 lb. plastic bag of rice with a 28 ounce box of rice, product to packaging weight ratio for bags is 99:1, with boxes it is 13.3:1, net waste is substantially lower for plastic bag, for 1,000 lb. of rice, waste is 3.9 lb. for boxes, it is 78.1 lb.

Source Reduction *(continued)*

- A Michigan State study looked at least and most packaging for a variety of products. Plastics were often in the "least" category – muffin mix in plastic pouch requires 1.2 g packaging per 100 g. product, vs. "most packaging" muffin mix option of 14.3g of packaging per 100g of product
- In the Michigan study there was a correlation between efficient packaging and flexible materials – potato chips in plastic/paper laminate bag produced 3.4g of packaging per 100g product, and the alternative was 27g of packaging per 100g of product
- To deliver 32 liters of juice or soda requires:
  - 1 kg plastic (but, if the container is 25 percent recycled, the result is 0.75 kg waste)
  - 1.5 kg aluminum (if the container is 50 percent recycled, the result is 0.75 kg waste)
  - 4 kg steel
  - 13.5 kg glass

Source Reduction *(continued)*

- Beyond packaging, plastics have many significant benefits. Just a few examples highlight the benefits to society from plastics products:
  - Energy-savings resulting from the use of polystyrene or polyurethane foam in home insulation
  - Increased use of plastic components in automobiles, reducing overall weight and thus fuel consumption
  - Plastics for safety items such as bicycle helmets, car seats, etc.
  - Plastics in medical equipment, computers, a large share of the durable materials used in today's society

Health and Environment

We discuss seven main topics under health and environment

- Plastics and health impacts
- PVC and phthalates
- Brominated flame retardants
- Litter – marine and land-based issues
- Compost contamination
- Biodegradable plastics
- Benefits of Recycling

Plastics and Health Impacts

- Plastics and health issues are extremely controversial, with one "side" expounding on the dangers of plastics and the other "side" defending plastics as entirely safe. Our limited review of the issues leads us to the conclusion that both sides have merits, and the "truth", if it could be determined, is most likely somewhere in-between these two perspectives
- Both "sides" appear to sometimes draw on those studies which make their point, for example using limited data sets or un-validated studies, or quoting only portions of a study's results to support or refute various claims

Plastics and Health Impacts *(continued)*

- Because of the nature of chemical exposure in our environment today – a wide variety of chemicals through all media – it may be impossible or extremely difficult to prove direct links from specific plastic components through epidemiological studies. However, that does not necessarily mean there are not potential problems with certain materials, and where there are credible concerns, it would seem prudent to take steps to limit human exposure, particularly to at-risk groups – for example, eliminating PVC use in chew toys or the phthalate DEHP in IV use for certain types of patients

Plastics and Health Impacts *(continued)*

- It is the nature of more radical environmental groups to focus on particular issues – in part as a fundraising tool, but also because industry will not typically respond to less active questioning of their products or processes. Industry has been less responsive to certain problems than they should be – as explored in a 1998 series in the Houston Chronicle on the PVC industry, or the more well-known example of the tobacco industry – and it is sometimes difficult to tell from the rhetoric on both sides how serious a problem is
- Another example is the use of polycarbonate in baby bottles. An inflammatory report in Consumer Reports in June 1998 started a flurry of articles and press on the potential risks from the release of the additive, bisphenol A from polycarbonate bottles.

Plastics and Health Impacts *(continued)*

The study that raised the problems could not be replicated, and the FDA determined that "with baby bottles, we haven't been able to detect bisphenol A if we use reasonable extraction techniques." After a comprehensive study conducted by the National Toxicology Program came out, the industry noted that the study showed no risks from bisphenol A and polycarbonate bottles. However, the actual wording in the study was somewhat more conservative, finding mixed results, including "credible evidence that bisphenol A can cause effects on specific endpoints." Because a number of other credible studies did not find negative results, the group was "not persuaded that a low does effect of bisphenol A has been conclusively established as a general or reproducible finding" and recommended additional research to clarify uncertainties.

Plastics and Health Impacts *(continued)*

There does not appear to be a reason to throw out all of our baby bottles, but it might be a good idea to take care that the bottles are not boiled extensively or other potential uses that might cause problems, and certainly there is a need for additional research

- Below, we identify some of the issues raised with certain plastics and additives (especially PVC) – at this point we are simply summarizing these issues, and want to clarify that there are almost always at least two opinions about every potential health risk from plastics

PVC and Phthalates

- Characteristics and uses
  - Only common plastic using chlorine in production, and the second most common resin type
  - Concern over release of dioxin (a known potent carcinogen) when PVC is produced or burned
  - Chemicals must be added to PVC to make vinyl products – including lead, cadmium, and other softeners, that can leach from the product. Lead and cadmium use are being reduced in favor of less toxic metals
  - PVC is used in wide variety of products, including toys, construction materials, furniture, clothing, shoes
  - Plasticizers such as phthalates are added to plastic materials to make them soft or flexible and are commonly used in PVC products. Medical devices may contain 20 to 40 percent by weight, one, di (2-ethylhexyl) phthalate (DEHP)

PVC and Phthalates *(continued)*

- Toys
  - US Consumer Product Safety Commission has requested that toy manufacturers stop using lead, cadmium, and phthalates in various PVC children's products
  - Major toy manufacturers and retailers have pledged to comply with these requests, a number of manufacturers have eliminated or are phasing out PVC in toys, particularly mouth toys
- Building materials
  - Greenpeace has developed a database on construction material alternatives to PVC
  - Blue Vinyl is a recently released documentary movie on the problems associated with PVC use and production in the building industry
  - Because of its positive characteristics, PVC is used extensively in siding, pipes, window frames, gutters, and wire and cable insulation

PVC and Phthalates *(continued)*

- Medical products
  - In March 1999 an editorial in Chemical and Engineering News outlined the risks and alternatives to PVC-IV bags that contain DEHP. There are polyolefin IV bags that can be used as alternatives at a similar cost
  - In October 2000 the National Toxicology Program of the U.S. Department of Health and Human Services released an expert panel report on DEHP, a phthalate commonly used as a plasticizer in PVC medical equipment. The panel focused on reproductive impacts of DEHP to critically ill infants, healthy infants and toddlers, and the offspring of pregnant or lactating women. The panel had "serious concern" or "concern" about potentially harmful exposure to these three groups
  - A U.S. study found high concern for one phthalate, DEHP, others had "low, minimal, or negligible" concern

PVC and Phthalates *(continued)*

- In January 2002 a Health Canada Expert Advisory Panel recommended that health care providers not use devices containing DEHP in the treatment of pregnant women, breastfeeding mothers, infants, males before puberty, and patients undergoing certain treatments. This is contrary to a controversial June 1999 review and consensus statement by the American Council on Science and Health that stated that "DEHP, as used in medical devices, is not harmful to humans even under chronic or higher-than-average conditions of exposure." A September 2001 FDA Safety Assessment on DEHP found that DEHP may not be safe for infants, children, and adults receiving certain treatments. The FDA is currently developing risk reduction strategies. In December 2001 the American Medical Association urged the FDA to address the potential risks of PVC medical devices containing DEHP. The Advanced Medical Technology Association countered that these reports do not take into account the full range of benefits of vinyl products
- The use of PVC-IV bags containing DEHP is a prime example of the controversy surrounding the health effects of plastics

PVC and Phthalates *(continued)*

- Production
  - At least three published medical studies have found a link between workers in vinyl facilities and pancreatic cancer and another to testicular cancer. Vinyl chloride leads to a rare liver cancer that has also been found at increased levels in PVC production plant workers. Since the mid 1970s, the PVC industry has taken steps to drastically reduce worker exposure
  - There are environmental justice concerns in communities with PVC plants
  - According to the US EPA, 35 of the 47 US chemical plants ranked highest in carcinogenic emissions are involved in plastics production (not just PVC)
  - The PVC industry has significantly reduced emissions of the vinyl chloride monomer and ethylene dichloride over the last 13 years. Ethylene dichloride releases per one million pounds produced dropped by 88 percent between 1989 and 1996, and vinyl chloride monomer releases decreased by 63 percent

PVC and Phthalates *(continued)*

- Contamination in recycling stream
  - PVC has the same density as PET, and thus is not easily separated in the recycling process. When the materials are processed, PVC contaminates the PET stream, resulting in black specks in the recycled PET resin flakes
  - PVC undermines the economic viability of PET recycling. The recycling community is advocating the phasing out of PVC in containers for sale in the United States

PVC and Phthalates *(continued)*

- APC states: "Due to a similar appearance to PET bottles, PVC bottles are commonly mistakenly included in recycling bins by householders. Once at a MRF, PET and PVC bottles are typically not separated and end up being baled together for delivery to PET reclaim markets. Only a small fraction of PVC can ruin or significantly downgrade a load of reclaimed PET. Due to different material properties, including differences in melting temperature, PVC is a major contaminant to the PET bottle recycling stream."
- Industry specifications for PVC contamination are 10ppm for bottles and sheet, 20ppm for strapping, 100ppm for compounding, and 200ppm for fiber
- Fiber end markets are satisfied by typical curbside PET streams, which are up to 2 percent PVC. Higher levels of PVC could lead to rejected loads, increased autosort costs, and foreclosed bottle markets

PVC and Phthalates *(continued)*

- Incineration
  - Another source of concern for PVC in medical products results from the incineration of medical waste. Dioxin, classified by the EPA as a human carcinogen, is a byproduct of PVC production and incineration. Medical waste incinerators have been identified as the third largest source of airborne dioxin in the U.S.. Numerous public health groups and other organizations have called for a phase-out of PVC medical products because of the dioxin emissions, including the American Public Health Association, the American Nurses Association, the International Society of Doctors for the Environment, and the United Methodist Church

PVC and Phthalates *(continued)*

- Incomplete incineration of chlorinated compounds like PVC release dioxins and furans into the air – both known carcinogens. However, these wastes can be incinerated safely, and according to the European document, "Technical Guidelines for the Identification and Environmentally Sound Management of Plastic Wastes and for their Disposal", adopted in 2001, "Research and practice developed over the past 10 years have shown conclusively that, under strict operating conditions, plastic wastes, even if the mixture is rich of PVC, can be incinerated safely and effectively. Consistent high temperature combustion will recover the maximum energy from the fuel and ensure the complete breakdown of toxic organic compounds."
- Greenpeace argues that there are fugitive emissions, and there is no incinerator operating at 100 percent efficiency. In addition, they are concerned about toxins in the fly ash remaining after incineration

PVC and Phthalates *(continued)*

- Organizations
  - Greenpeace, Blue Vinyl, Vinyl Institute – there are several groups involved in PVC issues. PVC has been implicated by several organizations as "the worst plastics for the environment" due to concerns about the production, use, and disposal of PVC, and its building block, the vinyl monomer. Organizations such as Greenpeace and Blue Vinyl are raising concerns and campaigning to limit the use of PVC in various products, including building products, toys, and shoes. The Vinyl Institute is among several industry organizations that are working to reduce the environmental impacts of PVC and promote its use

PVC and Phthalates *(continued)*

- Organizations
  - The European Union released a Green Paper on PVC in July 2001, assessing various environmental and health issues related to PVCs, and approved a revised proposal for regulating the use of phthalates based on migration in toys. This report followed the release of three studies in 2000 that raised concerns about landfilling PVC and the volumes of PVC waste. These studies were haled by environmentalists and criticized by industry
  - Health Care Without Harm (HCWH) – The mission of HCWH is to transform the health care industry worldwide, without compromising patient safety or care, so that it is ecologically sustainable and no longer a source of harm to public health and the environment. HCWH provides resources, articles, reports, and approved product lists. PVC is one of seven materials that HCWH focuses on

Brominated Flame Retardants

- Brominated flame retardants such as penta bromo diphenyl ether (Penta DBE) are used in the production of polyurethane cushions in automobiles and furniture, as well as appliances such as computers and televisions. While their fire retardation effects are important, these chemicals pose unknown health risks and are accumulating in the environment. Studies have found elevated levels in fish and breast milk. Japan and Europe have reduced the use of penta DBE, and 98 percent of worldwide use is in the United States. Potential risks include effects on memory, learning, liver and thyroid hormone. Because penta DBE bioaccumulates, there is concern about long-term exposure.

Litter – Marine and Land-Based Issues

- Problems arising from the release of plastics into the environment are significant. The issue of litter – marine or land-based – is difficult because it involves diffuse sources and human behavior – both of which are hard to regulate. Litter is a problem for of all types of plastics, but is particularly a concern for film plastics and polystyrene
- Marine debris: there are many organizations and efforts aimed at assessing and tackling the problem of marine debris, however, the problem remains intractable. In the next slides, we summarize key issues and concerns

Litter – Marine and Land-Based Issues *(continued)*

- Amount of plastics
  - In 1975, the National Academy of Sciences estimated that ocean-based sources dumped 14 billion pounds of garbage into the ocean. The international agreement, The International Convention for the Prevention of Pollution from ships (known as MARPOL), signed by 64 countries, reduced the amount of dumping and made dumping of plastics in the ocean illegal, however, it is still estimated that there are over 46,000 pieces of plastic debris floating on every square mile of ocean today, with roughly 60 to 80 percent coming from land sources
  - Almost 90 percent of floating marine debris is plastic; and according to one source, about 650,000 plastic bottles end up in the ocean each day
  - Plastics create particular problems because it floats on the surface, like many food sources, and it does not biodegrade
  - A major source of plastics in the marine environment are sewer systems and storm drains

Litter – Marine and Land-Based Issues *(continued)*

- Entanglement and ingestion are major concerns for marine animals
  - 49 of the 115 species of marine mammals are known to become entangled in, or ingest, marine litter
  - Over 265 species of marine and coastal wildlife are threatened by entanglement, smothering, and interference with digestive systems
  - The National Marine Mammal Laboratory found that plastic entanglement (often in fishing lines and nets, but in other plastics also) was killing up to 40,000 seals a year
  - About 100,000 marine mammals and turtles are killed by plastic marine liter every year around the world
  - At least 162 marine species, mostly seabirds, have been reported to ingest plastics and other litter

Litter – Marine and Land-Based Issues *(continued)*

- Between 700,000 and 1 million seabirds are killed from entanglement or ingestion each year
- Plastics soda rings, bags, Styrofoam particles, and plastic pellets are often mistaken as food by turtles and sea birds. Once eaten, the foreign objects block the intestines, reducing nutrient absorption and appetite – the result is the animals starve to death
- Sea turtles are at high risk because they ingest plastic bags, which look like jellyfish, a favorite food, and then starve to death

Litter – Marine and Land-Based Issues *(continued)*

- Other risks
  - Marine debris creates problems for fishermen and recreational boaters as well as wildlife, for example, when plastic sheeting and bags block cooling intakes. A survey in Newport Oregon found that 58 percent of fishermen had suffered equipment damage from marine debris with an average repair cost of $2,725
  - Plastic bags are the leading external cause of marine engine damage in Massachusetts
  - The U.S. Army Corps of Engineers spends $9.4 million annually to remove drifting and floating debris from the New York/New Jersey Harbor

Litter – Marine and Land-Based Issues *(continued)*

- In Shetland, UK, fisherman had 69 percent of their catch contaminated by litter, and spent 1-2 hours per week cleaning litter from nets. It was estimated that each boat could lose between £6,000 and £30,000 per year due to marine litter, between time cleaning nets and damage to propellers and blocked intake pipes
- In Japan, the leading cause of marine engine damage is plastics at sea, and insurance companies estimate that $50 million has been awarded for repairs from marine litter damage

Litter – Marine and Land-Based Issues *(continued)*

- Resin pellets
  - Only a small amount of the plastic in the ocean is pellets, however they are very attractive to birds, comprising about 70 percent of the plastics eaten by seabirds. Plastic particles have been found in the stomachs of 63 of the approximately 250 species of seabirds
  - Japanese researchers have recently established that plastics resin pellets can adsorb toxic substances in the seawater such as DDT derivatives, PCBs, and nonylphenols, increasing the risk to bird species

Litter – Marine and Land-Based Issues *(continued)*

- Resin pellets *(continued)*
  - In the early 1990s, the EPA conducted a study of plastic pellets in the aquatic environment, and found that pellets were among the most common items found in most harbors, entering the water through combined sewer overflow, storm water discharges, and direct spills. The study found that seabirds were at particular risk due to ingesting the pellets. Working with industry the EPA, identified several steps industry could take to help reduce the amount of pellets entering the environment. The number of pellets is astronomical, with each pound of pelletized HDPE containing about 22,000 pellets – the total number of pellets produced in the US could be well over a quadrillion

Litter – Marine and Land-Based Issues *(continued)*

- Plastics and invasive species
  - The extent of problem created by marine organisms traveling on rubbish, particularly plastics and invading other ecosystems is relatively new – in a recent article in Nature, David Barnes of the British Antarctic Survey reports disturbing results. "Rubbish at sea is much more dangerous than we had previously assumed. The problem of dumping at sea has got to be addressed." Debris has tripled the spread of alien species at high latitudes, and doubled the spread of alien species in the subtropics, 50 percent of debris in the tropics is colonized. Remote areas and those with a large percentage of endemic species are at high risk, because when invasive species replace the native species in these areas, they are gone. Barnes found, in his 10 year study of human litter on 30 remote islands, that plastics dominate the debris in most places, is the most durable type of litter, and is more readily colonized by organisms. Barnes notes that regulations such as MARPOL have begun to make a difference, but are not enough – once an organism gets into an area, it is almost impossible to remove it

Litter – Marine and Land-Based Issues *(continued)*

- Litter on land is also a significant problem, particularly as it relates to storm drains and litter entering watersheds
  - Relatively little has been done to address the issue of litter in the environment (land and water), although it is a universal problem
  - Most litter efforts are state or locally organized. Keep America Beautiful (KAB) and the U.S. Conference of Mayors have initiated the Urban Litter Forum to address issues of urban litter. Certain states, such as Florida and Texas, also have active litter programs
- Plastics in the litter stream
  - Plastics account for 50 to 80 percent of the volume of litter collected from roads, parks, and beaches

Litter – Marine and Land-Based Issues *(continued)*

- Plastics in the litter stream *(continued)*
  - In annual litter surveys conducted in Florida, plastics are prominent in the list of items collected, including miscellaneous plastics, polystyrene foam, film, plastic packaging, and plastic soda bottles. About 25 percent of the large items collected were plastics, with mixed items (including plastics) making up another 35 percent
  - When litter is quantified by weight, plastics make up a smaller percentage of the total, but the corresponding volume of aluminum and plastic beverage containers in a Washington study was actually larger than the volume of glass
  - In the 2001 Visible Litter Study in Texas, 30 percent of items collected were plastics, the second most common type of litter after paper and paperboard (49 percent of all items). The next largest category was metal items, at 14 percent

Litter – Marine and Land-Based Issues *(continued)*

- Coastal cleanups
  - Coastal cleanups in the US have produced up to 10 tons of garbage per mile of coastline, with plastics forming the biggest single item found
  - Annual coastal cleanups, such as those sponsored by the California Coastal Commission each fall collect a massive amount of debris, however, they do not solve the marine debris problem
  - Coastal cleanups provide large benefits, in Florida, it is estimated that 80 percent of all urban litter on the highways and parks ends up in the Gulf of Tampa Bay

Litter – Marine and Land-Based Issues *(continued)*

- Coastal cleanups *(continued)*
  - In October 2000 Congress passed the Beaches Environmental Assessment and Coastal Health (BEACH) Act, authorizing the EPA to award grants to support testing and monitoring of coastal recreation wastes, and assist with monitoring programs for floatable debris
  - In the 1999 U.S. Coastal cleanup, plastic items (excluding the top item, cigarette butts, which are made of plastic) made up six of the "Dirty Dozen" – the twelve categories with the most total numbers picked up. Plastics in the list included: plastic pieces, plastic food bags and wrappers, foamed plastic pieces, plastic caps and lids, straws, and plastic beverage bottles. Plastics was by far the largest category of materials collected

Litter – Marine and Land-Based Issues *(continued)*

- The cost of collecting litter is high
  - It costs an estimated $1.11 per pound to pick up litter, according to a Seattle Times article
  - In one summer in Orange County, it costs $350,000 for litter cleanup of six miles of beach
  - In 2000 Cal Trans spent $16 million cleaning up litter on California's highways, a cost that does not include the Adopt-a-Highway program efforts
  - Local governments in Texas spend about $14 million a year to clean beaches

Litter – Marine and Land-Based Issues *(continued)*

- Litter concerns
  - The durability of plastic adds to the problems created by litter – it takes 2 to 5 months for paper to biodegrade, and from 5 years to 450 years for plastic products to biodegrade
  - As an extreme example of the problems created by plastics litter, in India, a country where cows are sacred, up to 100 cows a day were reported to be dying from ingesting plastic bags. The plastics problem has escalated in that country, and a 16 member National Plastics Waste Management Task Force was convened

Litter – Marine and Land-Based Issues *(continued)*

- Storm drain issues
  - In urban areas in California, Regional Water Quality Control Boards are concerned about the levels of trash in storm sewer runoff that is entering the water systems and threatening water quality standards. In the Los Angeles area, trash has been designated as a major pollutant in urban runoff. Plastics are among the common items observed: Styrofoam cups, Styrofoam food containers, glass and plastic bottles, toys, balls, motor oil containers, antifreeze containers, construction materials, plastic bags, and cans. The City determined that more than 1,000 cubic feet of trash annually enters catch basins in just one drainage area of about 140 acres. The City of Los Angeles is seeking grant funding to install a net trash trapping system on storm drains to help alleviate the problem – the cost of the project is $860,000

Litter – Marine and Land-Based Issues *(continued)*

- Storm drain issues *(continued)*
  - About 13 metric tons of debris was discharged by stormwater into Santa Monica Bay in a single storm event in 1997, and over 4,000 metric tons of litter was collected each year from 1988 to 1996 on beaches in Los Angeles County
  - Plastics are by far the biggest problems in storm drains, entering waterways, internationally (Australia, New Zealand, and South Africa, for example, have significant problems with plastics entering waterways from storm drains)
  - One study recommended that there would be a greater benefit from reducing the production of litter rather than trying to trap it once its gotten into the drainage system, and data from Australia suggests that the basic litter load can be reduced by as much as 90 percent with public awareness and co-operation

Compost Contamination

- Non-biodegradable plastic bags in compost (used to collect yard waste) create significant problems for composters. They reduce the market price of the finished product, increase processing costs, reduce the volume of marketable product, and increase the amount of residue to be disposed. The U.S. Composting Council and Biodegradable Products Institute have developed a certification process for biodegradable plastic bags for use in yard waste collection programs.

