Tom Wright
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Green Mission Project
www.sustainablebizness.com

Afternoon Agenda, speakers

- Dan Imhoff, Watershed Media
- Bill Orts, USDA
- Fabian DeGarbo, Whole Foods Markets
- David Levine and Greg Nelson,
- Green Harvest Technologies
- Tom Wright, SustainableBizness.com

Green Supply Chain Example

The Idea of a System

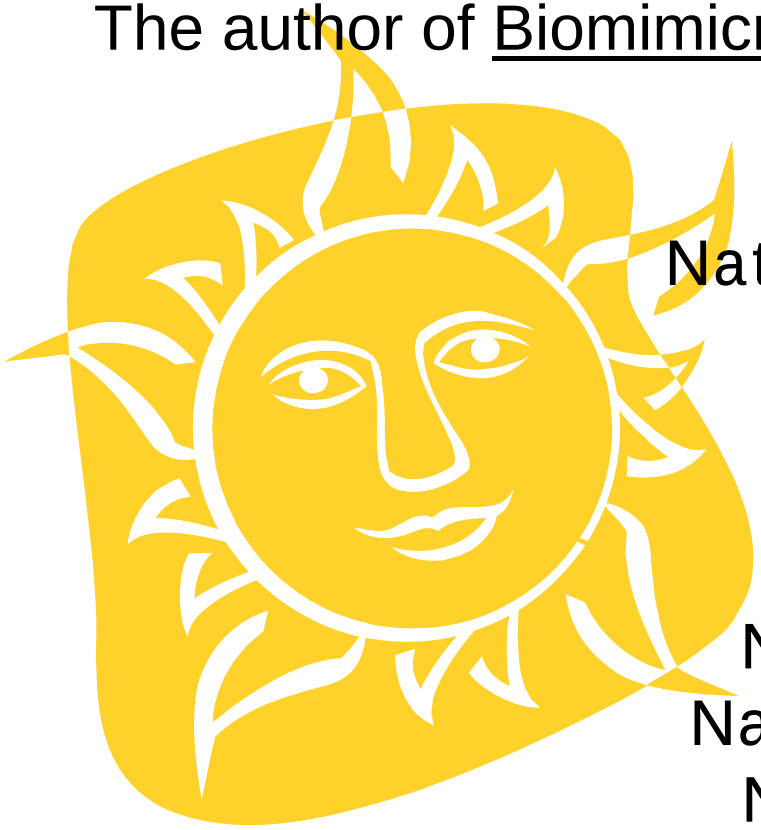
A system is a collection of parts which interact with each other to function as a whole.

A Green Claim Assumes …

- **The earth is a single living system.**
- **Open to energy from the sun**
- **Closed to matter**

The principles of the science of ecology determine the validity of a green claim.

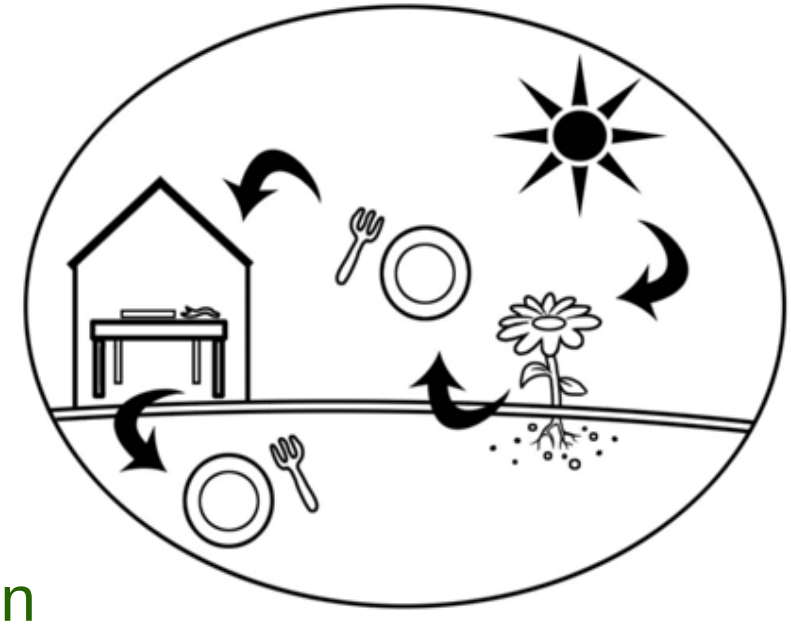
The author of Biomimicry, Janine Benyus explains ecology:



Nature runs on sunlight.
Nature uses only the energy it needs.
Nature fits form to function.
Nature recycles everything.
Nature rewards cooperation.
Nature banks on diversity.
Nature demands local expertise.
Nature curbs excesses from within.
Nature taps the power of limits.

Sustainability:
2 simple rules to follow

- Live off of current solar income
- The cyclic principle: waste = food for something else; there is no bioaccumulation of persistent human-made molecules