Benefits of Recycling

- There are typically five major categories cited for the benefits of recycling. While the size of the benefits varies by material type and location, all are relevant to some extent to plastics recycling:
  - Natural resource savings
  - Energy savings
  - Reduced emissions to air and water
  - Landfill space
  - Creation of economic benefits, including jobs

Benefits of Recycling *(continued)*

- Natural resource savings
  - Resource conservation, the most efficient use of our natural resources, is an underlying aspect of both the CIWMB and DOC missions. Although often overshadowed by our consumption ethic, the resource conservation ethic has been an integral part of US society since the country was founded
  - Recycling can reduce the amount of natural resources extracted from the earth – oil, gas, metals, and trees – and the resulting environmental damage that comes from extracting these materials
  - The conservation of energy and natural resources and the prevention of pollution in manufacturing that result from using recycled materials rather than virgin materials outweigh the additional environmental burdens from collecting and processing recyclables
  - Raw material use in the U.S. increased from about 500 million metric tons in 1940 to 2,500 million metric tons in 1989, a five-fold increase, while population increased just under two-fold

Benefits of Recycling *(continued)*

- Natural gas is the primary feedstock used to produce plastics. It takes a ratio of almost 2:1 in equivalent weight of oil to plastics produced – 2 kg of crude oil generate about 1 kg of plastics

- Energy savings
  - Using recycled materials in production generally requires about three times less energy than for virgin production because the recycled products are already partially converted into the final product
  - The US EPA estimates the following energy savings (in million Btu per ton and barrels of oil, gallons of gasoline) from recycling and not landfilling the following forms of plastics packaging:

LDPE Film	24 mil Btu/ton	4.1 barrels of oil	192 gal. of gasoline
PET bottles	24	4.1	192
Mixed plastics	21	4.1	168
HDPE bottles	19	3.3	152

Benefits of Recycling *(continued)*

- Over 95 percent of the total energy required to produce one kg. of plastics is due to extraction and refining – avoiding these steps by recycling can thus result in significant energy savings
- The energy savings from recycling beverage containers is equivalent to over 32 million barrels of oil per year, primarily through savings from aluminum, but also from glass and plastics (over 2 million barrels of oil from HDPE and PET recycling)
- A 1994 Franklin Associates study conducted for Keep America Beautiful found that recycling produced a net reduction in energy use as compared to landfilling, even when energy recovered from methane and the energy required to collect, sort, and process the recyclables are taken into account. Recycling saved 16.8 million Btus per ton of material while landfilling expended 0.5 million Btus per ton

Benefits of Recycling *(continued)*

- Reduced emissions to air and water
  - The 1994 Franklin Associates study also found that for 10 major categories of air pollutants and 8 of water pollutants, curbside recycling resulted in a net reduction in all categories relative to virgin manufacturing and landfilling
  - Recycling plastic beverage containers in 1999 was estimated to reduce green house gas emissions by almost 350 million tons of carbon equivalents (much lower than aluminum reductions, but higher than glass)
  - A Canadian study found that for each 2.7 liter HDPE bottle sent to the landfill instead of recycled, about 0.48kg of carbon dioxide equivalent is emitted. Expanding to all Canada, the study states that if all households disposed of one bottle per month instead of recycling it, the burden on the environment would be equivalent to an additional 1,500 gasoline powered vehicles being driven each year

Benefits of Recycling *(continued)*

- Landfill space – any materials kept out of the landfill increases the length of time the landfill can be used for disposal of non-recyclable materials, avoiding the need to permit, site, and pay for new landfills. Although the "landfill crisis" of the early 1990s is not as critical in California, there are still significant benefits to keeping materials out of landfills if they can be handled by other means
- Creation of economic benefits, including jobs
  - Transforming materials that would otherwise be discarded as waste into positively valued commodities can result in significant economic benefits

Benefits of Recycling *(continued)*

- Two recent studies on the economic impacts of disposal, diversion, recycling, and/or reuse conducted for the CIWMB both show the economic benefits of diversion. Average results of the two studies show the following benefits from diversion relative to disposal (comparing dollars per ton):
  - 212 percent increase in sales and public outlays
  - 165 percent increase in income
  - 177 percent increase in value-added
  - 190 percent increase in jobs
- California has about 5,300 recycling and reuse establishments in 26 general business categories, with an annual payroll of $2.2 billion and employing 84,000 people

Benefits of Recycling *(continued)*

- The two plastics-specific categories, plastics reclaimers and plastics converters have the greatest benefits compared to other materials types – 372 businesses employing 18,000 people, with an annual payroll of $546 million and over $2.5 billion in receipts
- Diversion creates 4.7 jobs per 1,000 tons, while disposal creates 2.5 jobs per 1,000 tons
- The total income impact of diversion is $209 per ton, while the total income impact of disposal is $108 per ton at 1999 diversion levels
- The results of these California-specific studies are similar to those done nationally or for other regions. For example, for ten states in the Northeast 13,000 recycling and reuse result in 206,000 jobs, $6.8 billion in annual payroll, and $44 billion in annual revenues

Benefits of Recycling *(continued)*

- Nationally, recycled plastics converters employ 178,700 people and gross nearly $28 billion in estimated annual receipts
- A Wall Street Journal article critical of recycling states: "To be sure, reuse of old paper, metals, glass, and even some plastics makes great sense. It almost always lowers raw-material costs in manufacturing … [and] thus helps the US paper industry remain globally competitive and reduced reliance on foreign steel."

Biodegradable Plastics

- There has been extensive research over the last several years on biodegradable plastic resins. While biodegradable resins are not yet cost effective, they offer promise in many areas, for example plastic bags for yard waste. Although even biodegradable materials do not necessarily degrade in landfills, biodegradable plastics released in the environment could reduce problems related to litter and marine debris.

2.i. Strawman Plastics Fundamental Issues

Long-Term Plastics Structural Issues

1. Plastics are here to stay in our lifetimes as they are integral to our lifestyle and economy, and they have societal benefits due to their light weight and versatile range of applications
2. There are significant economic externalities in the plastics production, use, recycling, and disposal phases (i.e., litter, marine ecosystem impacts, chemical emissions, and known/unknown health risks)
3. Plastics production continues to far outpace plastics recycling, and is displacing other more recyclable materials, as a result plastics in the MSW discard continues to grow rapidly, and it is the fastest growing portion of the MSW wastestream

Long-Term Plastics Structural Issues *(continued)*

4. The plastics recycling rate has stagnated at a low level, and plastics recycling quantities and rates remain lower than other materials such as steel, aluminum, glass, and paper
5. Plastics represent a disproportionate share of landfill space, and next to paper, is now the second largest overall category of waste volume going into municipal landfills
6. Plastics bottle-to-bottle recycling historically has been miniscule compared to other secondary material closed loop recycling

Long-Term Plastics Structural Issues *(continued)*

7. Plastics historically have been uneconomical to recycle (average collection and processing costs exceed scrap values by more than two and one-half times), plastics are generally not as economic to recycle as other material types, and plastics recycling costs could rise further due to the proliferation of plastic containers. Higher plastics recycling rates come at an extremely high cost, and higher than that for other material types

8. More so than other major material types, plastics are a global commodity, subject to the volatility of world economic forces

Long-Term Plastics Structural Issues *(continued)*

9. The long-term, structural plastics issues have not changed materially in the last twenty years, and optimizing plastics use, recycling, and disposal in California will require a significant shift in public policies

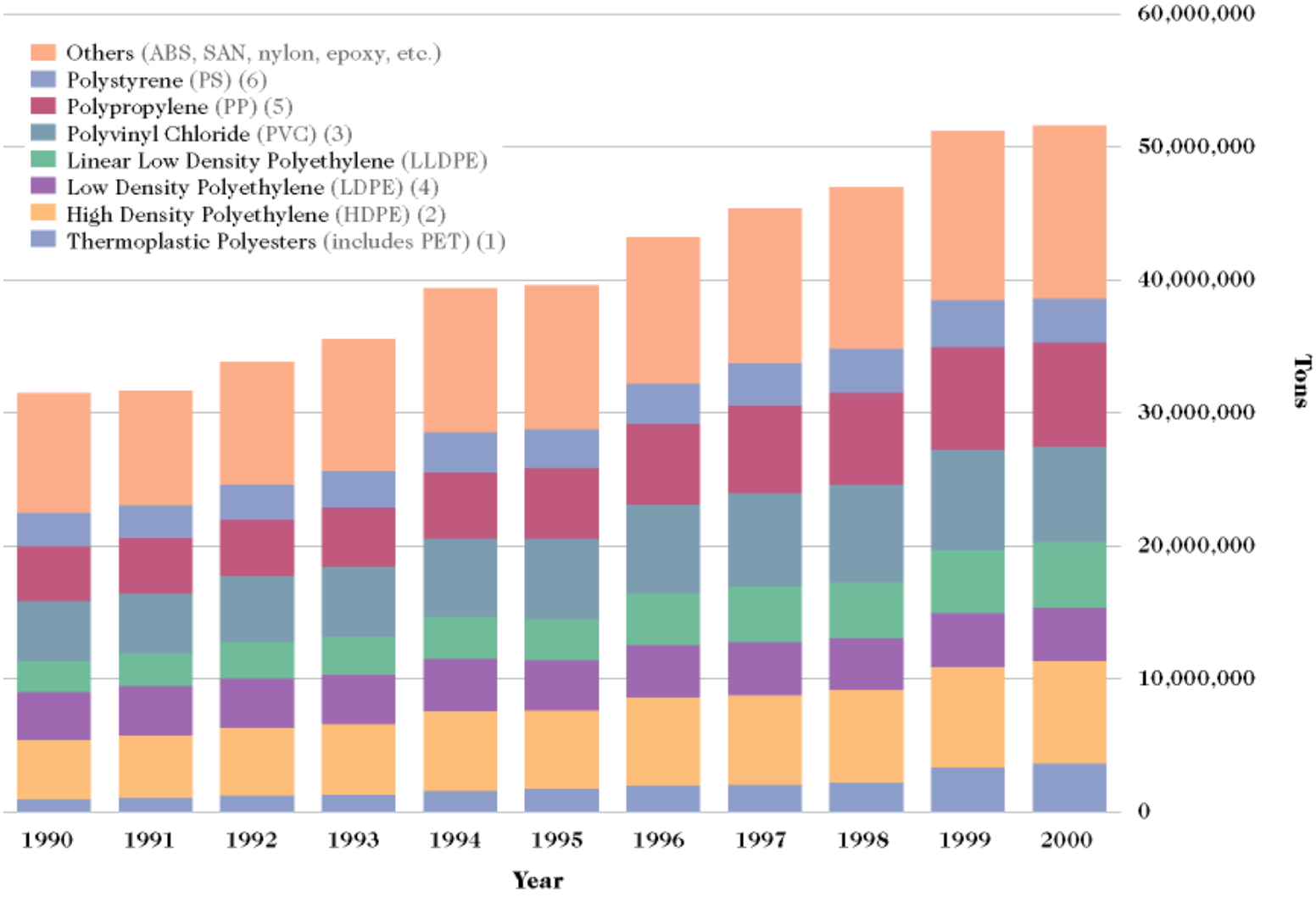
10. These fundamental plastics issues are by their very nature, subtle, long-term, unmet social infrastructure challenges that have not been effectively addressed, partly because they are not as dramatic as some other shorter-term environmental concerns such as automobile tires, waste oil, batteries, or hazardous waste, nonetheless, plastics need to be addressed before they create a crisis

Plastics Production Data

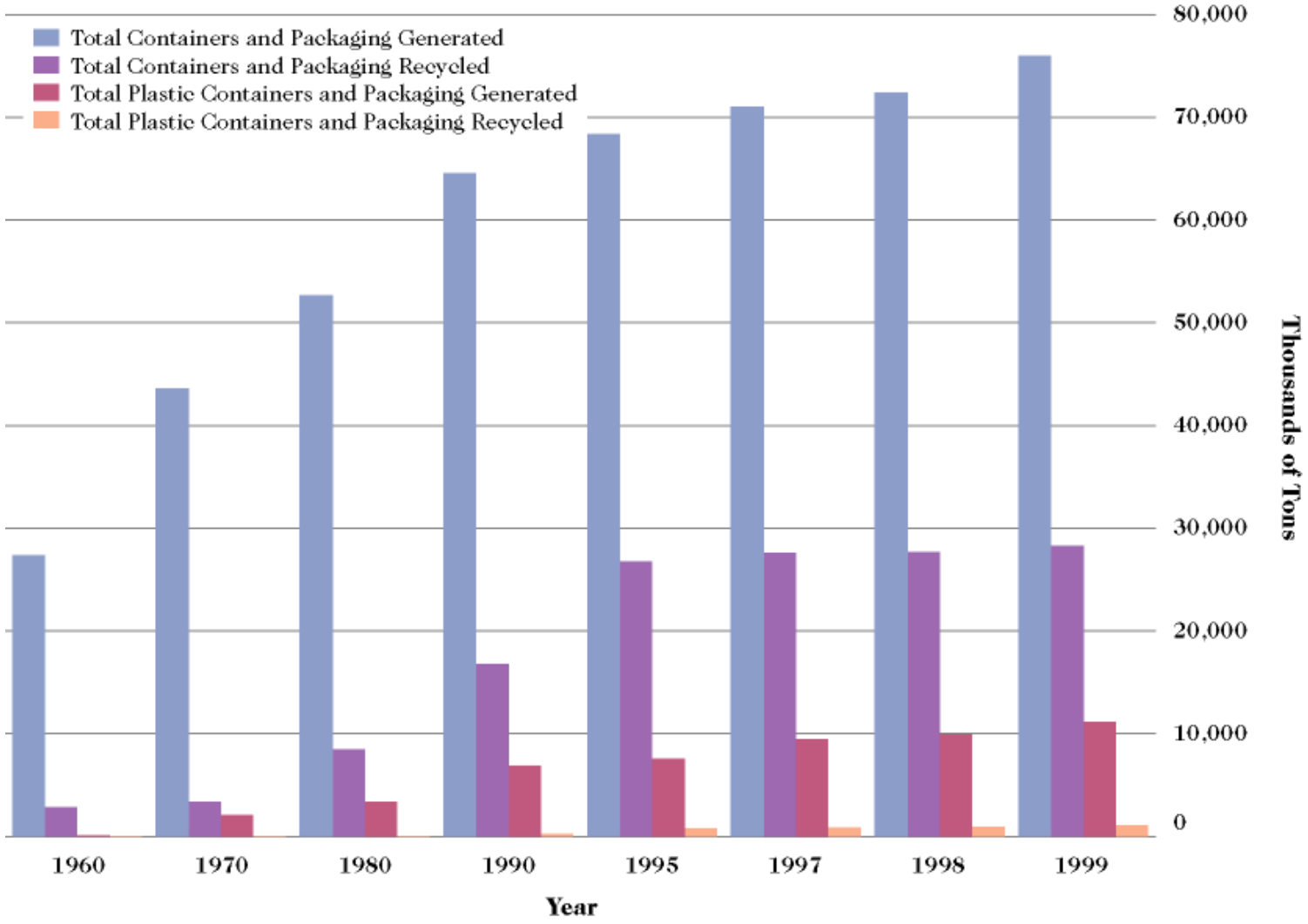
Sources:

1. U.S. Environmental Protection Agency. Municipal Solid Waste in the United States 1999. Prepared for the US EPA by Franklin Associates, Ltd. Washington DC, 2000.
5. American Plastics Council. The Resin Review 2000 Edition. APC, Washington D.C.: 2001.
6. "Plastics Industry Statistics: Year in Review". American Plastics Council: www.americanplasticscouncil.org/benefits/economic/00/pips_00_year_review.html, April 2002.
7. American Plastics Council. 2000 National Post-Consumer Plastics Recycling Report. Prepared for APC by R.W. Beck. Washington D.C., 2001.

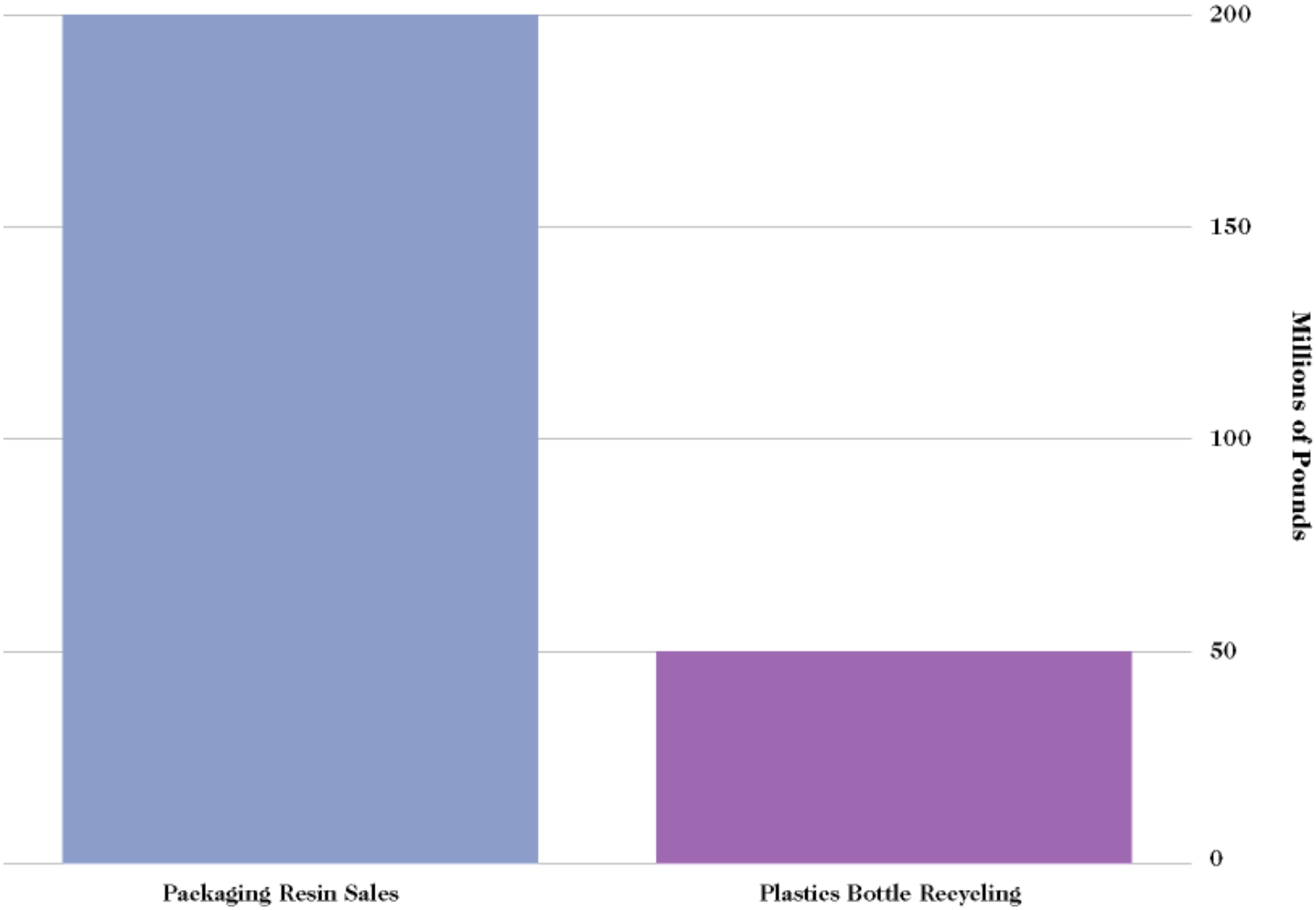
U.S. Total Plastics Resin Sales and Captive Use