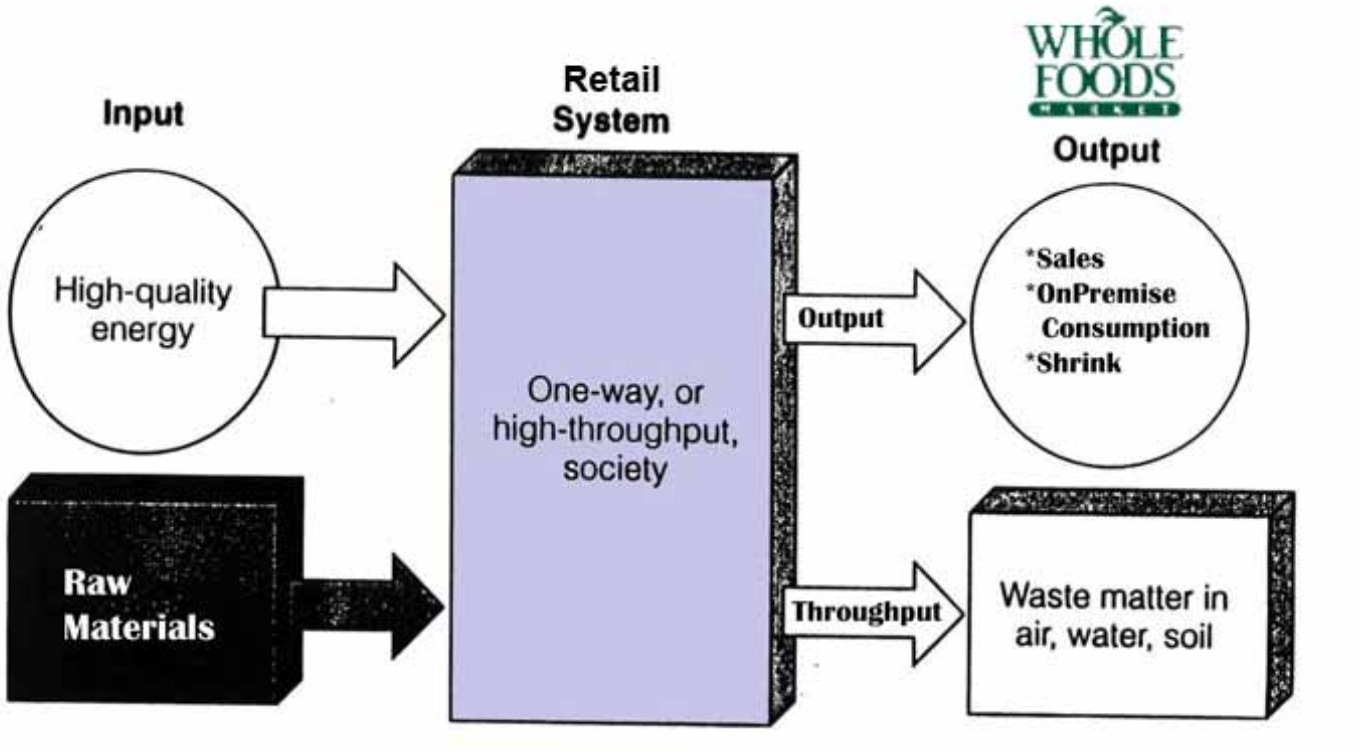


Common Ground

- Single living system
- Operating Principles of Ecology
- Regenerative Economics
- e.g. Organic Agriculture

Input Output Throughput

All stores and facilities have energy and material input, output and throughput (often what we call “waste”).



Waste matter in air, water and soil needs to be food for something!

“Sinks” for throughput. (a term for the destination of a flow.)

- Recycling: it becomes itself again
- Composting: top soil amendment
- Water (includes oceans, rivers, sewers, etc.)
- Landfill
- Air (includes incineration)
- Crust of the earth

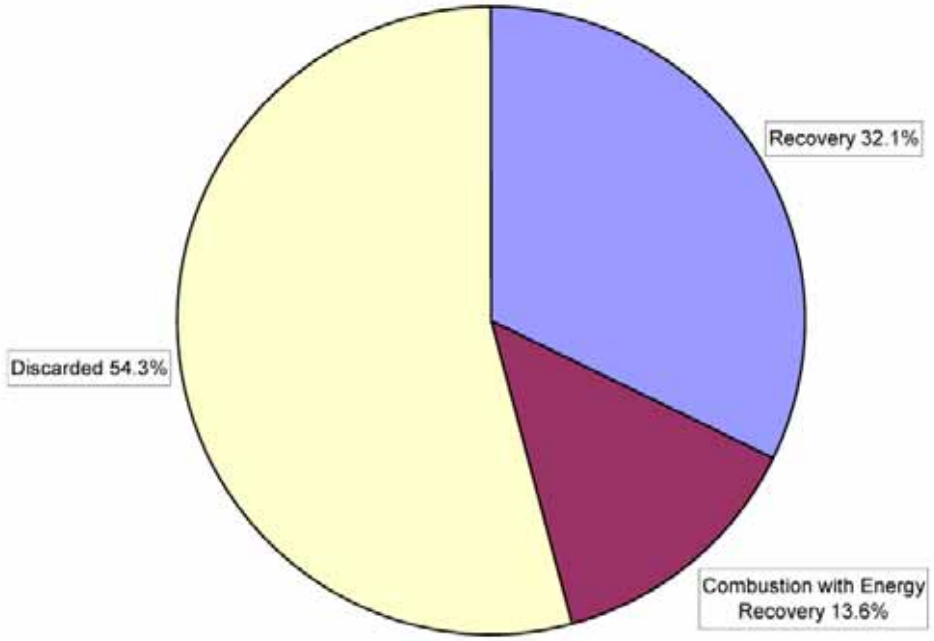
Management of MSW Overview

US EPA's integrated waste management hierarchy includes the following four components, listed in order of preference:

- Source reduction (or waste prevention), including reuse of products and on-site (or backyard) composting of yard trimmings
- Recycling, including off-site (or community) composting
- Combustion with energy recovery
- Disposal through landfilling or combustion without energy recovery.

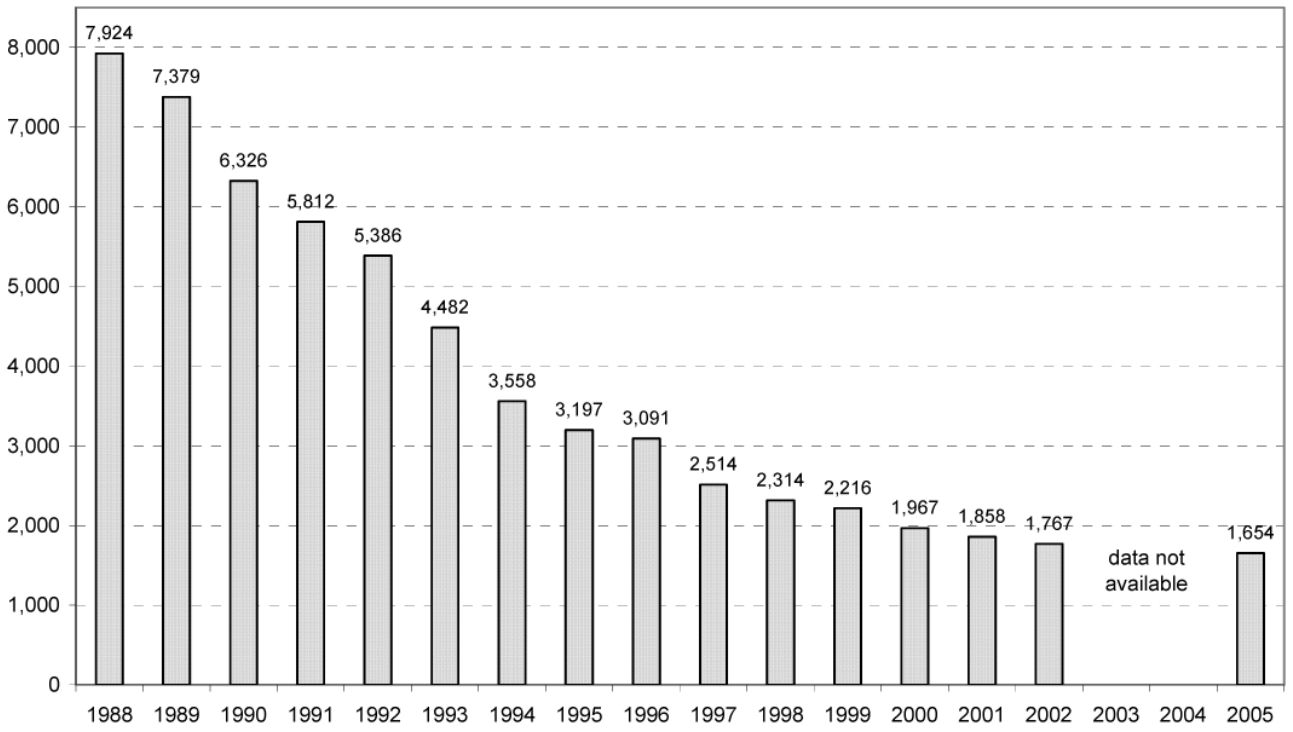
What happens to the trash stream

Figure ES-6: Management of MSW in the United States, 2005



Landfills are being closed, and there are good reasons.

Figure ES-5: Number of Landfills in the United States, 1988-2005



Infrastructure

- How many US cities have curbside for beverage containers: 50% - 60%
- How many states have deposit laws: 8 (and they recycle at 4 times the rest)
- How many industrial scale composters take food wastes: 18 with grinders
- How many cities take food waste compostables at curbside: 10 -20

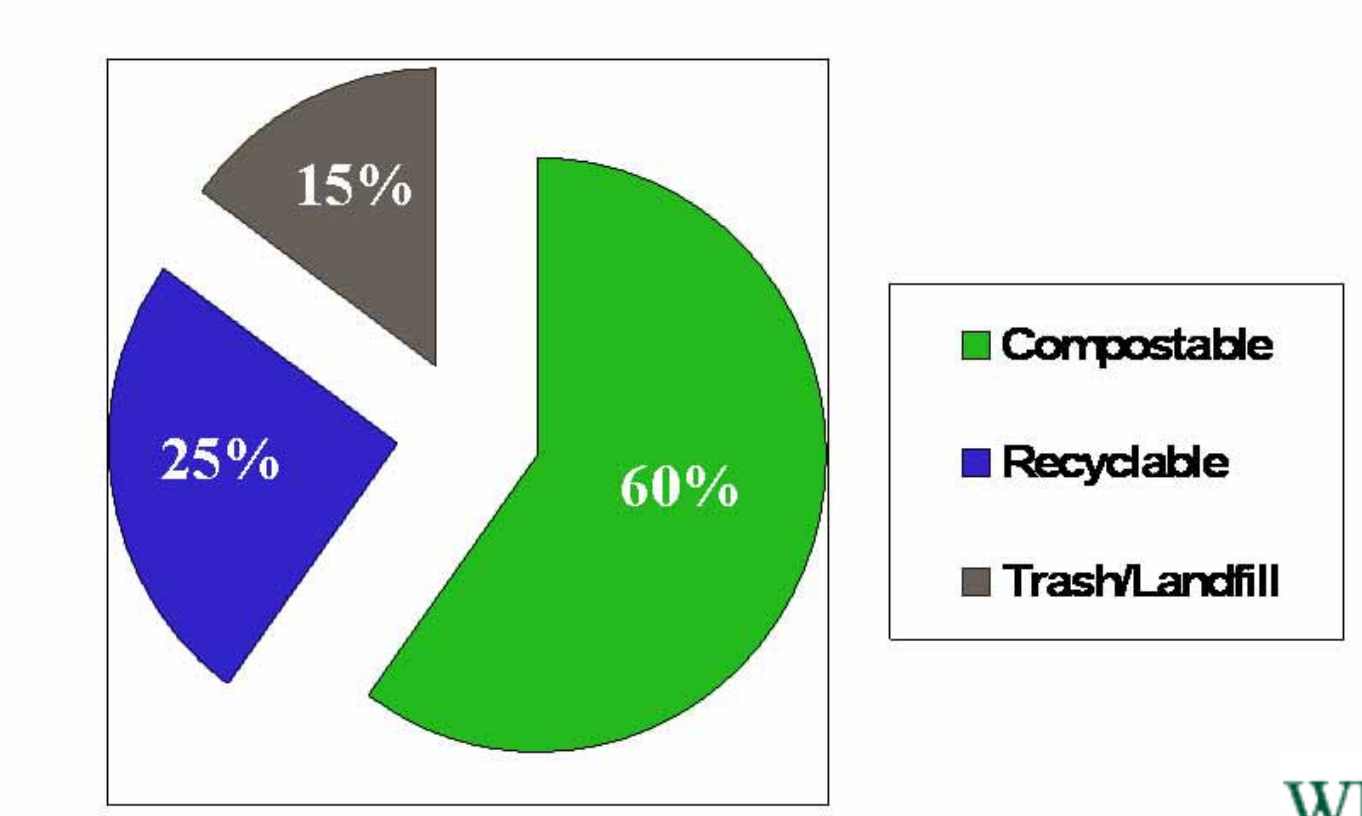
Bill McDonough

“There are two fundamental frameworks for metabolism: biological and technical nutrients. So we ask a company, ‘Are your materials safe and healthy for human and ecological systems? Do you have reverse logistics – do we know where this stuff comes from, where it goes, and how to get it back and it onto closed, zero-waste cycles? ”