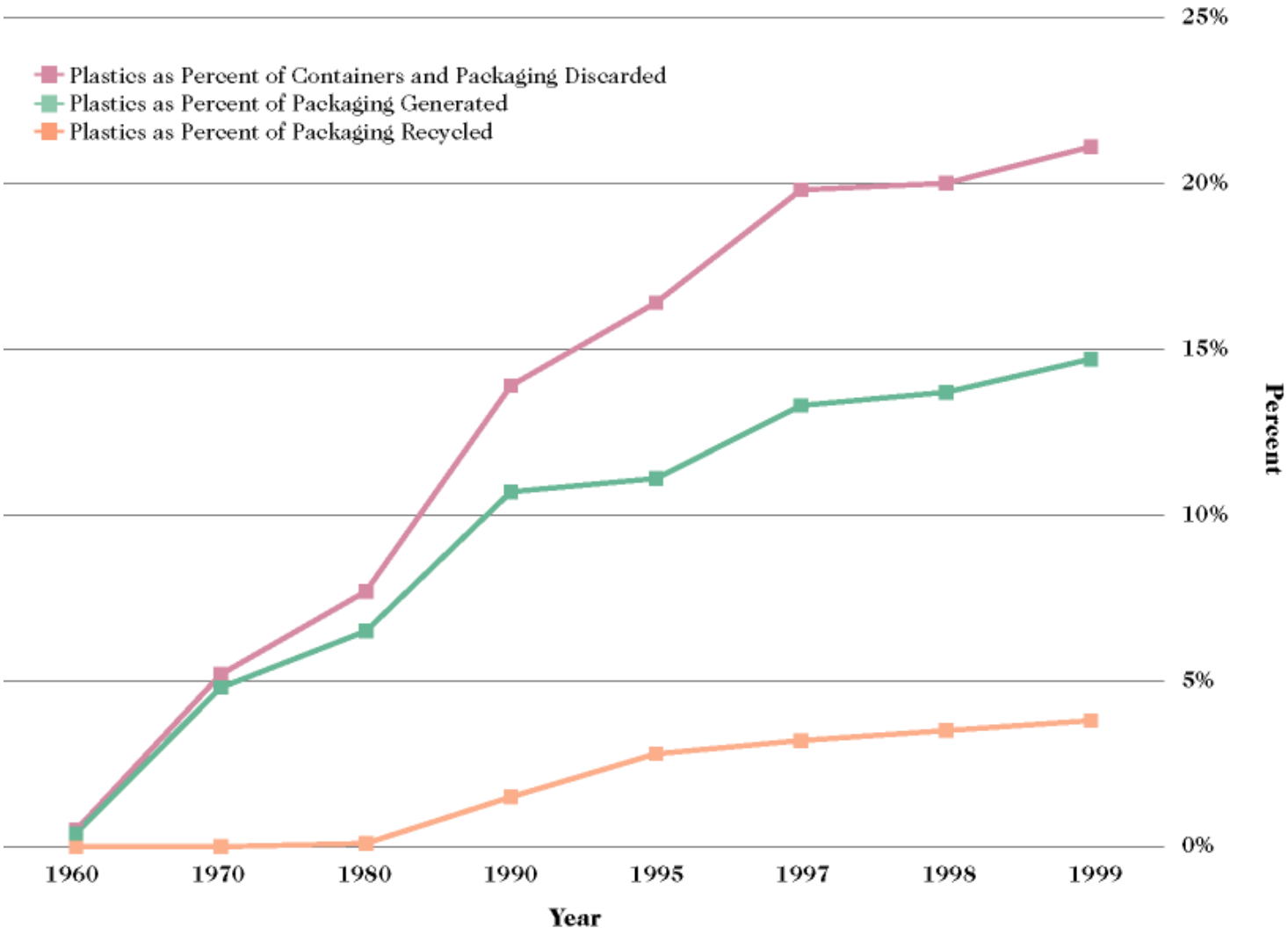
U.S. Containers and Packaging Generation and Recovery, Total and Plastics



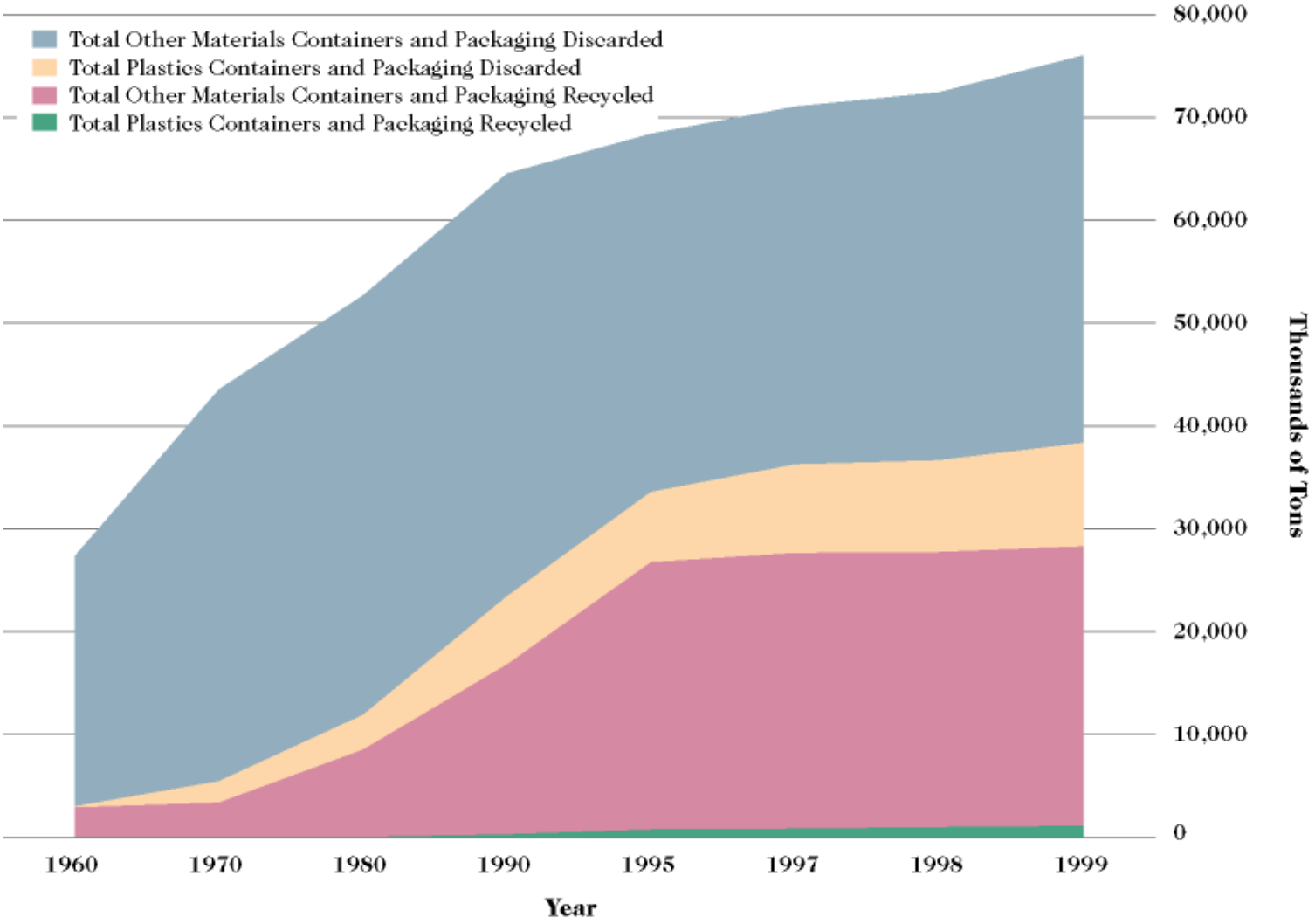
U.S. Typical Annual Increase in Plastics Packaging Sales and Recycling



U.S. Plastics and Packaging in the Wastestream



U.S. Containers and Packaging Discarded and Recycled



Plastics Recycling Data

Sources:

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7. American Plastics Council. 2000 National Post-Consumer Plastics Recycling Report. Prepared for APC by R.W. Beck. Washington D.C., 2001.
8. National Association for PET Container Resources (NAPCOR). 2000 Report on Post Consumer PET Container Recycling. NAPCOR, North Carolina: 2001.
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10. DOC. "Biannual Report of Beverage Container Sales, Return, Redemption & Recycling Rates". DOC, Sacramento, CA: December 18, 2001.
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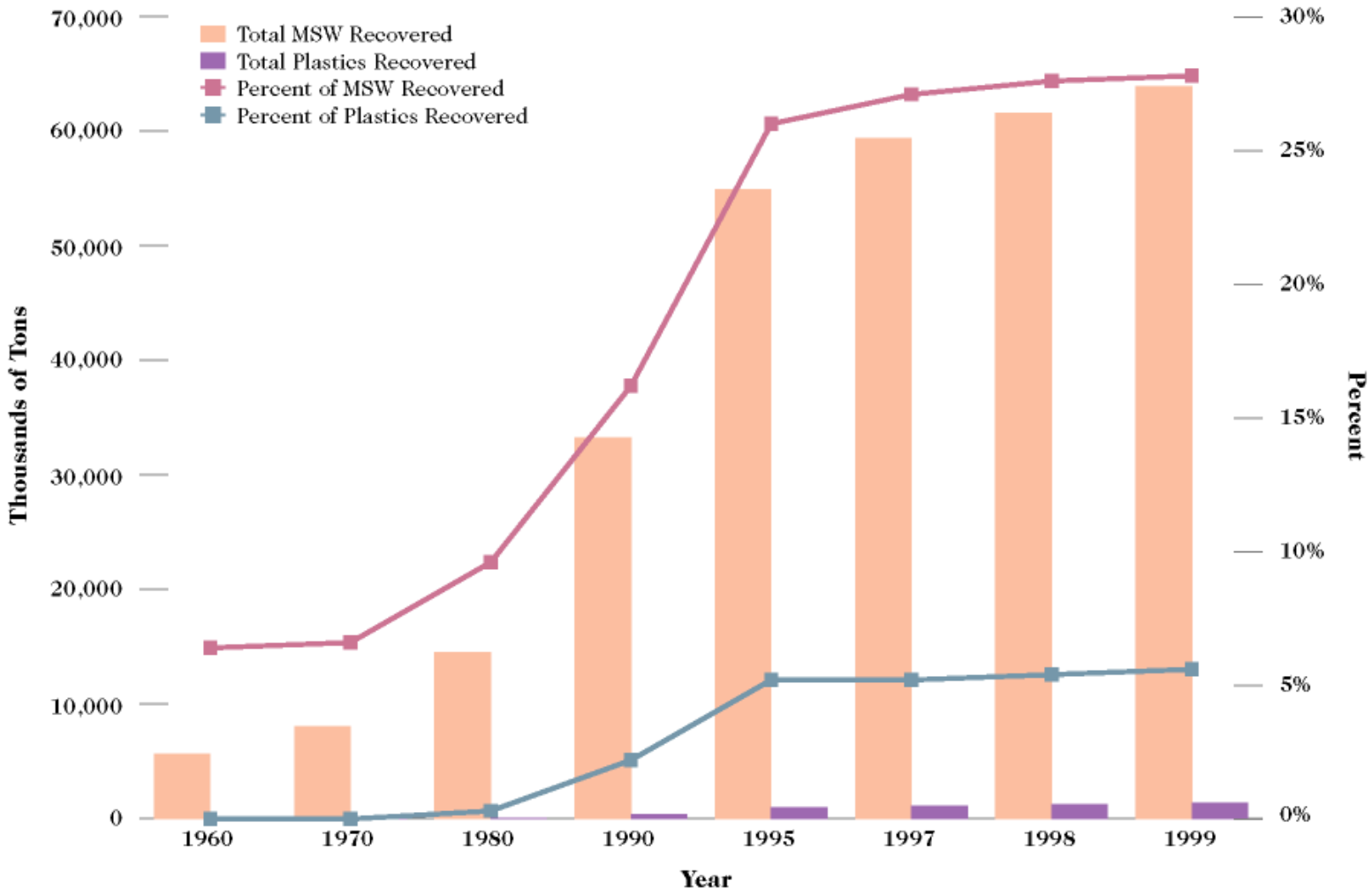
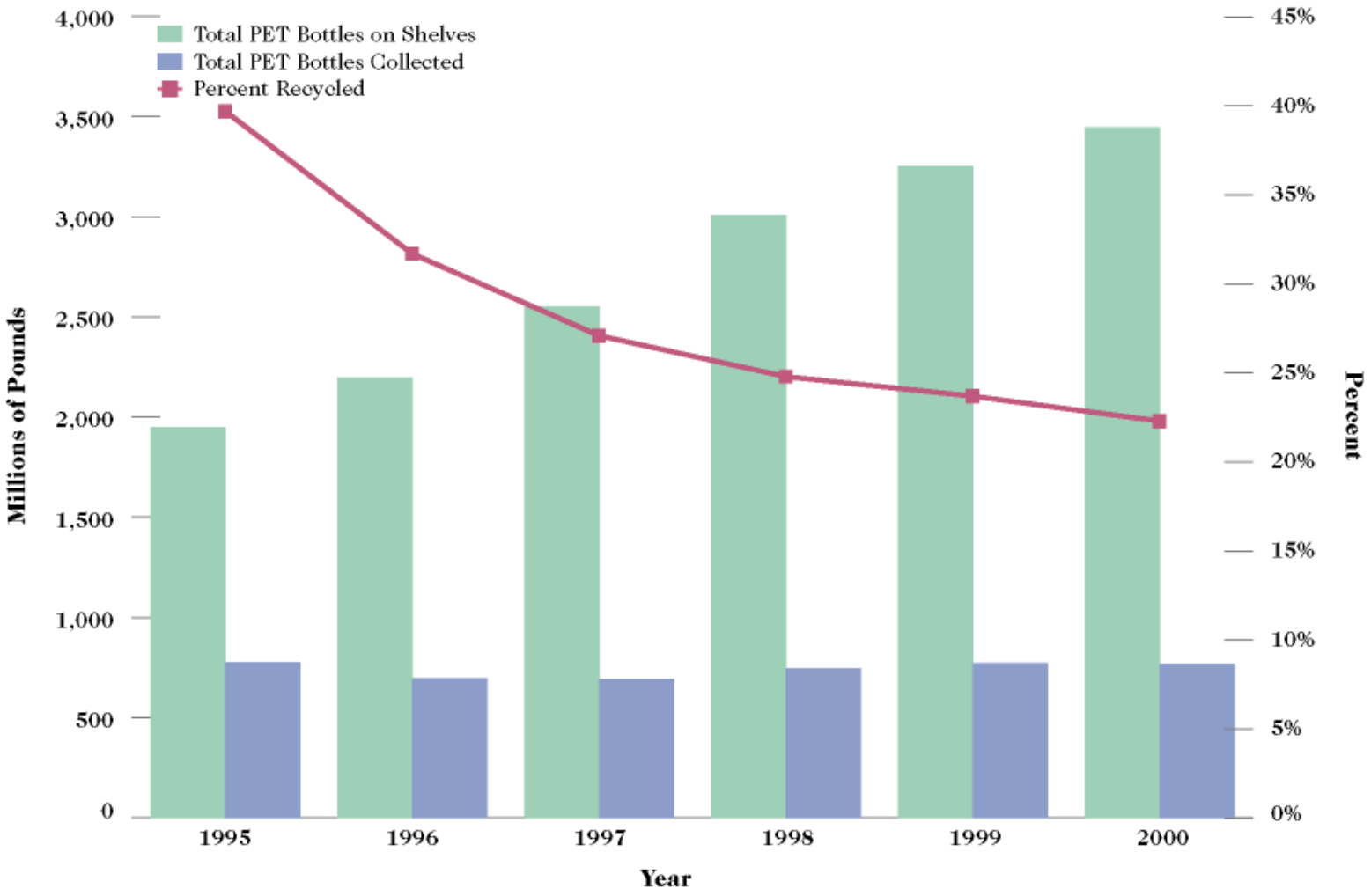
U.S. Plastics and MSW Recovery in the United States