3 Basic Streams

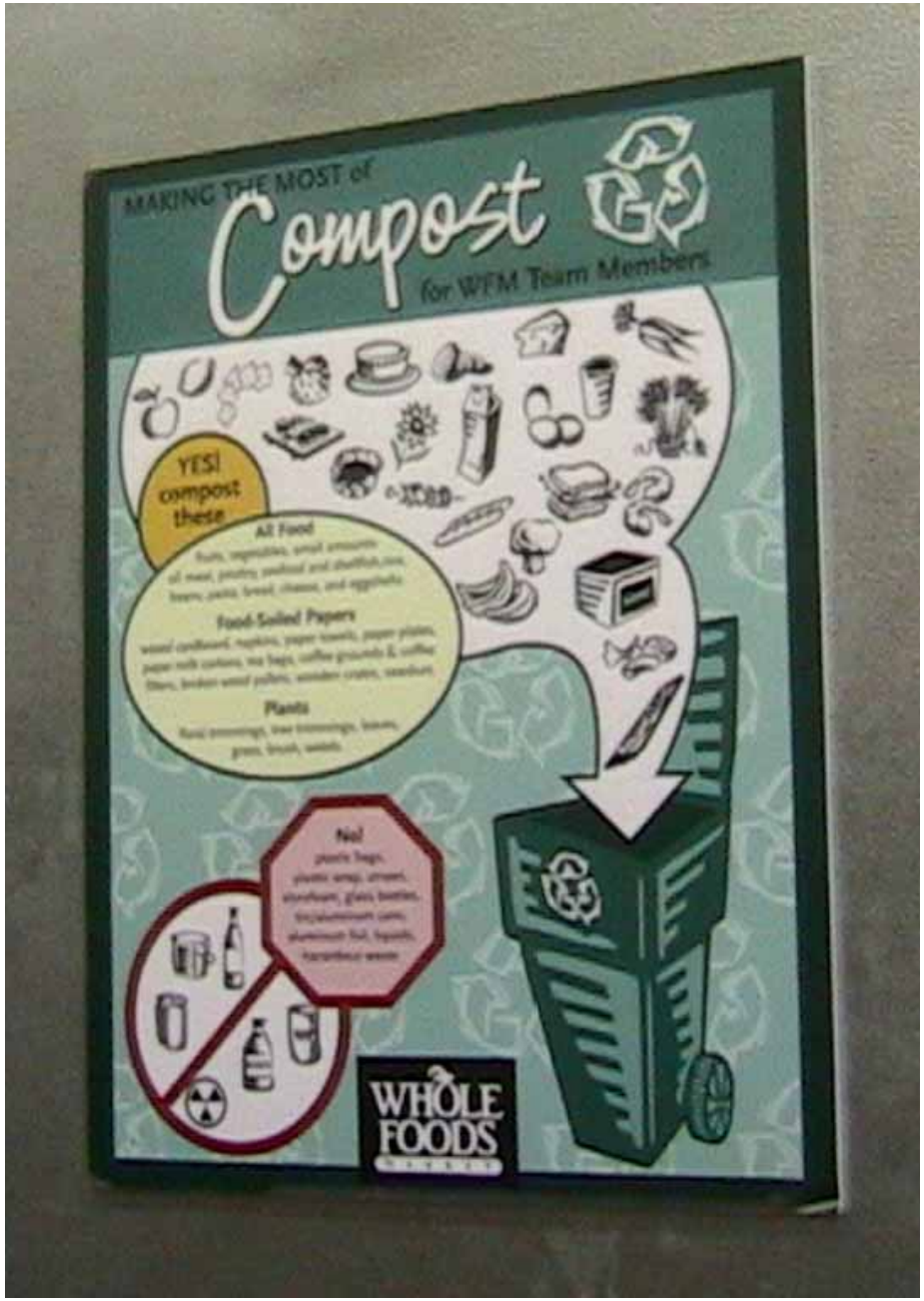
- Recyclables: #1 and #2 rigid plastics, glass, aluminum, paper (also cardboard and film plastics).
- Compostables: “green wastes”
- Trash/Landfill: like food soiled petro-plastics.

60% Compostables: Zero Waste Initiative



WHOLE FOODS MARKET

Compost Sign



Supermarket Compost Program

Compost prepared for agriculture

Fruits and vegetables grown in our compost complete the recycling process.

Cardboard

Cardboard is valuable.

All dry cardboard needs to be bailed. Wet or food-soiled cardboard can be composted.

Film Plastics

Laundry Bag Holder Used for Film Plastic Bags (#2 and #4)

A laundry bag holder with a clear plastic bag is a good receptacle for pallet wrap (#4) recycling in receiving.

Compostable Green Waste

WHOLE FOODS MARKET

Single Stream Sign


PLASTIC BOTTLES
PLASTIC BOTTLES
PAPER
ALUMINUM CANS
GLASS BOTTLES
No Household Recycling
Please take it to:
WRI #6
7564 SANTA MONICA BLVD
WEST HOLLYWOOD CA 90046
WHOLE FOODS
MARKET

Zero Waste is the Goal.

- Zeri.org:
- Transition to no landfill
- Then no incineration (molecular garbage in the air)
- Then no mining of toxic materials

Floral Department Display of Bagged Compost

What is recycling?

- Involves the separation and collection of materials for processing and remanufacturing into new products .
- A material becomes itself again, and again. (e.g. clear glass)