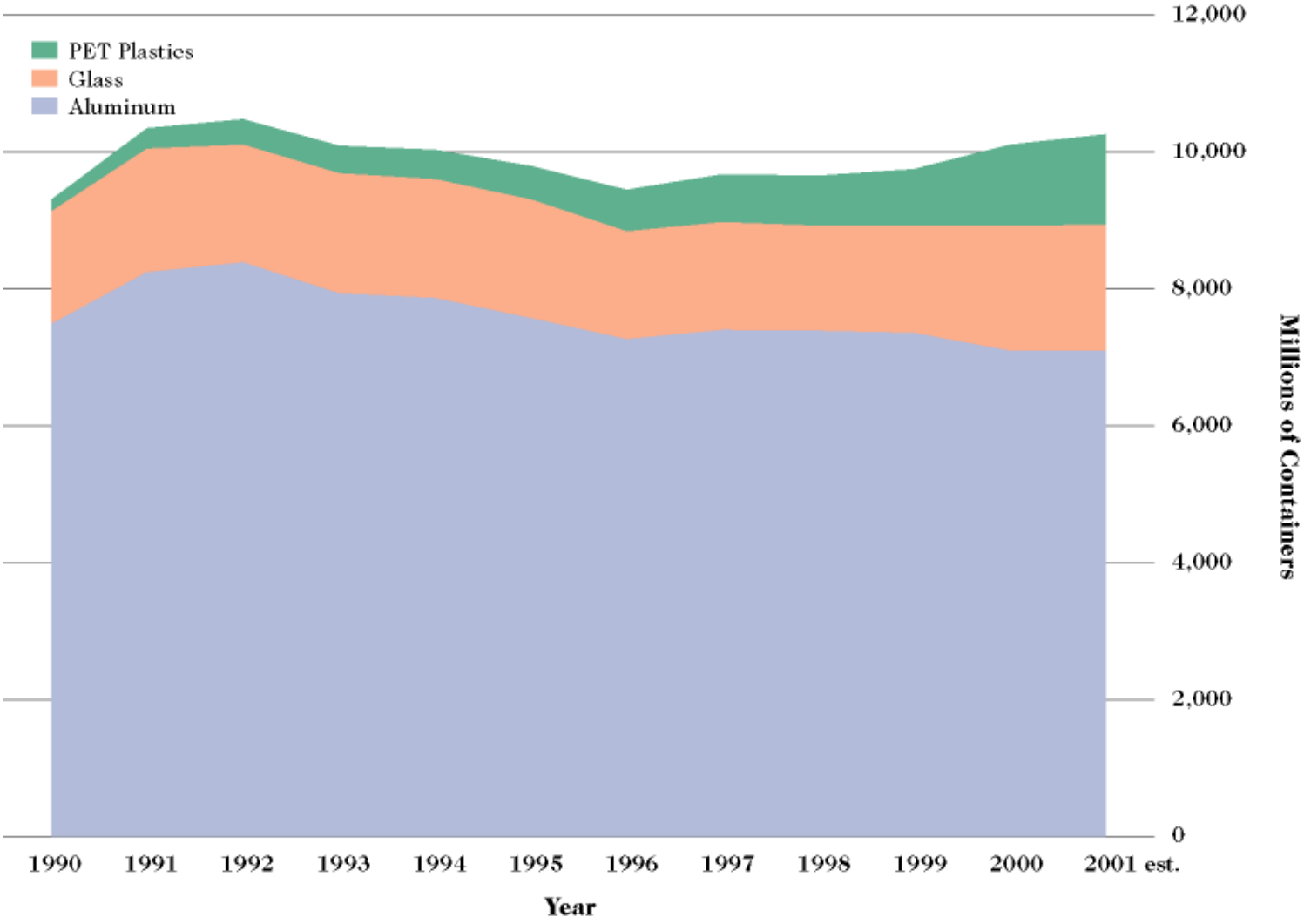


U.S. All PET Bottles Sold and Recycled

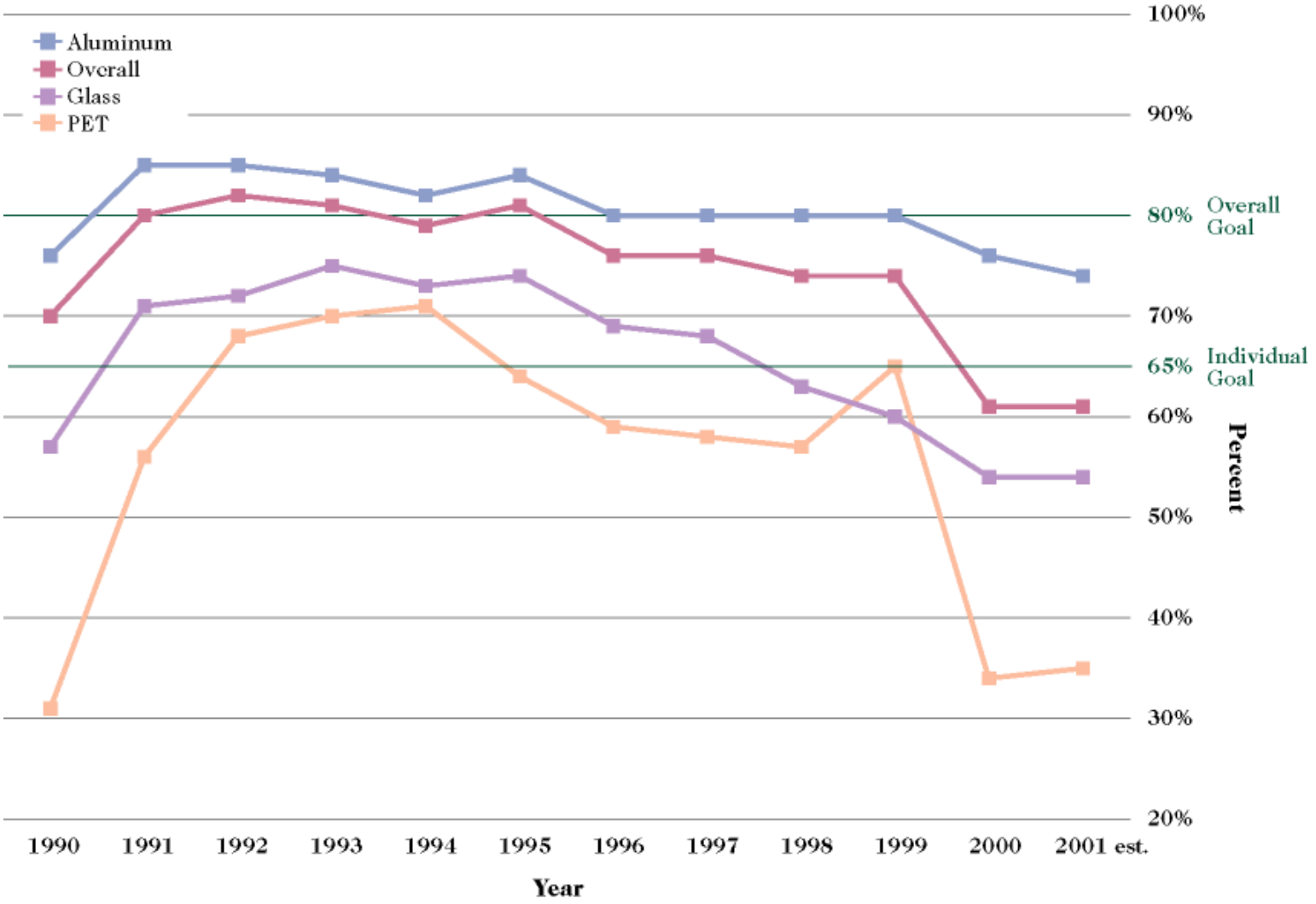


U.S. Soda PET Bottles Sold and Recycled

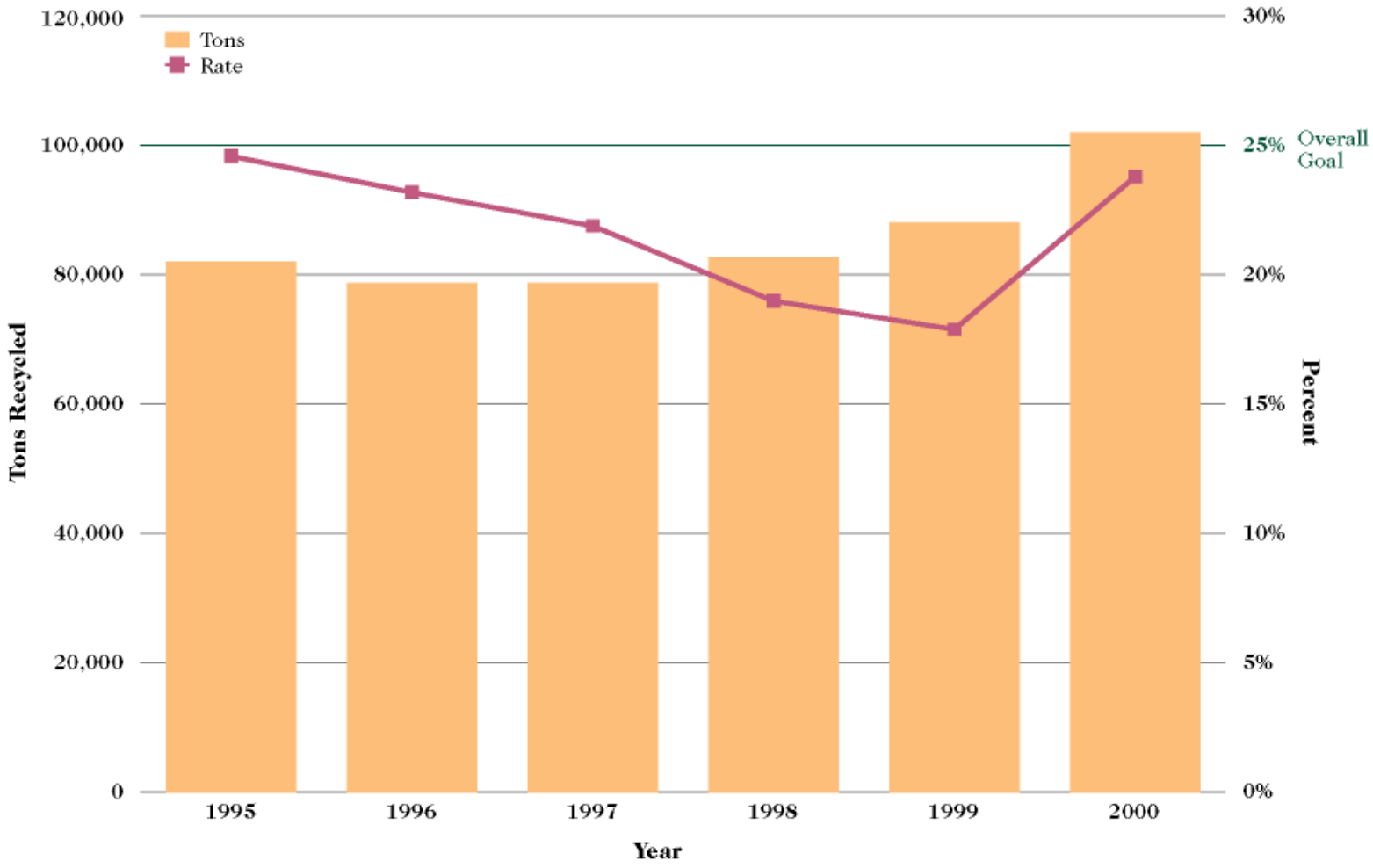
California Beverage Containers Recycled



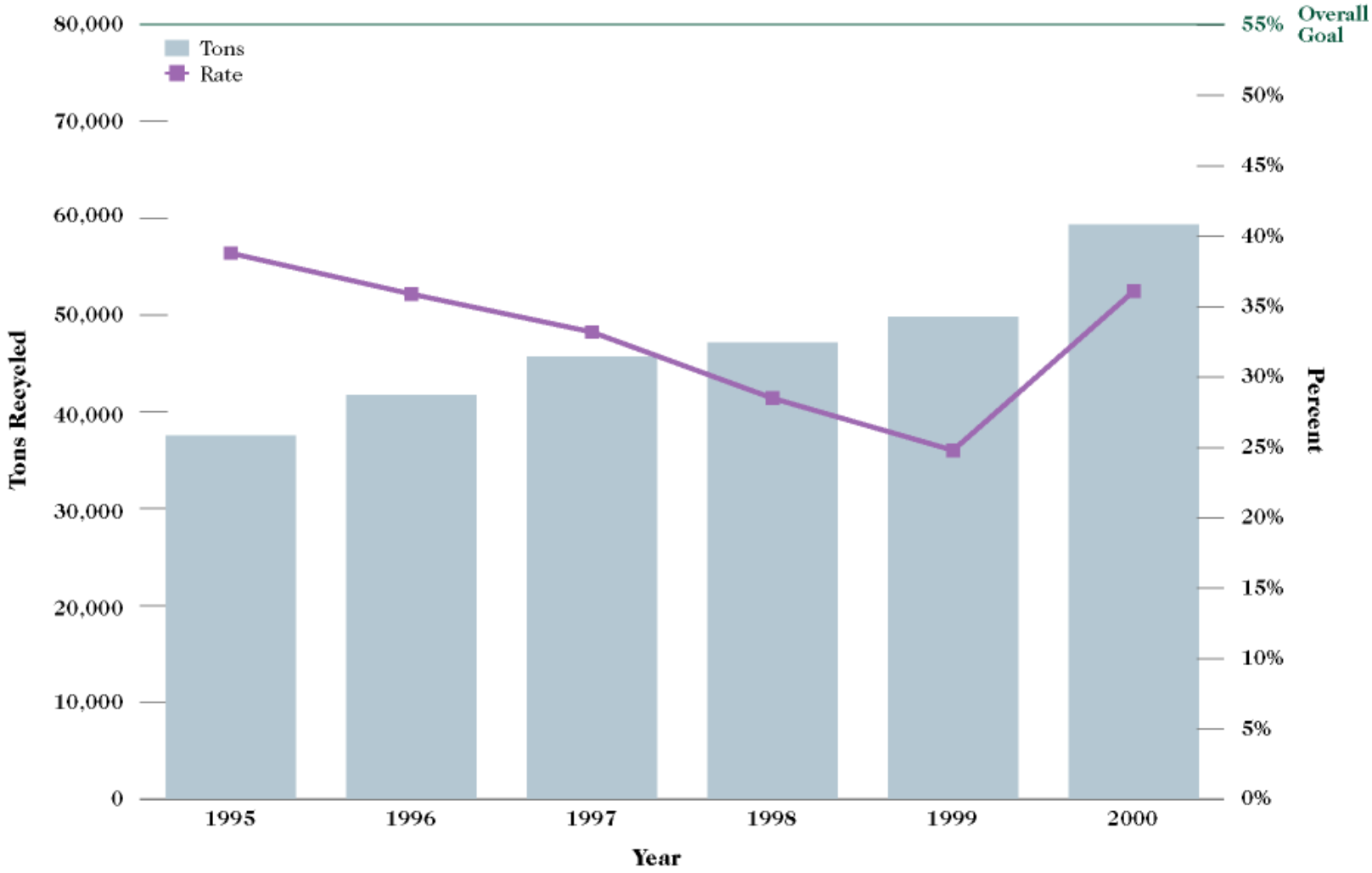
California Beverage Container Recycling Rates



California Rigid Plastic Packaging Containers Tons and Recycling Rates



California All PET Recycling Tons and Rates (RPPC)



Plastics MSW Generation and Discard Data

Sources:

1. U.S. Environmental Protection Agency. Municipal Solid Waste in the United States 1999. Prepared for the US EPA by Franklin Associates, Ltd. Washington DC, 2000.
2. CIWMB. Statewide Waste Characterization Study. Prepared for the CIWMB by Cascadia Consulting Group. Sacramento, December 1999.
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5. American Plastics Council. The Resin Review 2000 Edition. APC, Washington D.C.: 2001.
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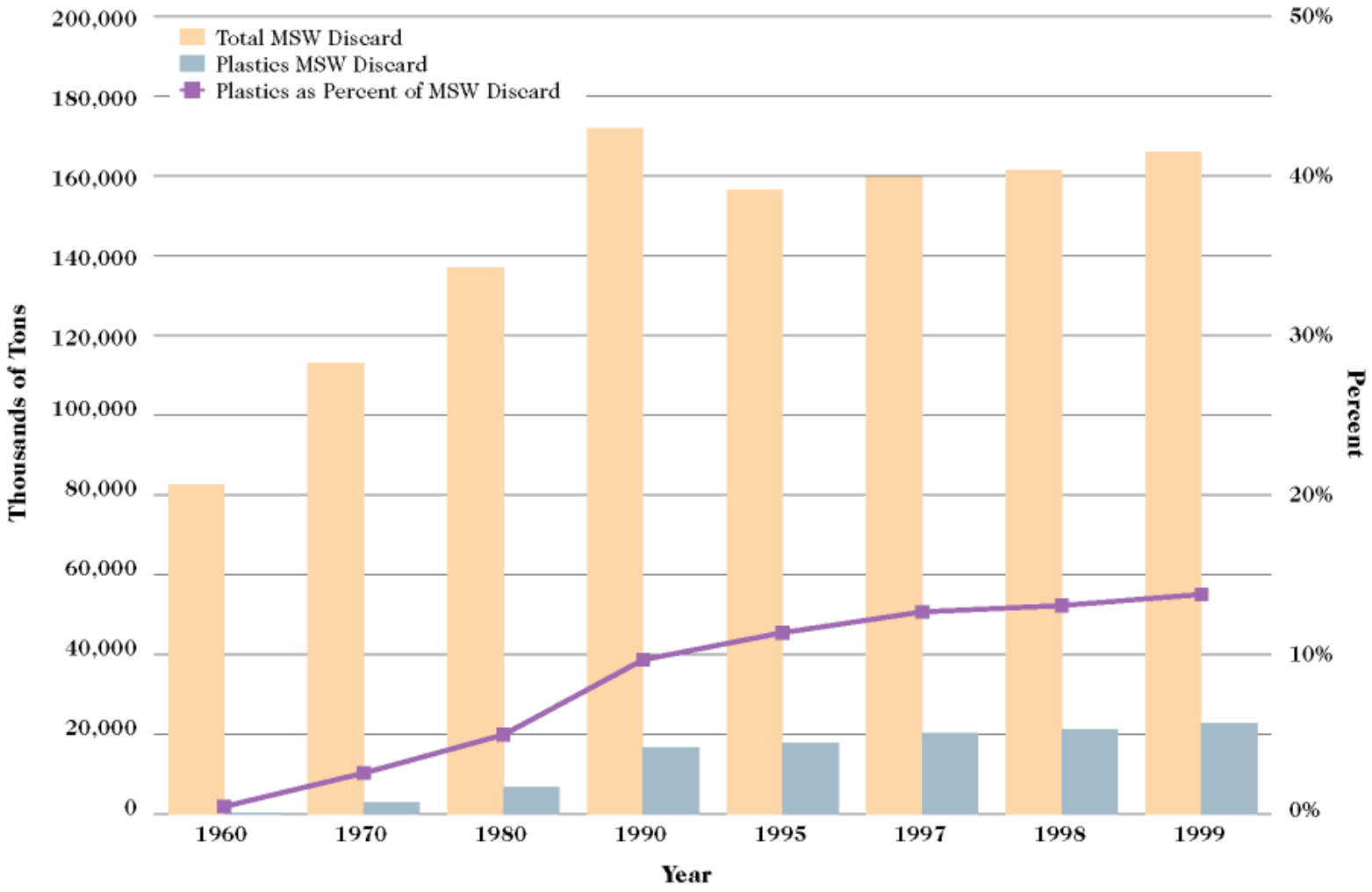
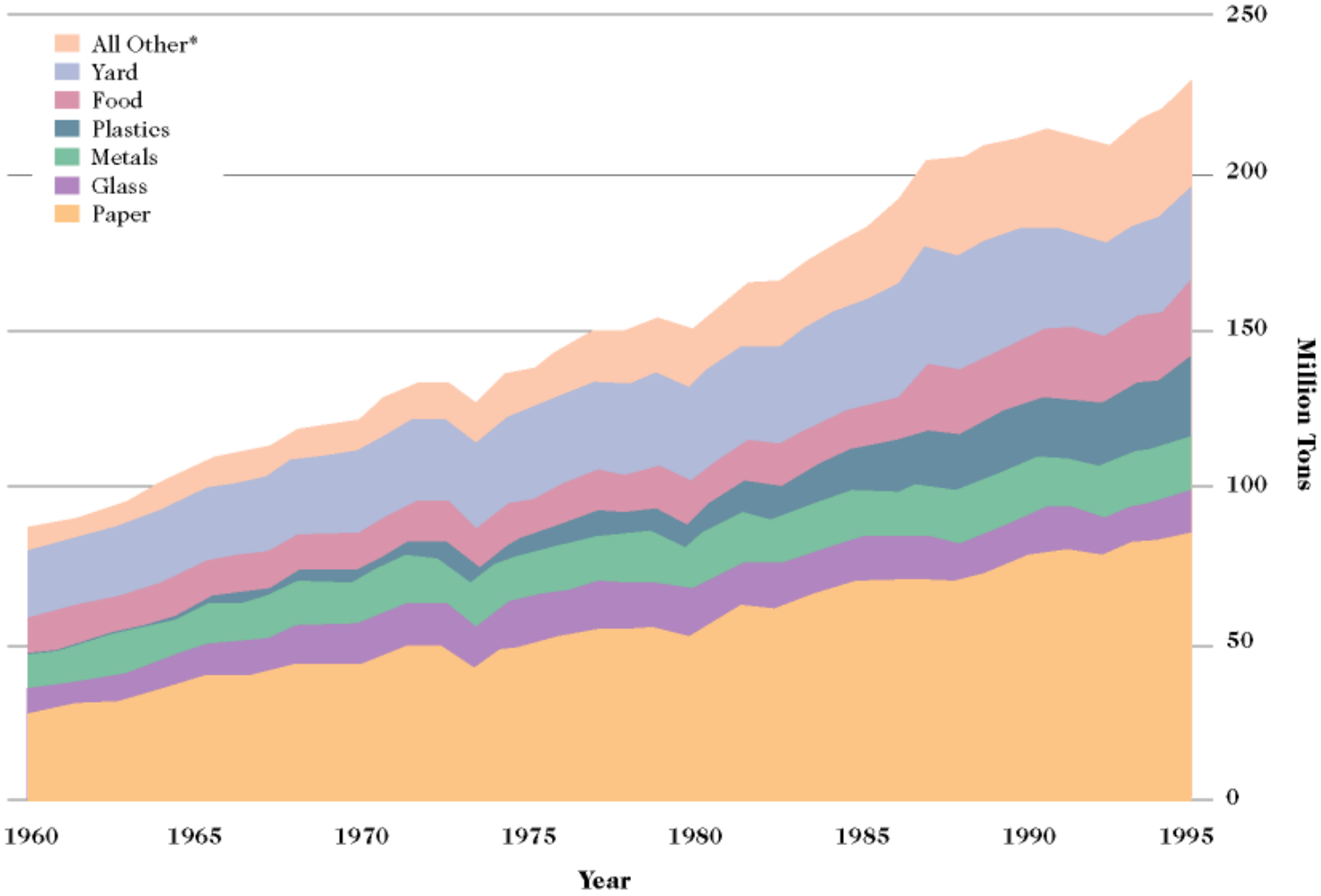
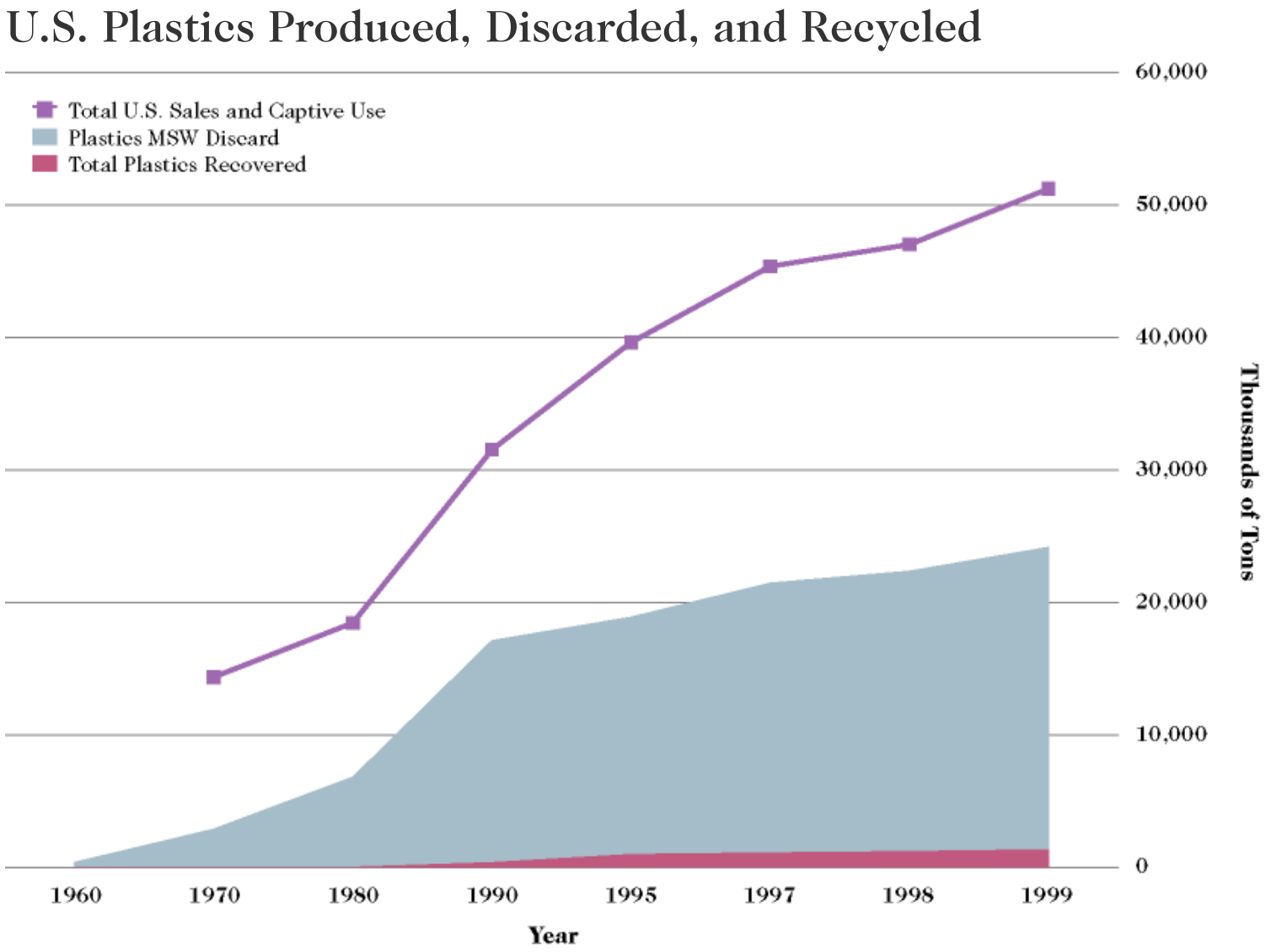
U.S. Plastics in MSW Discard



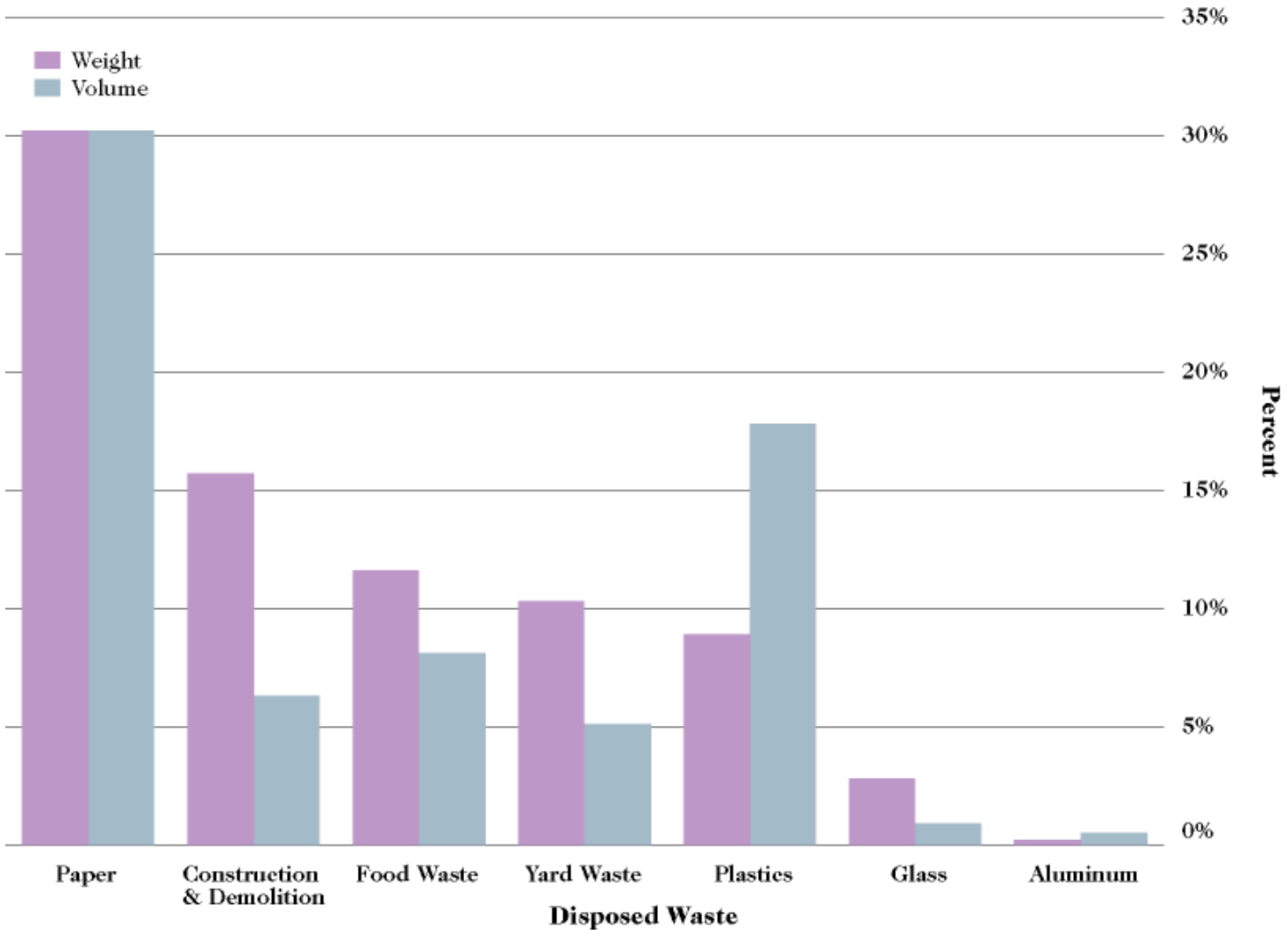
U.S. Generation of Materials in MSW, 1960 to 1999



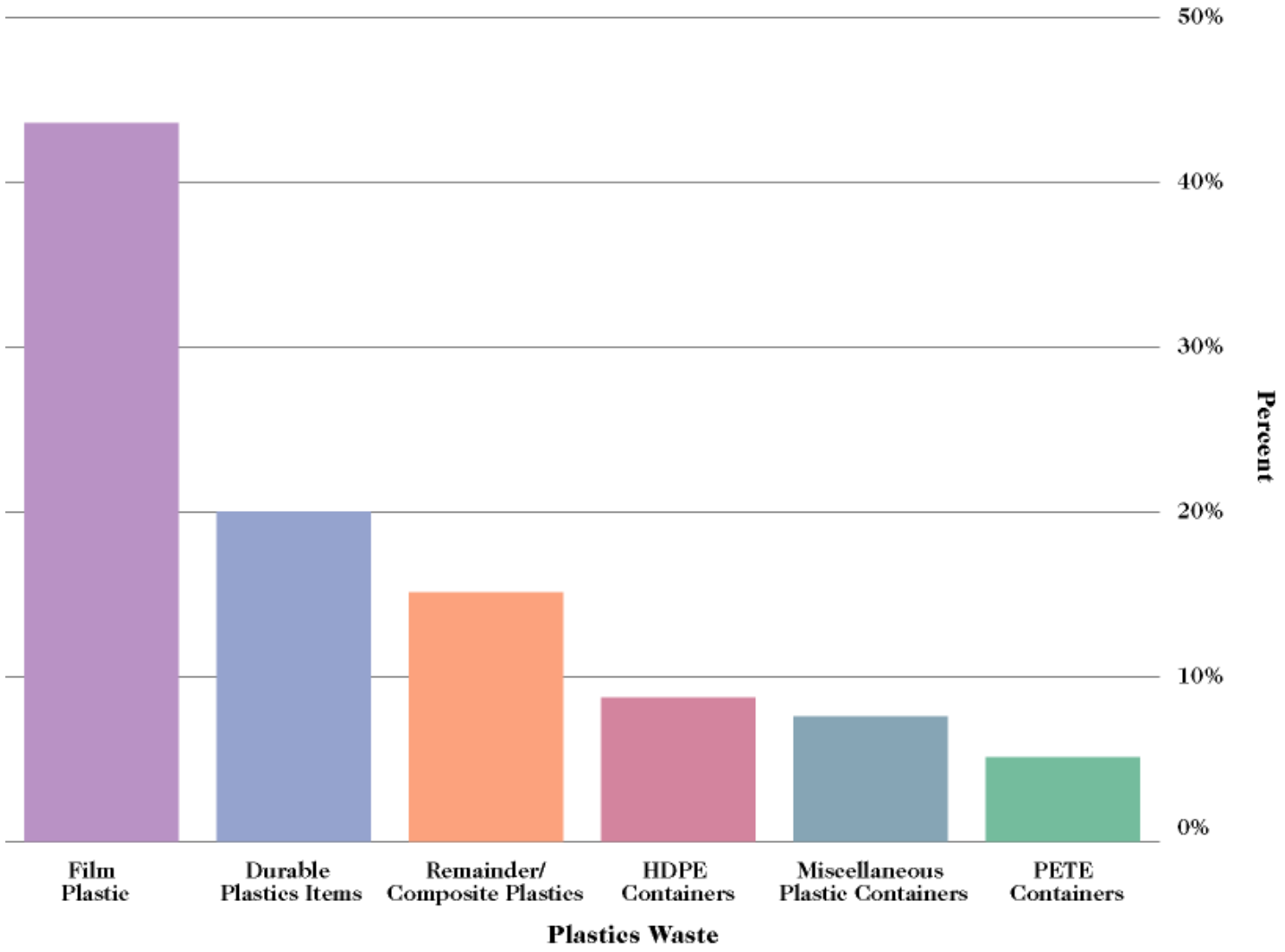
** All other includes primarily wood, rubber and leather, and textiles.*


U.S. Plastics Produced, Discarded, and Recycled
Total U.S. Sales and Captive Use
Plastics MSW Discard
Total Plastics Recovered
60,000
50,000
40,000
30,000
20,000
10,000
0
Thousands of Tons
1960
1970
1980
1990
1995
1997
1998
1999
Year

California 1999 Waste Disposed – Percent of Wastestream



California Plastics Waste in 1998 – Percent of Plastics



Plastics-Status versus Other Secondary Material Types

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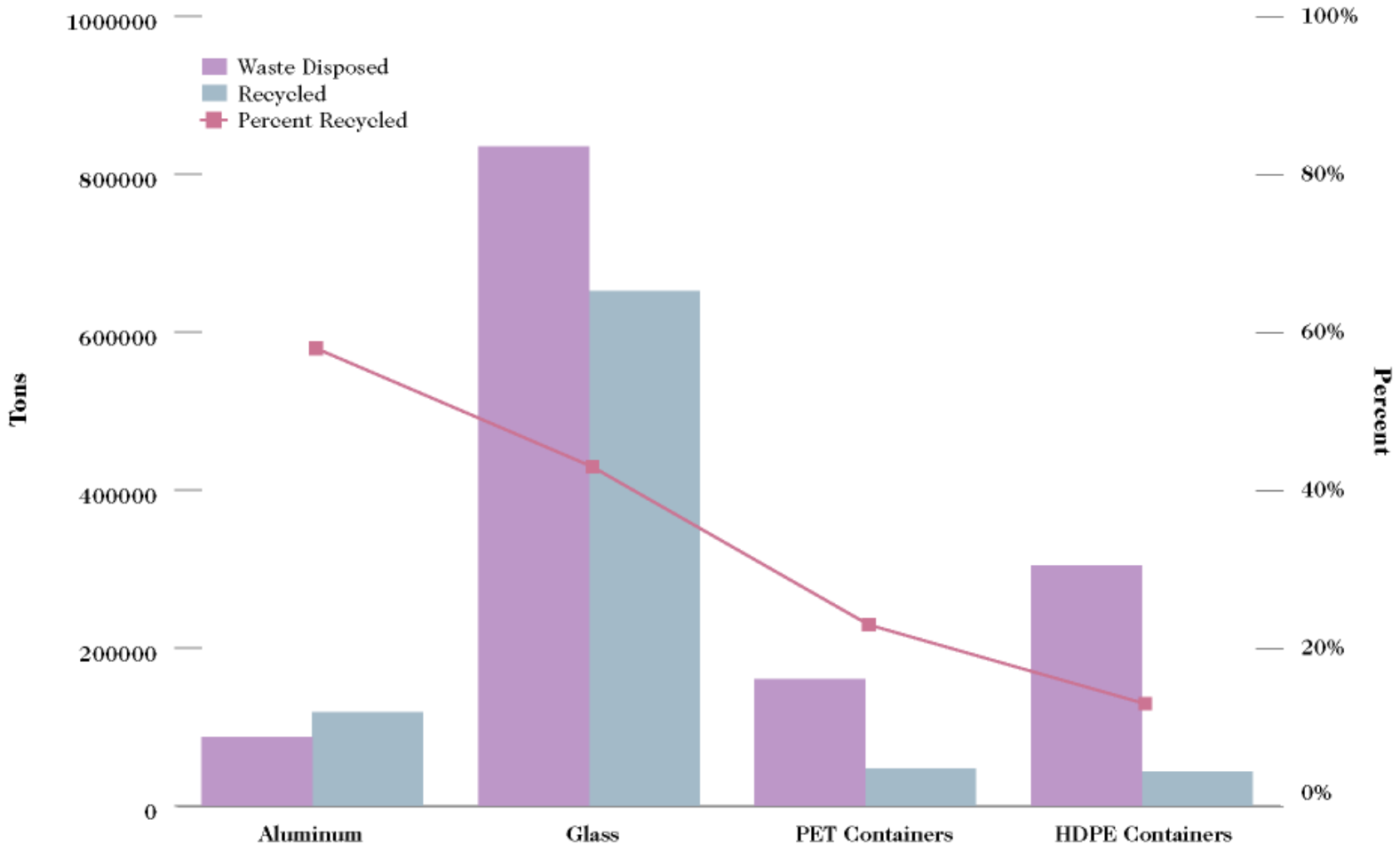
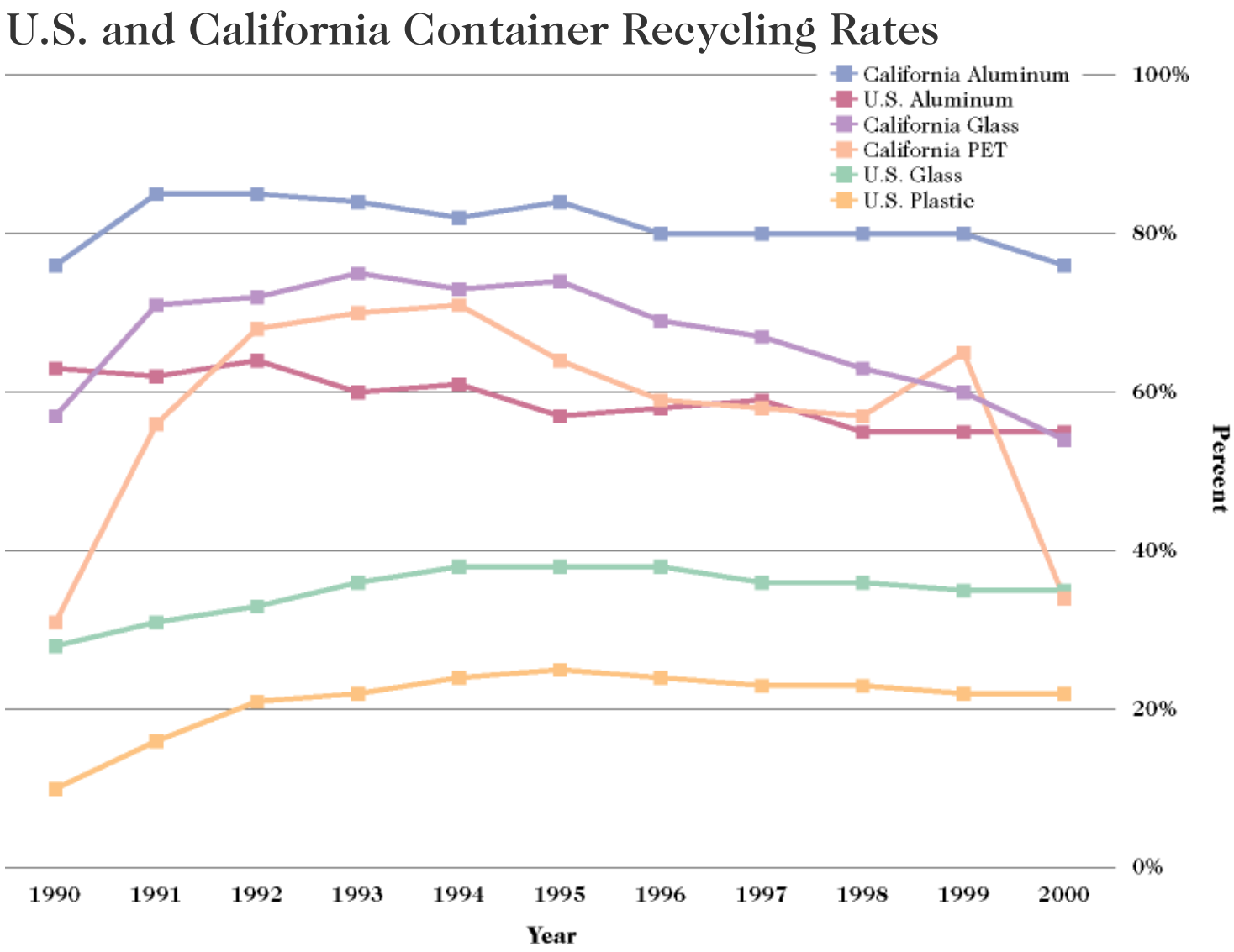
California Container Disposal and Recycling (2000)

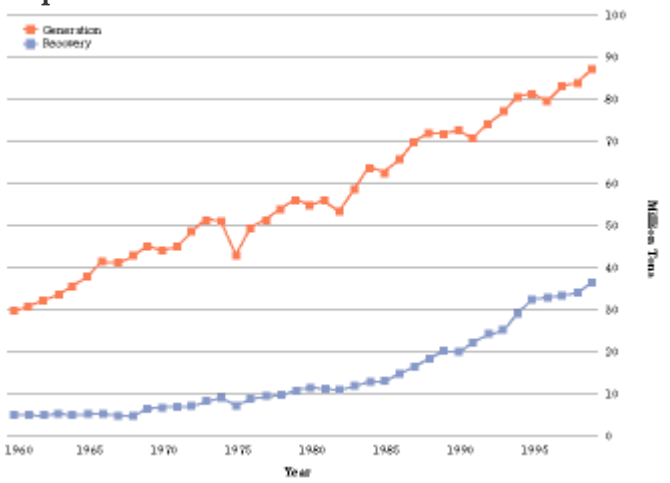


Plastics-Status versus Other Secondary Material Types
(continued)