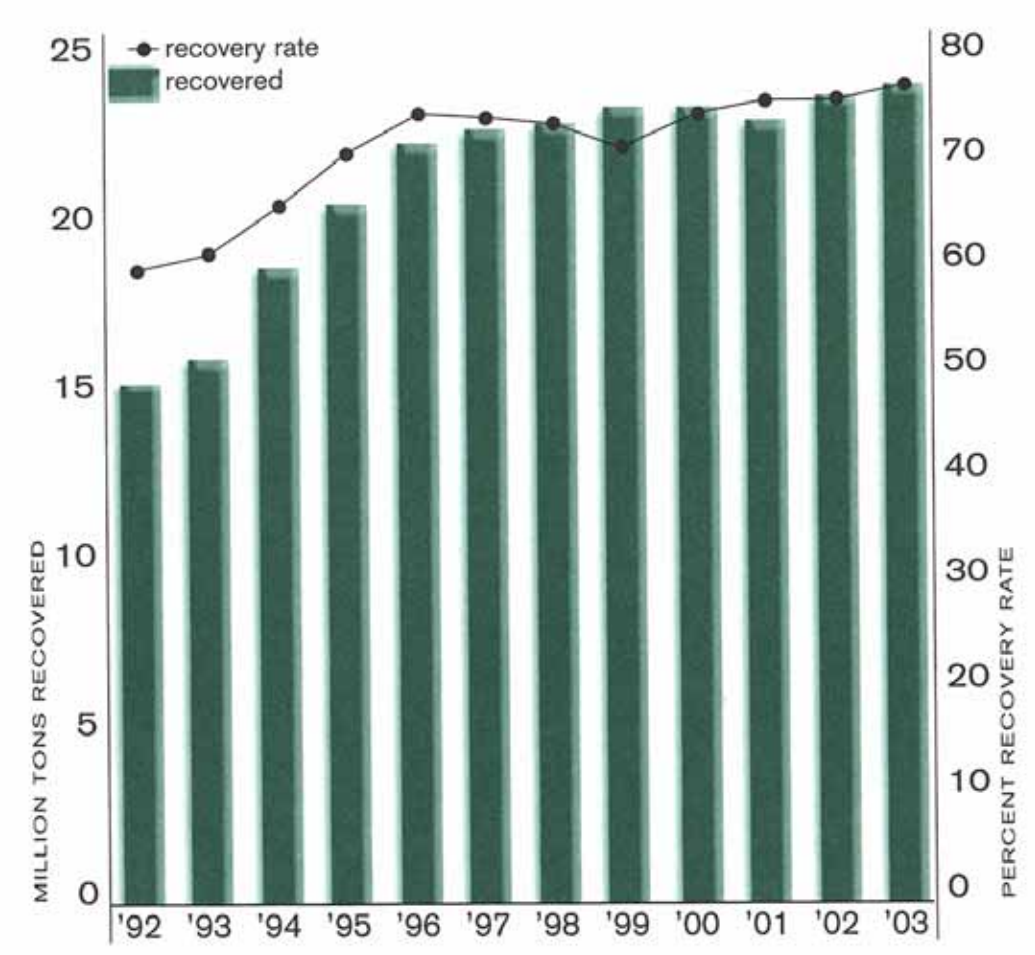
Downcycling

- You say that recycling, as it's currently practiced, is "downcycling." What we call recycling is typically the product losing its quality. Paper gets mixed with other papers, re-chlorinated and contaminated with toxic inks. The fiber length gets shorter, allowing more particles to abrade into the air, where they get into your lungs and nasal passages, and cause irritation. And you end up with gray, fuzzy stuff that doesn't really work for you. That's downcycling.

  -Cradle to Cradle

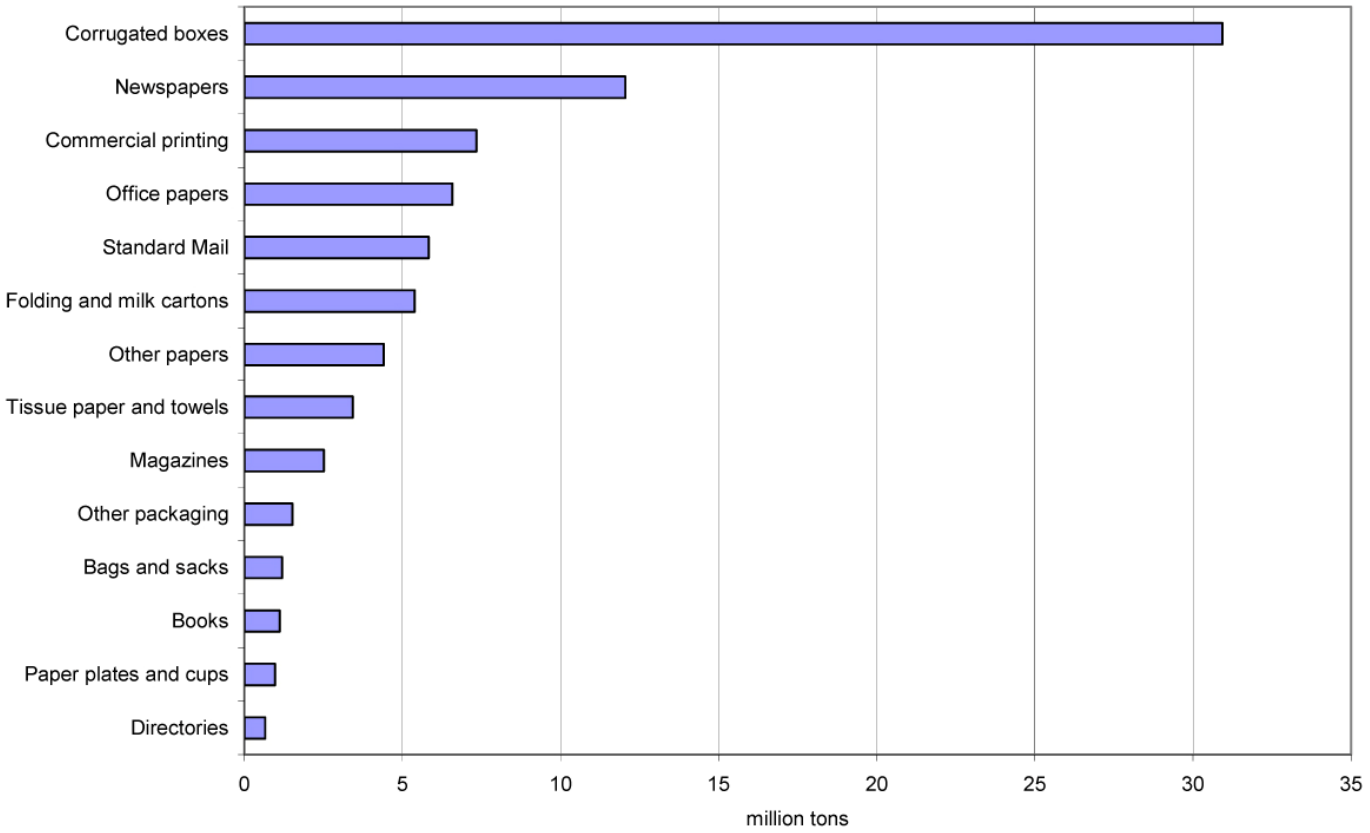
Recovery and Use of Old Corrugated Containers (OCC)

Recovery of old corrugated containers rose 2.2% in 2003 to a record-high 23.7 million tons. The recovery rate for OCC approached 76% in 2003, up from 54% in 1990.