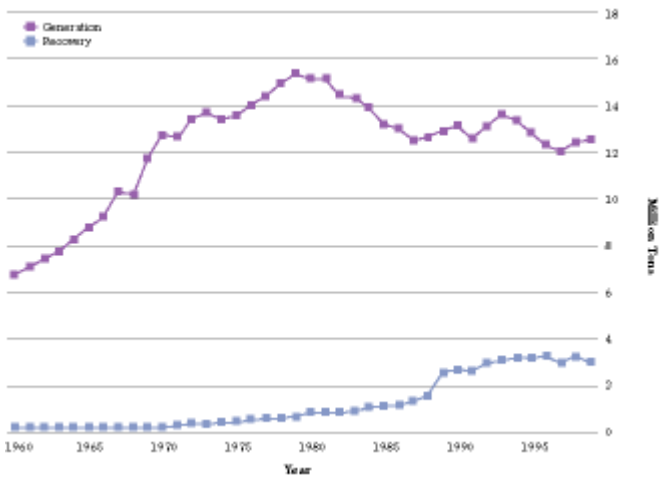


U.S. Generation and Recovery, 1960 to 1999

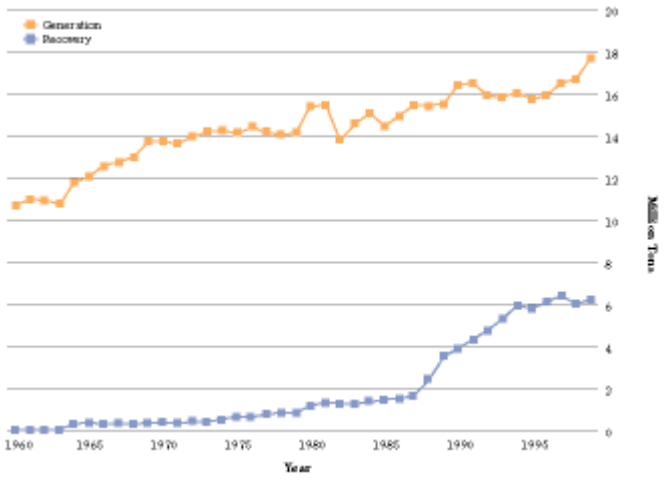
Paper



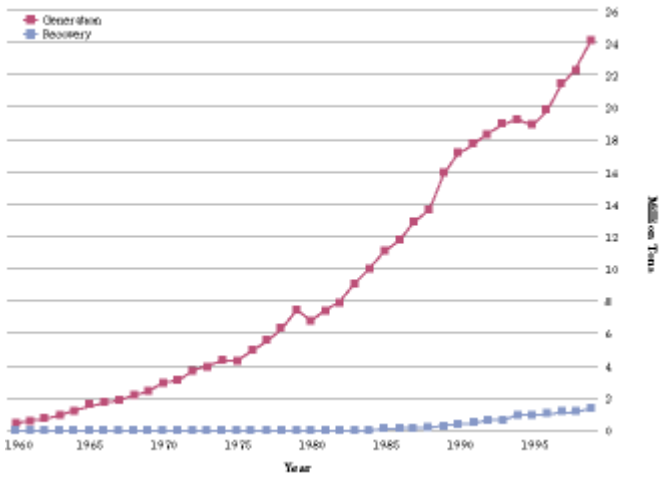
Glass



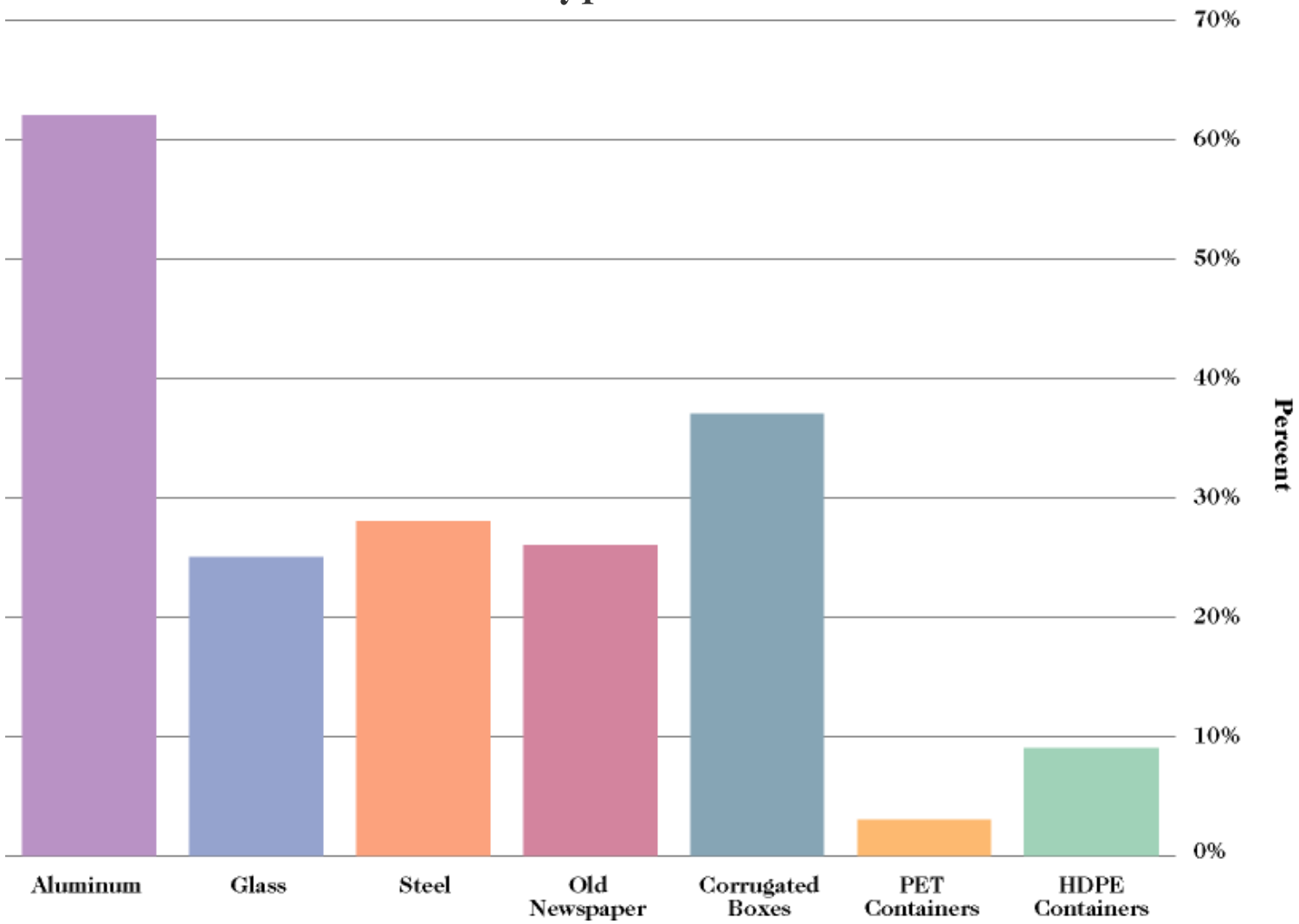
Metals



Plastics



U.S. Average Recycled Content Levels of Materials and Container Types



Plastics Collection, Markets, and Market Development

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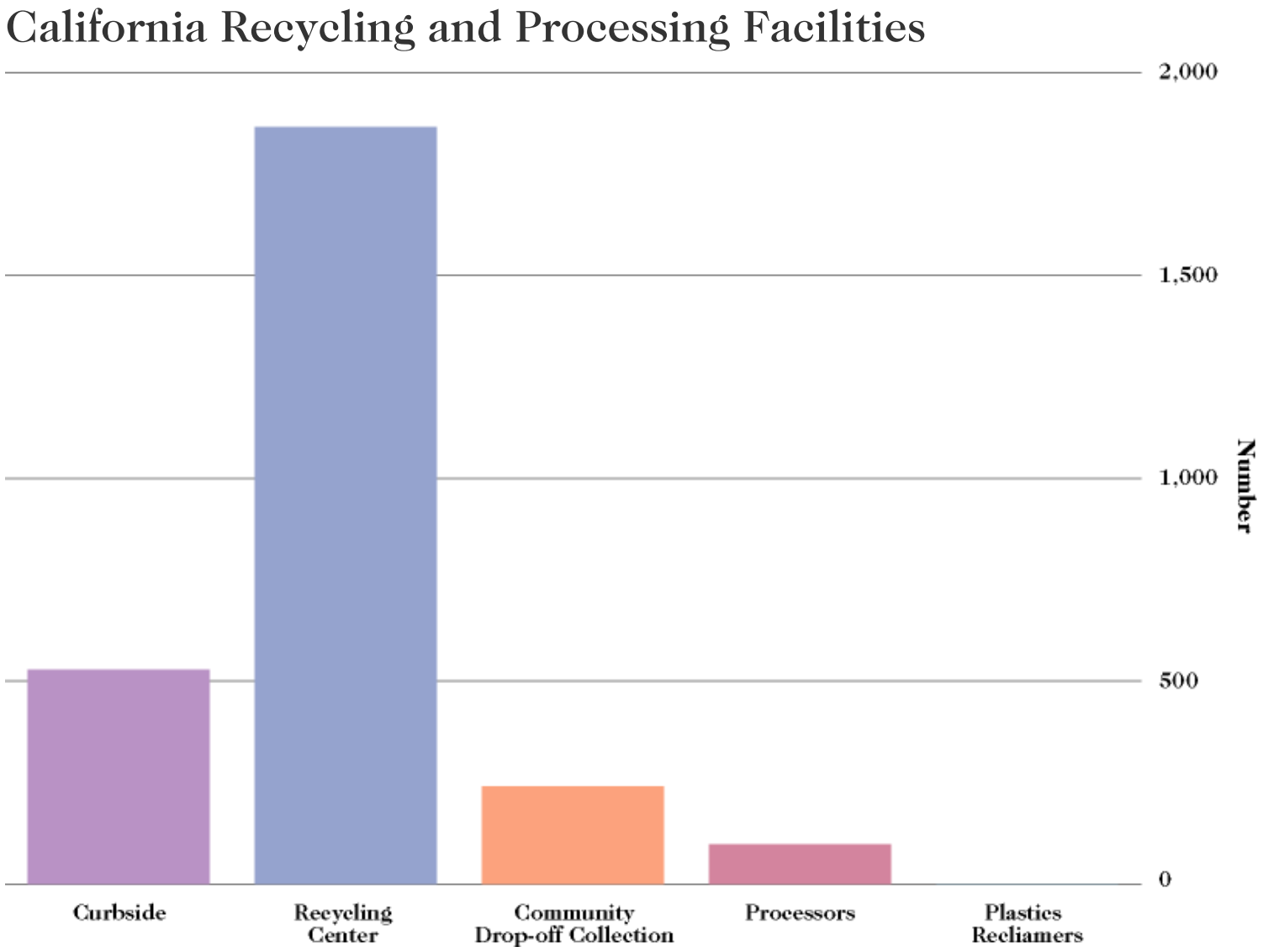
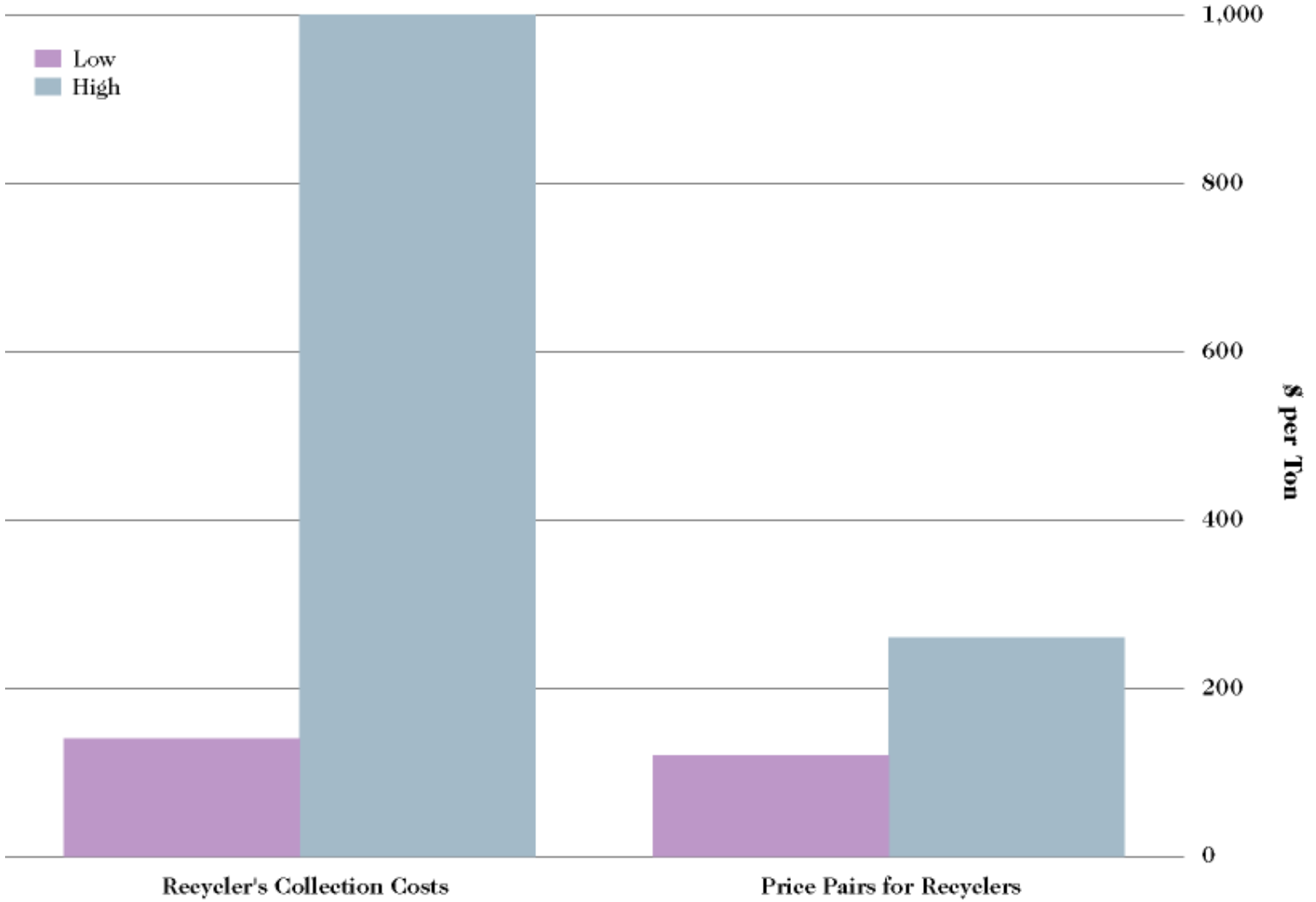
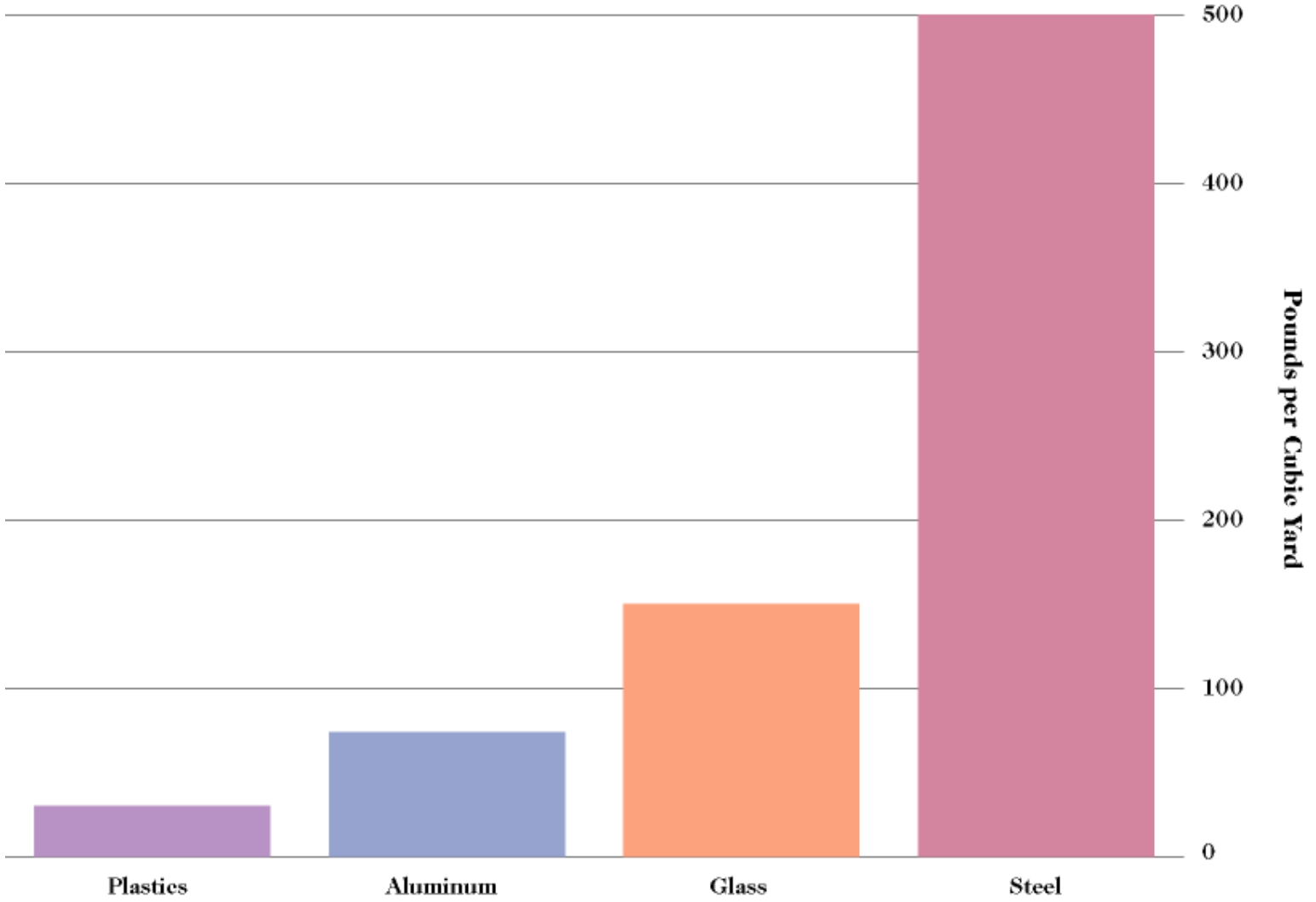

California Recycling and Processing Facilities
2,000
1,500
1,000
500
0
Number
Curbside
Recycling Center
Community Drop-off Collection
Processors
Plastics Reclaimers

Typical Collection and Recycling Costs and Prices for HDPE and PET



Comparison of Density for Recyclable Materials



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Estimated Time for Various Materials to Biodegrade

Paper	2-5 months
Rope	3-14 months
Orange peels	6 months
Cigarette butts	1-12 years
Plastic coated paper cartons	5 years
Plastic bags	10-20 years
Nylon fabric	30-40 years
Tin cans	50-100 years
Aluminum cans	80-100 years
Plastic 6 pack holder rings	450 years
Plastic bottle	450 plus years
Glass bottle	1 million years

AB 2020: Beverage Container Recycling Legislation

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AB 2020: Beverage Container Recycling Legislation
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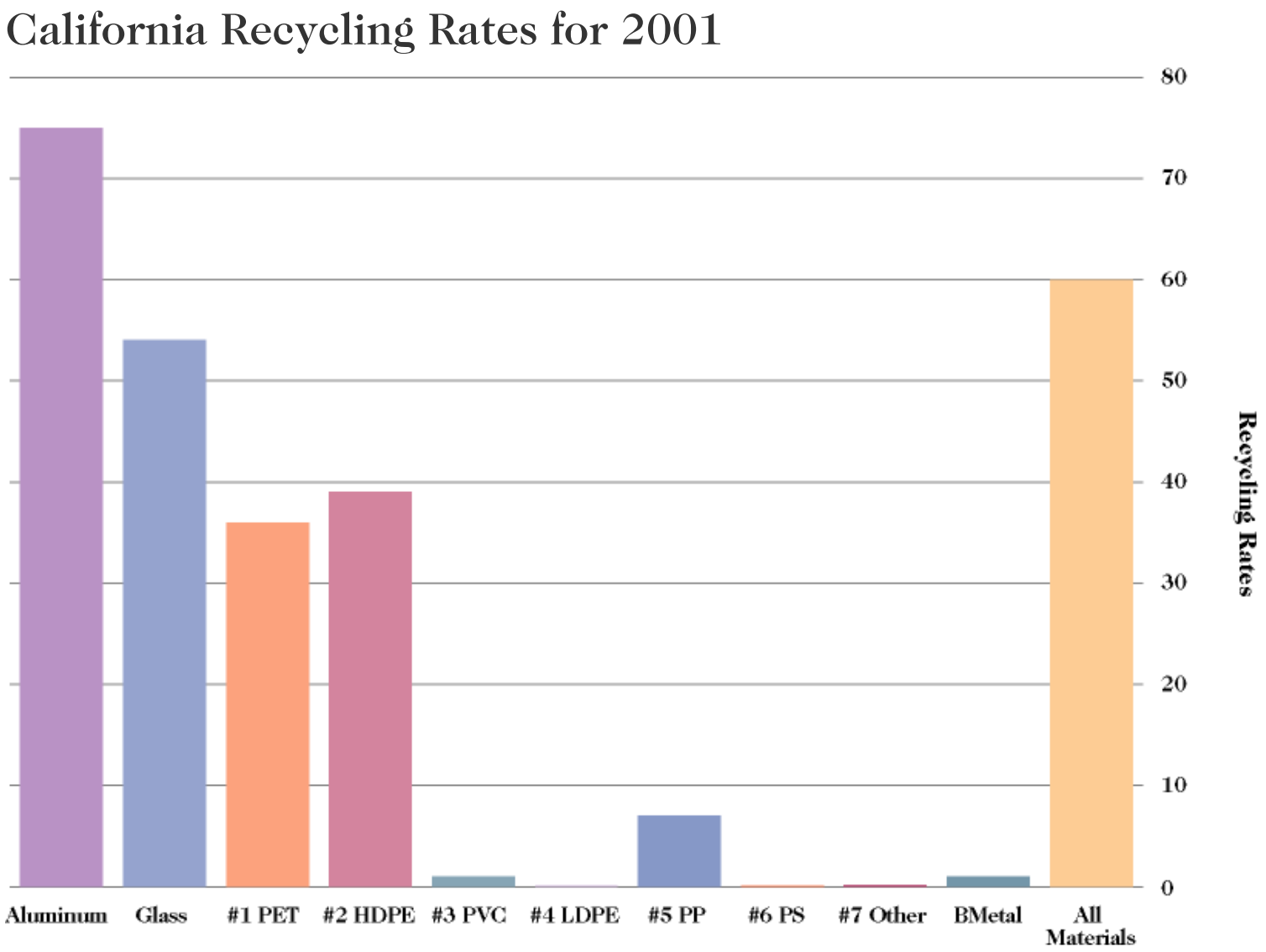
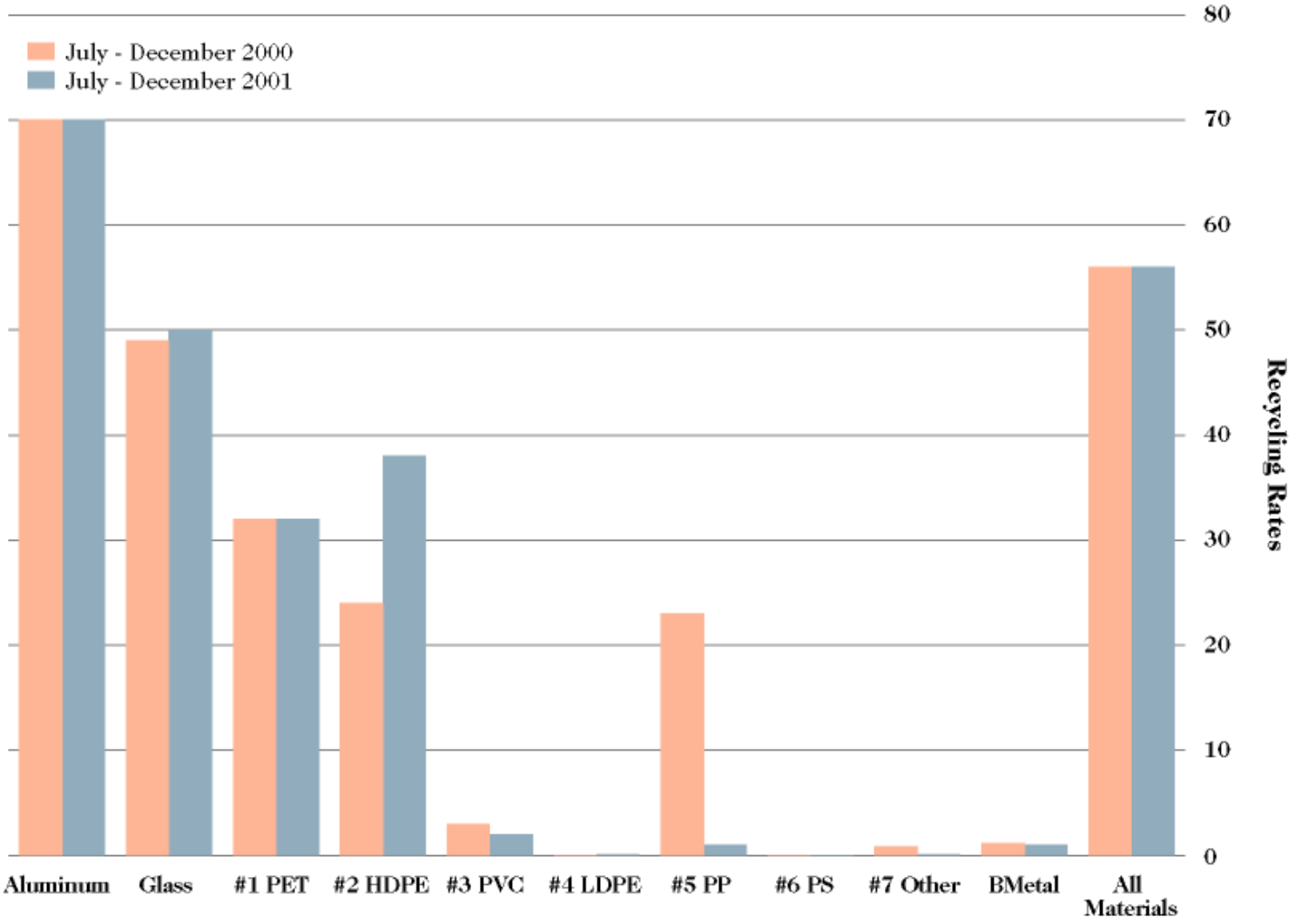
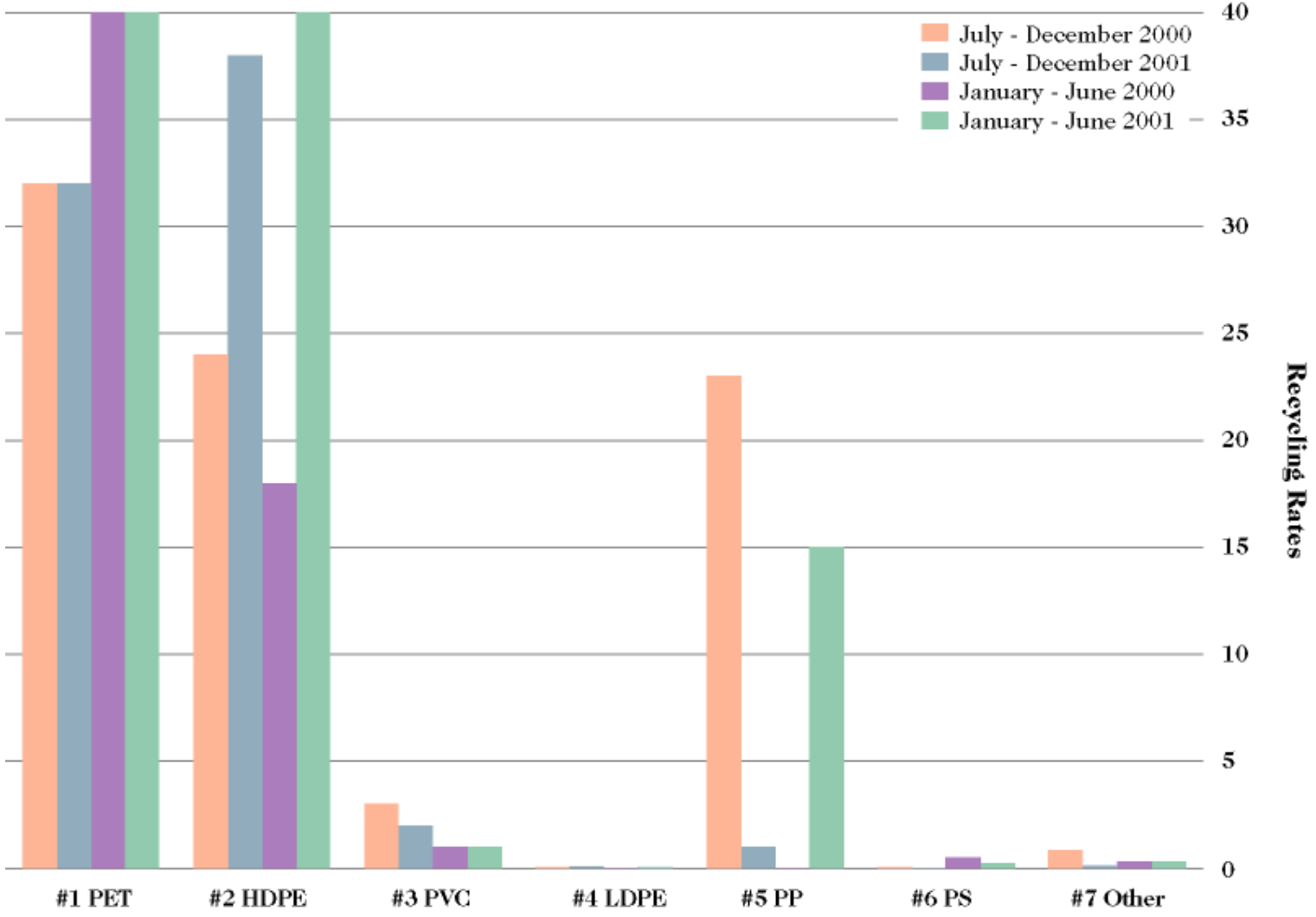