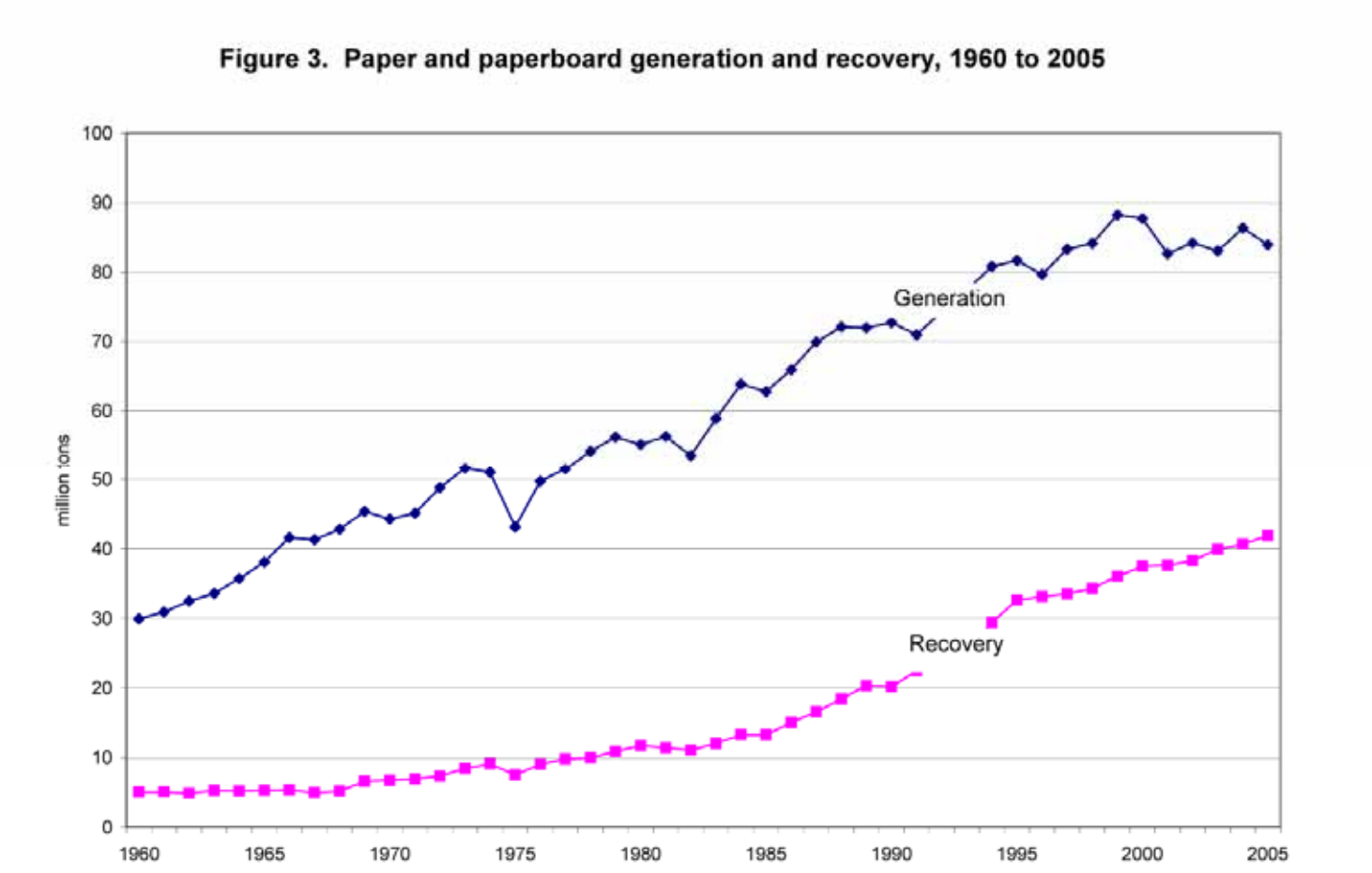


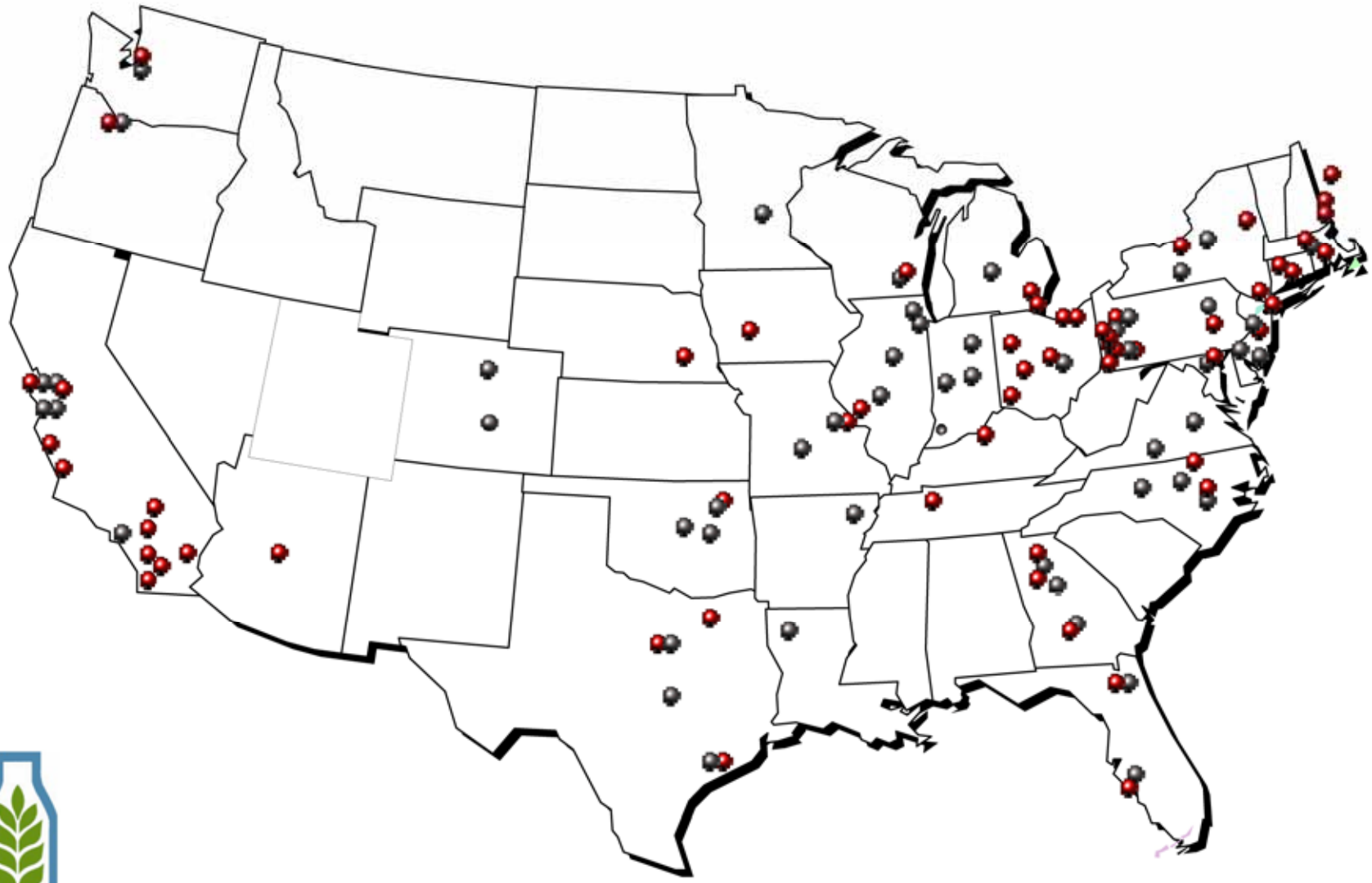
These stats do not include internal (trade) recovery and recycling