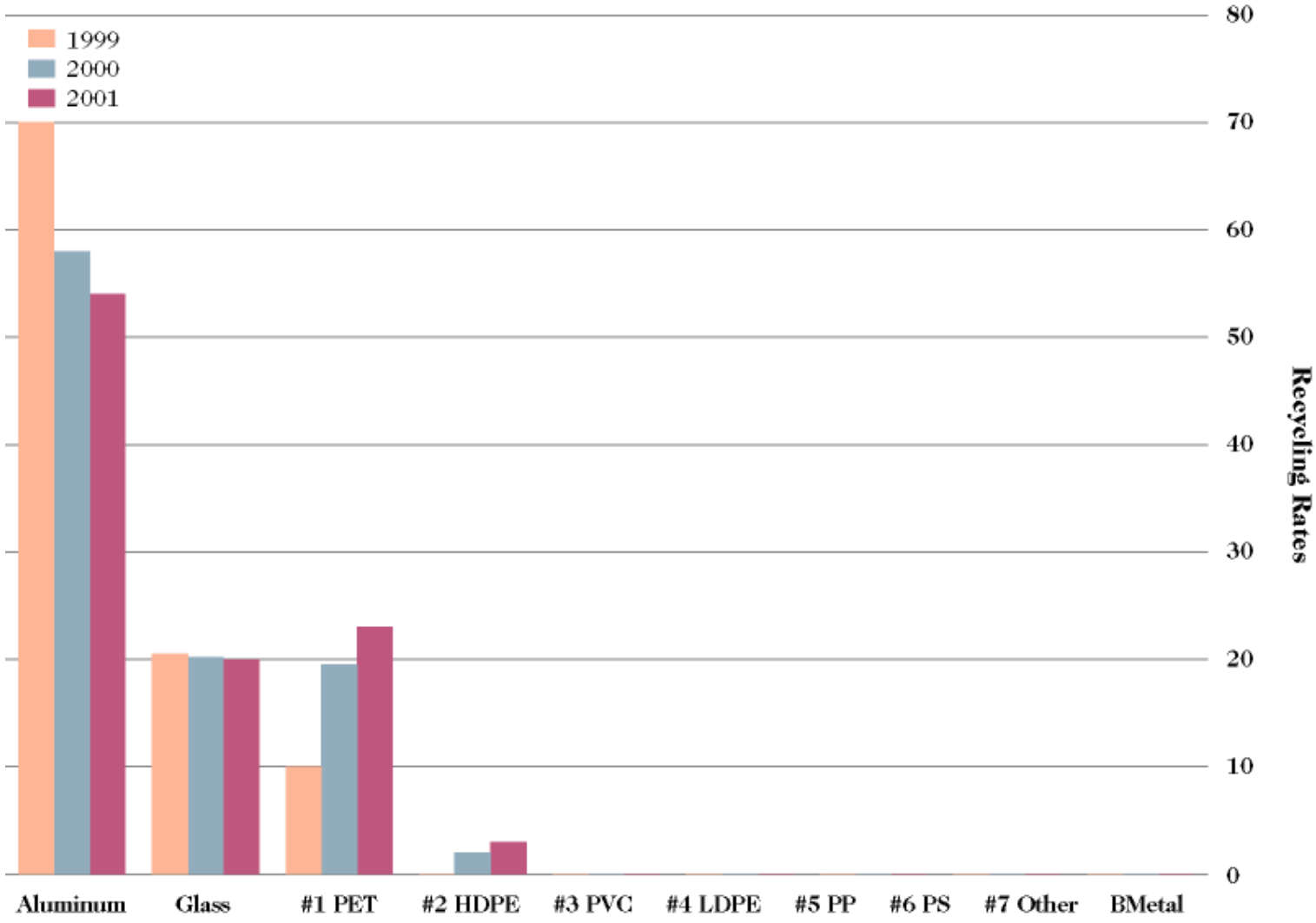
California Recycling Rates for the July through December 2000 and 2001 Periods



California Plastics Recycling Rates for the July through December and January to June Periods for 2000 and 2001

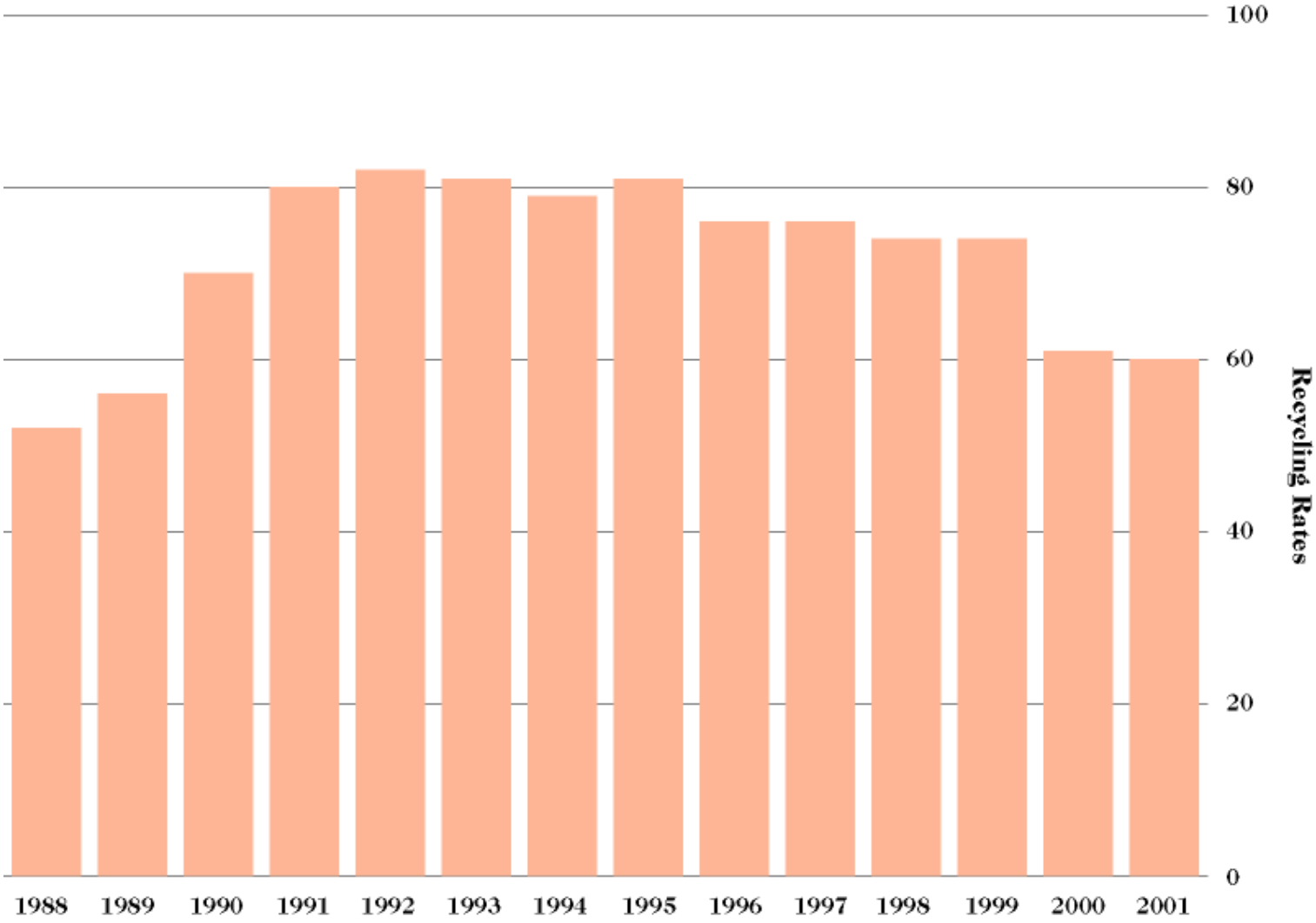


California Market Share of Beverage Container Sales from 1999 through 2001



AB 2020: Beverage Container Recycling Legislation
(continued)

California All Materials Recycling Rate



3.a. AB 939: Recycling and Landfill Legislation

Background

- The Integrated Waste Management Act of 1989 (AB 939) established a new approach for managing California's waste stream – one that created a hierarchy of waste prevention first, followed by recycling and composting
- Central to AB 939 were mandated goals of 25 percent diversion for each city's and county's waste from landfills by 1995, and the highly ambitious goal of 50 percent diversion of waste generated within each jurisdiction in 2000. The Legislature amended this statute in 2000, requiring jurisdictions to sustain their waste diversion efforts into the future

3.a. AB 939: Recycling and Landfill Legislation *(continued)*

Successes

- Jurisdictions have achieved their diversion rates by tailoring waste handling infrastructure options that include curbside recycling, material recovery facilities, and composting operations, that are supported by waste prevention and public education efforts
- The State's diversion and recycling infrastructure represents an investment of hundreds of million of dollars of public and private sector funds. California's reuse and recycling industry employs over 60,000 workers, with a several billion dollar payroll

Failures

- The State has not met its overall 50 percent waste diversion goal, though several jurisdictions have met or exceed the 50 percent goal. By 2001, approximately 33 California jurisdictions exceeded the goal, but this number is less than ten percent of the 444 reporting jurisdiction diversion programs
- There are a number of reasons why most California jurisdictions have not met their 50 percent diversion mandate including:
  - The State's economy soared in the 1990's, driving up estimated waste generation nearly 50 percent, from 45 million tons in 1989, to over 66 million tons in 2000

3.a. AB 939: Recycling and Landfill Legislation *(continued)*

(continued)

Successes

Failures

- The relatively high costs for collecting and sorting recyclables of sufficient quantity and quality, and the challenges of maintaining markets for recyclables
- The ambitious original 50 percent waste diversion goal

- AB 939 is strictly a weight based system that does not favor plastics recycling in relative terms of helping to meet goal attainment (i.e., heavier materials, like paper, and construction & demolition, provide more potential diversion points, approximately 30 and 15 percent, by weight, respectively, of California waste disposed), whereas plastics make up only 8.9 percent of total disposed California waste weight (versus over 15 percent by volume)

Issues

- AB 939 compliance requires that all city and county California jurisdictions meet the 50 percent diversion goal. As a result of AB 939, some local jurisdictions have chosen to expand their curbside programs to include certain recyclables, such as plastics, whose markets are not generally economically feasible, or are non-existent
- There is a lack of recycling opportunities for many types of plastics. Of the seven major types of plastics packaging (classified by the Society of the Plastics Industry), only two resins, Numbers 1 and 2 (PET and HDPE), are recycled to any significant degree in California. While most California cities and counties now have some kind of curbside collection program that includes Number 1 (PET), and maybe Number 2 (HDPE), plastic bottles, a minority of the curbside collection programs accept Numbers 3 through 7 plastics. Also, many communities do not collect plastic milk bottles (#2 HDPE)

Issues *(continued)*

- The cost of collecting, storing, and marketing plastics bottle resin Numbers 3 through 7, generated in some municipalities is not economical and becomes financially cumbersome. Some municipalities have collected and sorted these resins only to have them land filled, much to everyone's disillusionment
- Local governments landfill thousands of tons of all kinds of plastics, costing millions of dollars in collection and disposal fees
- Plastics curbside recycling is very confusing to the public, and even the "professionals"

Issues *(continued)*

- Some municipalities, like Sacramento County, collect only narrow-necked, Numbers 1 and 2 plastics (includes soft drink bottles, water bottles, milk jugs, shampoo and conditioner bottles, and detergent and bleach bottles). Other municipalities, like the City of Sacramento, collect Numbers 1 and 2 plastics containers, and all California Redemption Value containers, including plastics Numbers 3 through 7. The City of Sacramento still does not accept however, plastic bags, Styrofoam, plastic food trays, and cups. Both the County and the City of Sacramento systems now use so-called mixed recycling, which involves tossing all recyclables into a single large bin rather than requiring residents to separate plastics, aluminum, glass, and paper. In January 2002, only approximately 2 percent, by weight, of the mixed recycling in the City of Sacramento was plastics

Issues *(continued)*

- According to the American Plastics Council (a trade organization for large plastics manufacturers), 95 percent of the narrow-necked bottles are made from Numbers 1 or 2 plastics. The APC argues that by asking communities to concentrate on just bottles, people will be recycling more of the most valuable plastics. The APC wants more communities to go the all bottle method because it is simpler, and they argue that more Number 1 and 2 bottles are collected through this system. The APC argues that the simplified message "recycle all your plastic bottles" significantly increases collection of post-consumer plastic bottles. The program has the support of several other industry trade associations such as the Association of Post Consumer Plastics Recyclers (APR), the National Association for PET Container Resources (NAPCOR), and the National Soft Drink Association (NSDA)

Issues *(continued)*

- Recycling coordinators in many jurisdictions have been reluctant to adopt programs to collect all plastic bottles, citing concerns with:
  - Potential for increased contamination (especially PVC) and residue disposal
  - Increased costs of collection
  - Increased costs of sorting (including mixed color HDPE)
  - Reduced material marketability

Issues *(continued)*

- Recycle Worlds Consulting evaluated the all-bottle program (instead of plastics Number 1 and 2 – only programs) for the collection of plastic bottles. They argue that the APC study is not appropriate to show whether these programs increases recovery of Numbers 1 and 2 plastic, as asserted, any more than would any reinvigorated education effort. Recycling World argues that a probable reason for all-bottle's popularity with some recyclers is because it creates the perception that Numbers 3 to 7 bottles are finally being recycled (when in fact these bottles are not recycled in most cases)

Issues *(continued)*

- A few other California communities, such as the City of Berkeley and the City of Arcata, have stopped collecting plastics at the curb all together. Berkeley argues that plastics recycling is very expensive, does little to achieve recycling goals, and that processing used plastics often costs more than virgin plastic. The City of Berkeley argues that increasing the capture rates of glass, paper, or yard debris could divert more resources from landfills than collecting plastics at curbside. The City of Berkeley emphasizes that none of the recovered plastics containers from Berkeley are being made into containers again, but rather into new secondary products such as textiles, parking lot bumpers, or plastic lumber, not reducing the use of virgin materials in plastic packaging

Issues *(continued)*

- Film plastics, the single largest plastics component in the landfill, is not being collected at curbside, as it is too bulky and expensive to collect. Film plastics is problematic for curbside recycling

Issues *(continued)*

- In sum – there is much confusion and inconsistency on the best practices for plastics curbside recycling, and even on what the higher level goals of plastics recycling should be. There is bewilderment at the consumer level, and a general lack of agreement between government, industry, and environmentalists on what to do with plastics curbside recycling. One has to ask if local governments can continue to absorb the cost of plastics curbside recycling? In reaction to deteriorating economics of curbside plastics, are plastics really a recyclable curbside container? AB 939 can seemingly effectively collect only Numbers 1 and 2 plastics, whereas AB 2020 now is supposed to take all types of plastics beverage containers (i.e., Numbers 1 through 7). Does the "one size fit all approach" (ie. all material types, aluminum, glass, plastics, paper, etc.) of AB 939 (and AB 2020), really fit plastics? Notwithstanding the best efforts by many, and the fault of no one, curbside plastics recycling has a tough road to hoe ahead

3.b. AB 2020: Beverage Container Recycling Legislation *(continued)*

Background

- The California Beverage Container Recycling and Litter Reduction Act of 1986 (AB 2020) is aimed at making beverage container recycling integral to the California economy. The primary goal of the program is to achieve, and maintain, high recycling rates for each beverage container type included in the program, thereby reducing the beverage container component of litter in the State
- The AB 2020 program is basically a redemption system for beverage containers, whereas the AB 939 program is a mandate for waste diversion
- The AB 2020 program is unique among the states that have a beverage container return system (in other deposit bottle states the cans and bottles are returned to stores from which the containers were purchased)

Background *(continued)*

- The program is funded through redemption payments made to the Department of Conservation (Division of Recycling), by beverage distributors on each beverage container sold in the State. Redemption payment revenues are deposited in the California Beverage Container Recycling Fund. Payments are made out of the Fund to consumers in the form of California Redemption Value (CRV) when they return empty beverage containers to certified recycling centers. The redemption payments are 2.5 cents for each container under twenty-four fluid ounces, and 5.0 cents for containers of twenty-four fluid ounces, or greater

Background *(continued)*

- Beverage containers now covered by the program include those filled with carbonated mineral and soda water, and other similar carbonated soft drinks, noncarbonated soft drinks, wine coolers and distilled spirit coolers, beer and malt beverages, noncarbonated water, including noncarbonated mineral water, sport drinks, coffee and tea drinks, vegetable juice in beverage containers 16 ounces or less, carbonated and noncarbonated fruit drinks that contain any percentage of fruit juice, and 100 percent fruit juices that are packaged in beverage containers less than 46 ounces in volume. The program does not cover any beverage container product type that is not specifically included by the Act

Background *(continued)*

- Redemption material is collected and redeemed by participant type, including recycling centers and reverse vending machines, curbside programs, and collection, dropoff, and community service programs. Most material types are redeemed at recycling centers, except for #2 HDPE, which has a larger percentage (65 percent) collected through curbside programs

Background *(continued)*

- Material that is light and easy to handle, such as aluminum, and has both scrap and CRV value, will be primarily brought to redemption centers where consumers can receive the CRV and scrap value payments. Material that is heavier, or less easy to handle, such as glass, #1 PET, or #2 HDPE, will have a larger component collected by donation programs such as curbside programs, collection and dropoff programs, and community service programs. Still, 67 percent of #1 PET, and 25 percent of #2 HDPE, is collected at redemption centers. Contrary to trends in other material types, CRV for plastics # 3 through # 7 are currently returned exclusively through redemption centers (a possible reason for this is that curbside and donation programs decide not to accept or sort this material for redemption, so the redemption centers are the only possible source to redeem the containers)

3.b. AB 2020: Beverage Container Recycling Legislation *(continued)*

Successes

- The AB 2020 program is widely recognized as one of the most efficient, and cost-effective, of all the deposit state programs, with the California redemption value half the size of most deposit states
- Stakeholders that support the program, as well as critics, recognize that the program has a high level of public acceptance, has met many of its original goals, including helping with litter reduction, and has promoted a State recycling infrastructure and ethic

Failures

- A goal of the program is to achieve an 80 percent recycling rate for all aluminum, glass, plastic, and bimetal containers sold in California. In 2001, the all materials recycling rate was 60 percent. The highest the all materials recycling rate achieved was 82 percent (in 1992). For the fourteen year period, from 1988 through 2001, the all materials recycling rate was 80 percent or greater, for only four different years (1995, 1993, 1992, and 1991). The low recycling rate of 2001 is largely attributable to the addition of new beverages to the program in 2000 and 2001. However, in 1999, before the addition of new containers to the program, the all materials recycling rate was still only 74 percent, below the original all materials goal set over sixteen years ago