Figure 2. Paper and paperboard products generated in MSW, 2005

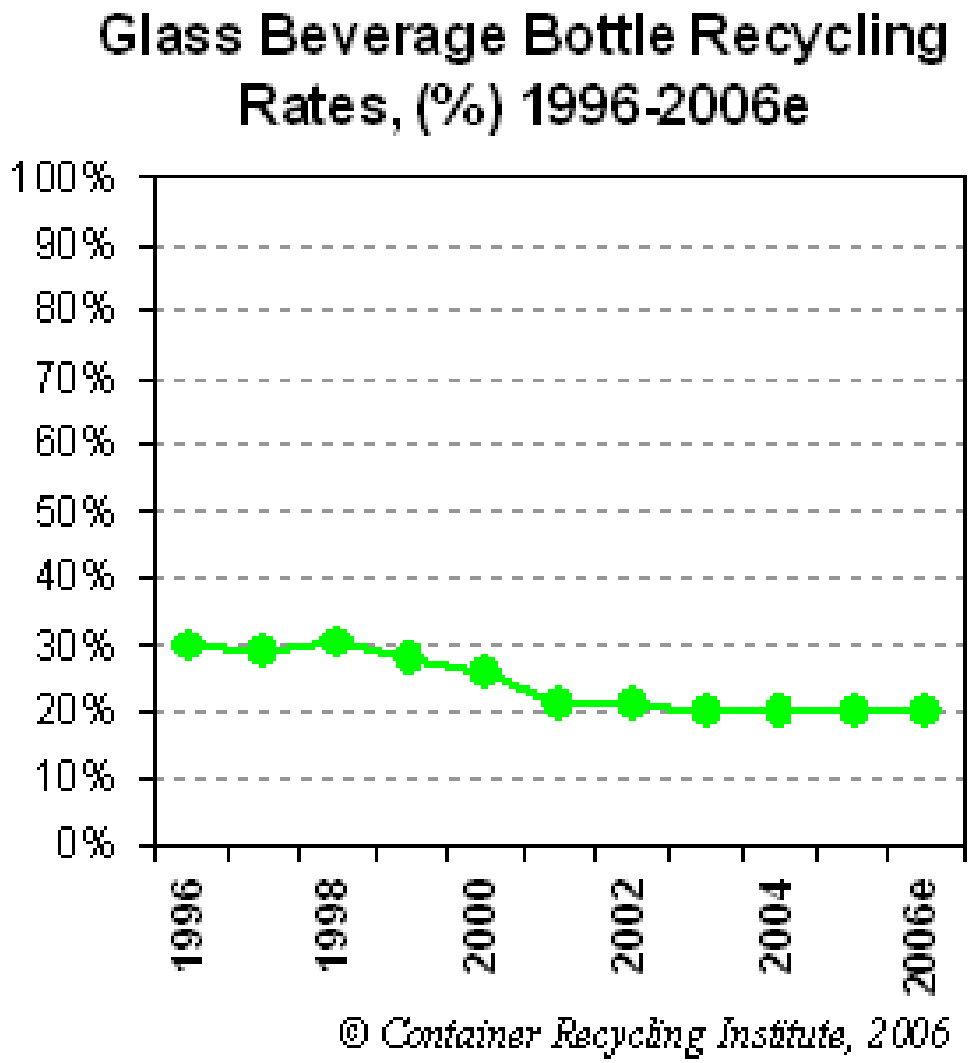


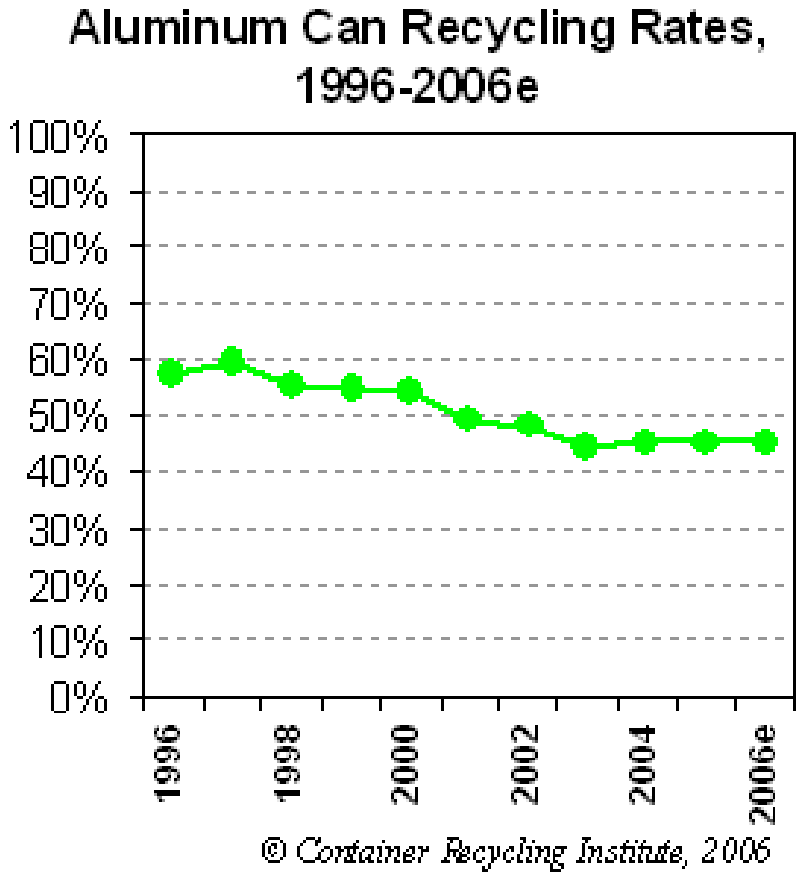
Paper recovery grows at same rate as trashed paper.