3.b. AB 2020: Beverage Container Recycling Legislation *(continued)*

(continued)

Successes

- Californians enjoy a convenient form of container recovery with nearly 2,000 recycling opportunities statewide. The program is also used as a funding source for various recycling and litter reduction programs throughout the State
- California's beverage container recycling program now includes over 17.5 billion containers, of which over 10.5 billion were returned for recycling in 2001. The CRV of 2.5 cents that consumers pay when they purchase beverages, now applies to more containers than ever before

Failures

- Another goal of the program is to have each beverage container type achieve a recycling rate of 65 percent. In 2001, only one material type, aluminum, achieved this goal with a 75 percent recycling rate. In 2001, the recycling rates for glass, #1 PET, and #2 HDPE were 54 percent, 36 percent, and 39 percent, respectively. In 1999, the glass and # 1 PET recycling rates were 60 percent and 65 percent, respectively. Glass achieved the 65 percent goal seven times during the fourteen year period, 1988 through 2001, whereas #1 PET achieved the goal four times during this same period

3.b. AB 2020: Beverage Container Recycling Legislation *(continued)*

(continued)

Successes	Failures
	■ Beyond, #2 HDPE, the recycling rates for the other plastics resin types (#3 (PVC), #4 (LDPE), #5 (PP), #6 (PS), and #7 (Other)) is miniscule, at most a few percent, or less, each ■ AB 2020, in spite of its successes, has numerous failures, particularly with regard to plastics. Also, the program includes an array of complex command-and-control regulations, requirements, fees, and payments which lead to seemingly endless legislative "reforms"

Issues

- In January 2000, significant changes occurred within the program due to Senate Bill 332, specifically adding noncarbonated fruit drinks, coffee and tea drinks, noncarbonated water, and sports drinks. In addition, SB 332 applied the CRV to beverages sold in all of the seven plastic resin types. SB 332 also prescribed a $10 million public relations and advertising campaign to help implement new containers in the program. In January 2001, Senate Bill 1906 added non-carbonated soft drinks and vegetable juices in beverage containers of 16 ounces or less. With recent changes in the law, sales of CRV beverage containers continue to grow

3.b. AB 2020: Beverage Container Recycling Legislation *(continued)*

Issues *(continued)*

- Changes made by SB 332, along with growth in sales, increased the total beverage container sales from 1999 to 2000, by 26 percent. In 2001, changes attributable to SB 1906, again coupled with sales growth, resulted in a 6 percent increase in container sales. These are huge increases in the number of program containers, and the CRV assessments. In 2001, with close to 7 billion unredeemed containers, this equals nearly $175 million in potential funds
- In 2001, of the 17.5 billion containers sold in the program, approximately 4.6 billion, or 26 percent, were all types of plastics. This is both a significant number, and percent, of plastic containers in the program, and plastics historically have generally not achieved their individual recycling goals

Issues *(continued)*

- Traditionally, aluminum has always had the largest market share per sales volume, compared to other material types, and the all material recycling rate generally followed the same trend as aluminum. However, in the past two years, since inclusion of the new beverages and new container types into the program, there has been a drop off of aluminum market share and a gain in that for #1 PET. The result of this market transition is that the high recycling rate of aluminum has a reduced impact on the overall recycling rate, and the lower recycling rate of #1 PET now has a greater impact on the overall recycling rate, than they did prior to the passage of SB 332 (there is very limited market share of all material types other than aluminum, glass, and #1 PET plastic, and the glass market share has remained static in recent years). In sum, largely due to plastics, it will be even harder to achieve the all materials recycling rate program goal

Issues *(continued)*

- In January 2000, when new beverages were added to the program, they brought with them new containers also, namely #2 HDPE, #3 LDPE, #5 PP, #6 PS, and #7 Other. The #2 HDPE plastics already has an established market and was being collected by many curbside programs for which they had received a scrap payment only. Adding HDPE to the program did not require extensive adjustments for it to be collected, and the material had a recycling rate of 22 percent in 2000, which increased to 38 percent in 2001. Plastics #3 through #7 have not been commonly collected previously and therefore have limited, if any, established markets. These plastic resins, however, are sold in limited volumes, each having less than 1 percent of the market share of beverage containers. Even if 100 percent of the #3 through #7 plastics beverage containers sold were redeemed in 2001, it would only raise the all material recycling rate by 1 percent

Issues *(continued)*

- SB 332 added containers with limited or non-existent markets to the program, though these containers are a very small percent of the program. This container addition has also created concerns by some curbside programs regarding redemption by separate plastic resins. Currently the Department of Conservation is reviewing the segregated and commingled rate structures to better accommodate the new plastics resin types. Now there is a commingled (CRV + Non-CRV) payment rate for PET plastics and for HDPE plastics. There is no commingled rate for plastics #3 through #7, as they just have a CRV rate, and this creates a particular problem for the curbside recyclers. The DOC is reviewing a commingled rate for plastics #2 though #7, but some end users of HDPE do not like this

Issues *(continued)*

- AB 2020 is a complex program that concerns itself with only a small portion (approximately 3 percent) of the California waste stream. There is confusion about what is, and what is not, in the program, and how AB 2020 overlaps, or not, with the RPPC program. For example, some plastics juice containers (# 6 PS) have sealed foil lids that are not recloseable (making it a beverage container), and are new to the AB 2020 program. However, clam shells, also #6 plastics (but EPS), has a recloseable lid, making it a RPPC. Finally, common Styrofoam coffee cups (EPS) are outside the boundaries of both the DOC bottle bill program and the CIWMB RPPC program. This is confusing to professionals working in the area, let alone consumers, and defies both common sense and practicality

Issues *(continued)*

- In sum – AB 2020 now, for the first time, takes all types of plastics beverage containers (i.e., #1 through #7). The total number of containers in the program has jumped nearly 33 percent from 1999 to 2001. Over 75 percent of this increase in containers is attributed to plastic containers.
  - Can AB 2020 now meet its overall recycling goal with this larger percentage of plastics?
  - Does there now need to be a different CRV for plastics?
  - Is industry paying its fair share plastics processing fee if manufacturers are to internalize the cost of recycling their containers (because there is very little plastics scrap value, the plastics processing fee is essentially the cost of recycling)?

Issues *(continued)*

- Do we need a new, much higher processing fee for each plastics type #3 to #7, versus the one overall plastics processing fee, such as we now have (prior to the year 2002, beverage manufacturers paid the processing fee on containers recycled, not sold, and now the processing fee is paid on the much larger sold number)? (Proposed SB 1733, Sher, would authorize paying a plastic beverage container recycling incentive payment to certified recycling centers, to the extent funds are available, to increase recycling rates for plastics beverage containers.)
- Do we need material specific funds for plastics (to guarantee that each container "pays its own way"), versus the present common central fund?
- Should it still be mandatory for all redemption centers to take plastics or all types of plastics?

Issues *(continued)*

- Should we really be collecting plastics #3 through #7 through this program at all, versus relying on curbside recycling?
- Does the "one size fit all approach" (i.e. all material types) of AB 2020 now really fit plastics, and all the subcategories of plastics?

- Again, notwithstanding the best efforts of many, and the fault of no one, AB 2020 also has a tough road to hoe ahead with regards to plastics

3.c. SB 235: Rigid Plastic Packaging Container Legislation

Background

- The Rigid Plastic Packaging Container Act (SB 235) was passed in 1991. The intent of the Legislature was to "spur markets for plastic materials collected for recycling by requiring manufacturers to utilize increasing amounts of postconsumer recycled material in their rigid plastic packaging containers and to achieve high recycling rates for these plastic packaging containers."
- 1995 was the first year that the law was implemented after regulations were developed
- In 1995 the RPPC recycling rate range was above 25 percent so all companies were in compliance
- In 1996 food and cosmetics containers were exempted from the law

Background *(continued)*

- 1996 was the first year the RPPC recycling rate fell below 25 percent (23.2 percent), requiring companies to retroactively meet one of four compliance options for their RPPCs:
  - Use 25 percent recycled content
  - Source reduce by 10 percent
  - Meet a brand-specific recycling rate of 45 percent
  - Be reusable or refillable at least 5 times

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

Background *(continued)*

- The CIWMB sent surveys to 500 randomly selected firms in July and August of 1998 to determine 1996 compliance. The 460 respondents were in five categories:
  - 133 not regulated (29 percent)
  - 55 submitted data (12 percent) (45 in compliance (10 percent); 8 not in compliance, 2 incomplete data)
  - 54 requesting exemptions (12 percent)
  - 42 requesting extensions or waivers (9 percent)
  - 176 not responding (38 percent)

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

Background *(continued)*

- For 1997 to 1999 compliance, CIWMB surveyed 950 companies, with an emphasis on certain industries with RPPCs:
  - 128 out of compliance (13 percent)
  - 81 in compliance (9 percent)
  - 348 not regulated (37 percent)
  - 393 in process, incomplete, non-responsive (41 percent)
- Ongoing implementation – over the last three years, the CIWMB has signed compliance agreements with 122 companies, and is negotiating agreements with about 70 more in 2002

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

Background *(continued)*

- Compliance agreements follow a basic template: the company has six months to gear up to comply, and six months to prove compliance. Companies must submit interim reports during this time. There are some special provisions for smaller companies
- A company that will not develop a compliance agreement could go to public hearings and have a fine imposed. There are currently four companies that may go to public hearings

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

Successes

- Changed packaging: some companies that might not otherwise have considered using PCR, or source reducing RPPCs, are considering the RPPC requirements as they design future products or specify packaging
- Improved compliance: six of seven surveyed companies that were out of compliance with the RPPC law in 1996 made changes to their rigid plastic packaging under compliance agreements, and are now in compliance with the law
- Relatively high compliance among larger manufacturers

Failures

- Low recycling rates: plastics are not meeting the 25 percent recycling rate goal for RPPCs or the 55 percent recycling rate goal for PET. Both RPPC and PET rates fell below 1995 levels in 2000
- Markets: the law has relatively little impact on plastics recycling and markets, especially in-state – only 20 percent of the companies surveyed for 1997-99 were in California
- Low compliance: it could be thousands of firms that are not aware that they are required to comply with the law

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

(continued)

Successes

- Recycled content: most of the companies in compliance in the first round of certifications were using PCR in their materials, at an average rate of 28.2 percent for the 253 containers using PCR
- Source reduction: another 40 containers were source reduced an average of 14.5 percent

Failures

- Changed packaging: law creates incentives to switch packaging from a regulated RPPC to another material, change containers, or reduce or increase container size to avoid regulation
- Containers exempt: at least half of RPPCs are exempt food and cosmetic containers
- Low percentage of wastestream: In 1999, RPPCs made up a total of 1.1 percent of the waste disposed and 12.1 percent of the plastic waste disposed

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

Issues

- Need to reduce plastic going into landfills in California through increased plastics recycling or other means
- Fragmented approach to dealing with only a small portion of the plastics wastestream
- Small firms or those selling only a few RPPCs have a difficult time meeting the requirements
- Difficult to measure and encourage source reduction within the RPPC
- High cost to the CIWMB for implementing and administering law – 10.5 CIWMB staff, plus legal office, executive office, and Board members/staff time (If assume $70,000 for staff, is $735,000/yr for direct staff, alone)

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

Issues *(continued)*

- High costs to industry to comply with law and document compliance. For an average company, from the time they receive notification from the CIWMB that they are subject to compliance, until a decision is made, costs probably exceed $100,000 at a minimum – not including costs of changing containers. If a new injection mode is needed, the cost to a company could be in the millions of dollars
- During the 2000 Legislative session industry opponents to an expansion of the RPPC law spent $4.5 million to lobby members of the California Legislature
- Food and beverage containers are exempt from the requirements of the law, but they are used to calculate the RPPC and PET statewide recycling rates

3.c. SB 235: Rigid Plastic Packaging Container Legislation *(continued)*

Issues *(continued)*

- Overlap with the beverage container program: 67% of the RPPCs recycled in 2000 were CRV containers, and total tons of plastic containers recycled and reported through the beverage container program account for over 95 percent of the RPPCs and PETs used in the RPPC and PET recycling rate calculations
- In sum – spending significant government and industry time and money for very little environmental gain, and without making a significant impact on plastics recycling rates or plastics markets in California

3.d. SB 951: Plastics Trash Bag Legislation

Background

- California's recycled content requirement for trash bags by the manufacturers of plastic trash bags (Plastics Trash Bag law) was enacted nine years ago, in 1993, by Senate Bill 951 (Hart). The intent of the Plastics Trash Bag law was to encourage the diversion of polyethylene from California landfills by establishing a market for it in plastic trash bags. SB 951 required all trash bags 0.75 mil, or greater, in thickness to use 30 percent recycled-plastic, post consumer material (RPPCM)

Background *(continued)*

- SB 698 was then signed into law four years ago, in 1998, and amended certain provisions of SB 951. SB 698 eliminated the 30 percent recycled-content requirement for trash bags and replaced it with two compliance options for bags 0.70 mil, and greater, in thickness. These two options are (1) ensuring that a manufacturer's plastic trash bags contain a quantity of RPPCM equal to at least 10 percent of the weight of the regulated bags and (2) ensuring that at least 30 percent of the weight of material used in all of a manufacturer's plastic products intended for sale in California is RPPCM

Background *(continued)*

- Trash bags are made from various types of plastics, including HDPE, LDPE, LLDPE, and PETE. Regulated plastic trash bags are between 0.70 and 2.0 mils in thickness. The used material that serves as feedstock for trash bags include dry cleaning bags, grocery store bags, mattress bags, furniture bags, irrigation tubes, and stretch wrap. Plastic trash bags include garbage bags, composting bags, lawn and leaf bags, can-liner bags, kitchen bags, compactor bags, and recycling bags. There are approximately 32 regulated plastic trash bag manufacturers, 14 of which are located in California

3.d. SB 951: Plastics Trash Bag Legislation *(continued)*

Successes

- The use of recycled plastics in California trash bags has increased sevenfold over the last decade (from 2,000 tons to more than 14,000 tons), while creating business opportunities for a number of California manufacturers
- Almost one-half of all suppliers of recycled plastic for trash bags are located in California, and 78 percent of the 6,183 tons recycled plastic used in California trash bags comes from California suppliers
- The law has helped ensure a stable and growing market for recycled plastics in trash bags and has correspondingly reduced the amount of plastics disposed in California's landfills

Failures

- Two provisions of the law, its applicability only to bags of a certain thickness, and the ability for manufacturers to exempt themselves if they cannot meet the 10 percent minimum content requirement, has resulted in the law applying to only about one-fourth of the trash bags manufactured for sale in California
- Almost two-thirds of all bags produced according to California's minimum-content requirements are being sold by California manufacturers to users outside of the State
- The volume of bags imported into the U.S. has tripled in the past 5 years (almost 50 percent come from China)

3.d. SB 951: Plastics Trash Bag Legislation *(continued)*

(continued)

Successes

- For small manufacturers of trash bags for sale in California, the amount of post consumer material used has increased
- Using recycled post consumer film in trash bags has been shown to be an economically sound business decision for some manufacturers
- Technological trends in the manufacturing of trash bags may encourage more post consumer content being included in trash bags (e.g., multi-ply bags that contain post consumer film sandwiched between virgin film and development of new polymers resulting in the manufacture of stronger films with less material being used)

Failures

- A sufficient quantity and quality of recycled resin does not exist to raise the amount of actual post consumer content in bags above 10 percent, and large corporations make most trash bags for sale in California but generally exempt themselves from compliance due to unavailability or quality of post consumer resins
- Proliferation of world markets for reprocessing film and manufacturing trash bags, as well as the creation of secondary markets and collection systems for plastic film by plastic lumber, siding, flooring, garden products, and traffic control industries has resulted in a decreasing supply of post consumer resins for use in domestic trash bags

3.d. SB 951: Plastics Trash Bag Legislation *(continued)*

(continued)

Successes

Failures

- There is confusion over the legal definitions of the kind of material to be used in trash bags (postindustrial versus post consumer)
- In California only a small quantity of film is being collected through conventional recycling programs, and the amount collected appears to be decreasing. Most, if not all, film used as recycled content in plastic trash bags is sporadically collected from isolated commercial sources
- There is a general shortage of post consumer film for domestic trash bags due to the lack of collection programs and competitive markets for the small amount collected particularly by manufacturers of plastic lumber and the like, and brokers who sell film to foreign markets

Issues

- The CIWMB was required, before October 1, 2001, to make recommendations to the Legislature regarding the content of recycled post consumer plastic in trash bags. The Board approved the following two recommendations at its September 2001 meeting: (1) increase the amount of RPPCM by an amount still to be determined and (2) remove the exemption from compliance for manufacturers who could not meet the RPPCM requirements, as stated by law. In a January 2002 workshop at the CIWMB, industry raised serious concerns about these recommendations

Issues *(continued)*

- At the Board's May 2002, meeting it was then presented with additional options for trash bags, namely, (a) increase recycled content to "x" percent, (b) eliminate the exemption, (c) provide additional compliance options such as source reduction, biodegradable trash bags, or tradable credits, (d) make no changes in the law as it now exists, (e) defer any recommendation until after completion of the plastics white paper, (f) direct the Board to work with the DGS to develop a list of approved brands for sale to the State, and (g) eliminate the certification program. Staff recommended that the Board approve Options (f) and (g), but the Board choose option (e)

Issues *(continued)*

- In sum – there are several problems with the Plastic Trash Bag law and the best strategy for improving the recycling and reuse of film plastics is unclear. One lesson learned is that it is very difficult to micro-manage plastics markets via minimum content requirements over a long period of time, especially since plastics is subject to strong international forces and volatility. Also, it is difficult to force closed-loop plastics recycling when market forces may dictate open-loop plastics recycling

3.e. Summary of California Plastics Major Legislation

- Of the four major California laws that concern themselves with plastics (AB 939, AB 2020, SB 235, and SB 951), all are severely flawed with regards to dealing with plastics. None of the four laws come close to effectively managing plastic issues, and additional focused improvements to these existing laws, overtime, are likely to be unable to address the unique and fundamental, long-term structural characteristics of plastics

3.e. Summary of California Plastics Major Legislation
(continued)

- Two of the laws (AB 939 and AB 2020) concern themselves with multi-material types beyond plastics, and two of the laws only focus on plastics (SB 235 and SB 951), but both types of laws have little future potential for managing broad and complex plastic issues. The two diverse multi-material (including plastic) laws (AB 939 and AB 2020), struggle to adopt to the unique attributes of plastics (i.e., "one size doesn't fit all"), whereas the two specialized plastic laws, are too narrowly focused on a sliver of the plastic issues, and have proven themselves inflexible to adopt to rapidly changing plastic technologies and market conditions

3.e. Summary of California Plastics Major Legislation *(continued)*

- All of the laws are fractionalized, or piecemeal in their own way with regards to plastics, even including the two multi-material laws, and at best, only try to address a small portion of the overall plastics management problem. Some of these laws, like SB 235 and SB 951, almost became obsolete upon implementation
- No matter how ineffective, piecemeal, and short-term focused are the four plastics laws, there is subtle reluctance on the part of all three major stakeholders (government, industry, and environmentalists) to overly criticize these laws as concern plastics, let alone to give them up entirely, or even temporary suspend them. This is for a variety of good reasons. For government, each of these laws is now a known institution with its own inertia, and sometimes the "known" is more comfortable than the unknown, and the programs have become vested.

Issues *(continued)*

For industry, many companies have already figured out how to adapt the unknown, and the programs have become vested. For industry, many companies have already figured out how to adapt to these laws, so why overly criticize the existing system as something much more onerous could come in its place. For environmentalists that have fought so hard over many years to get these laws enacted, it is difficult to give these positions up when there is not a known realistic and better replacement alternative. Also, all of the three major stakeholder groups often see only a relatively small portion of the overall plastic issues (for example one law application or one container/resin type), and very few of the stakeholders can see, or even want to examine, the totality or cumulative impact of plastics issues combined. All of these reasons favor ineffective status quo laws and institutions

Issues *(continued)*

concerning plastics, even though some representatives from each of the three major stakeholder groups would probably acknowledge major inadequacies of our present plastics management and regulatory system

- There now is a need to reassess the role and effectiveness of each of California's four major plastic laws in terms of meeting the larger goal of "Optimizing Plastics Use, Recycling, and Disposal in California". Our current plastics management and regulatory system is "not good enough" to meet the magnitude and significance of our cumulative plastics issues

Issues *(continued)*

- There is a vital need to start considering new, realistic, and better alternatives to the current plastics management and regulatory system for the State. There is a need to begin a formal collaboration process of government, industry, and environmentalists to develop, and ultimately implement, an effective, comprehensive, and long-term solution to the State's plastic issues

Issues *(continued)*

- The likely solution to California's plastic issues will be a new model, unique to our State, much like the AB 2020 Bottle Bill and AB 939 System were over a dozen years ago, and will entail a "clean sheet of paper" approach, or "a day one concept", rather than additional focused improvements to our existing plastic systems. The long-term plastics management solution will not simply be another "Band-Aid" repair of our current plastic laws. California has an opportunity to again be a leader in this area, not only with the other states and the federal government, but internationally as well

Issues *(continued)*

- It is a recommendation of this Plastics White Paper to start a needed, three-way dialogue of government, industry, and environmentalists concerning difficult, and often contentious, plastic issues. This process will not be easy, and it likely will take several years in order to develop, and ultimately implement, a long-term plastics management and regulatory system for the State. It is hoped that this Plastics White Paper Workshop will be the beginning, and not the end, of a fruitful collaboration to seek new ways to achieve old ends