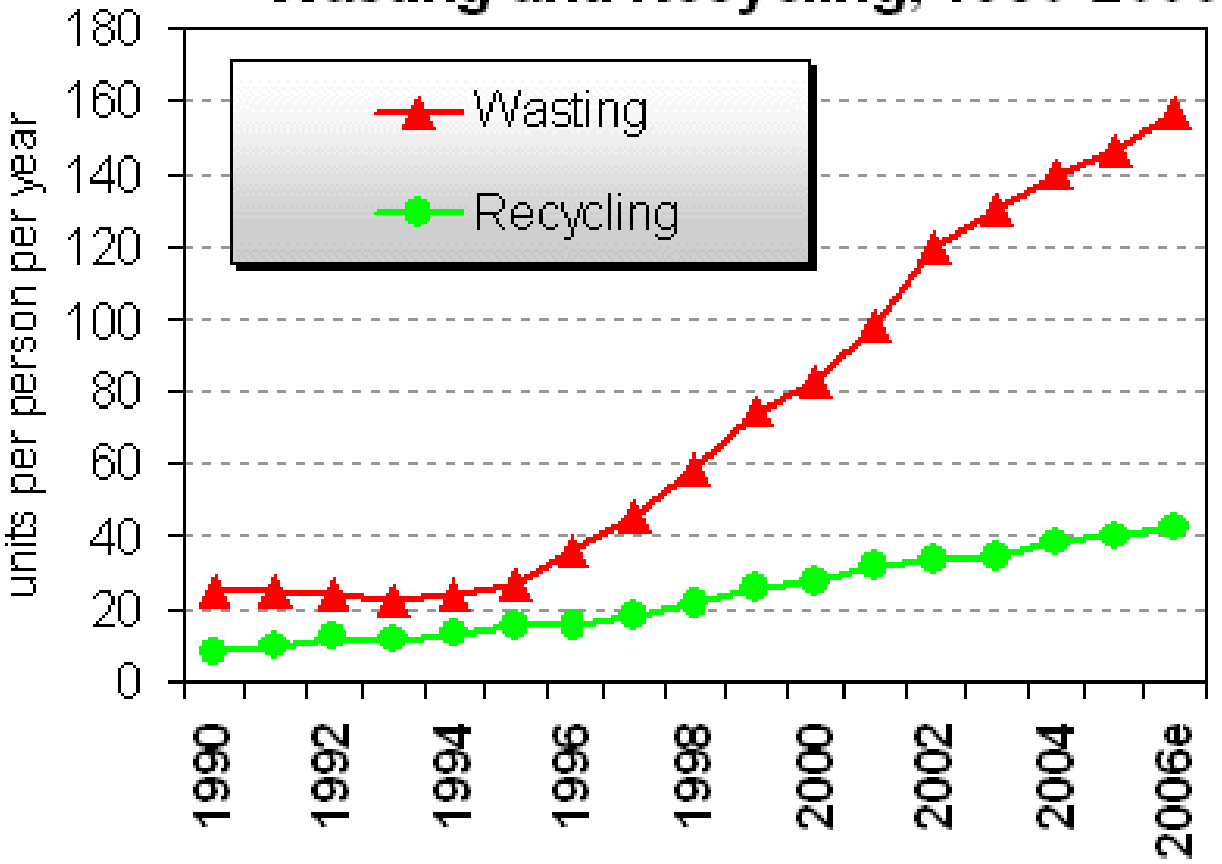


glass packaging institute


Glass Beverage Bottle Recycling Rates, (%) 1996-2006e
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1996
1998
2000
2002
2004
2006e
© Container Recycling Institute, 2006

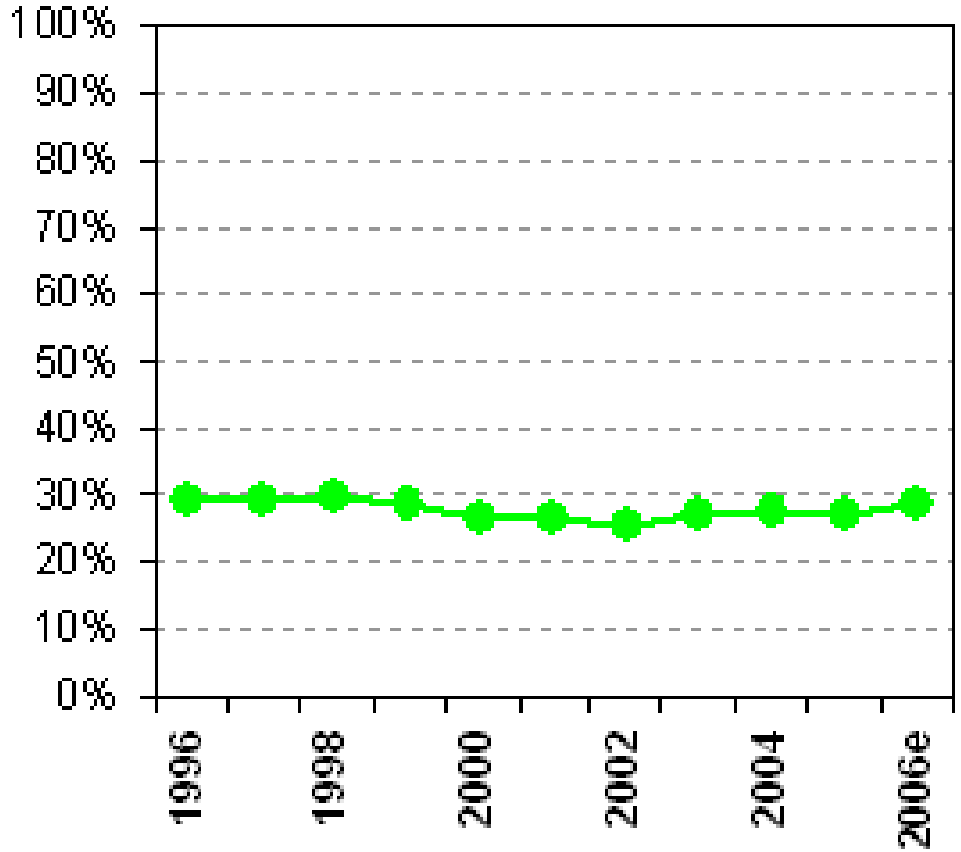

Aluminum Can Recycling Rates,
1996-2006e
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1996
1998
2000
2002
2004
2006e
© Container Recycling Institute, 2006

Per Capita PET Beverage Bottle Wasting and Recycling, 1990-2006

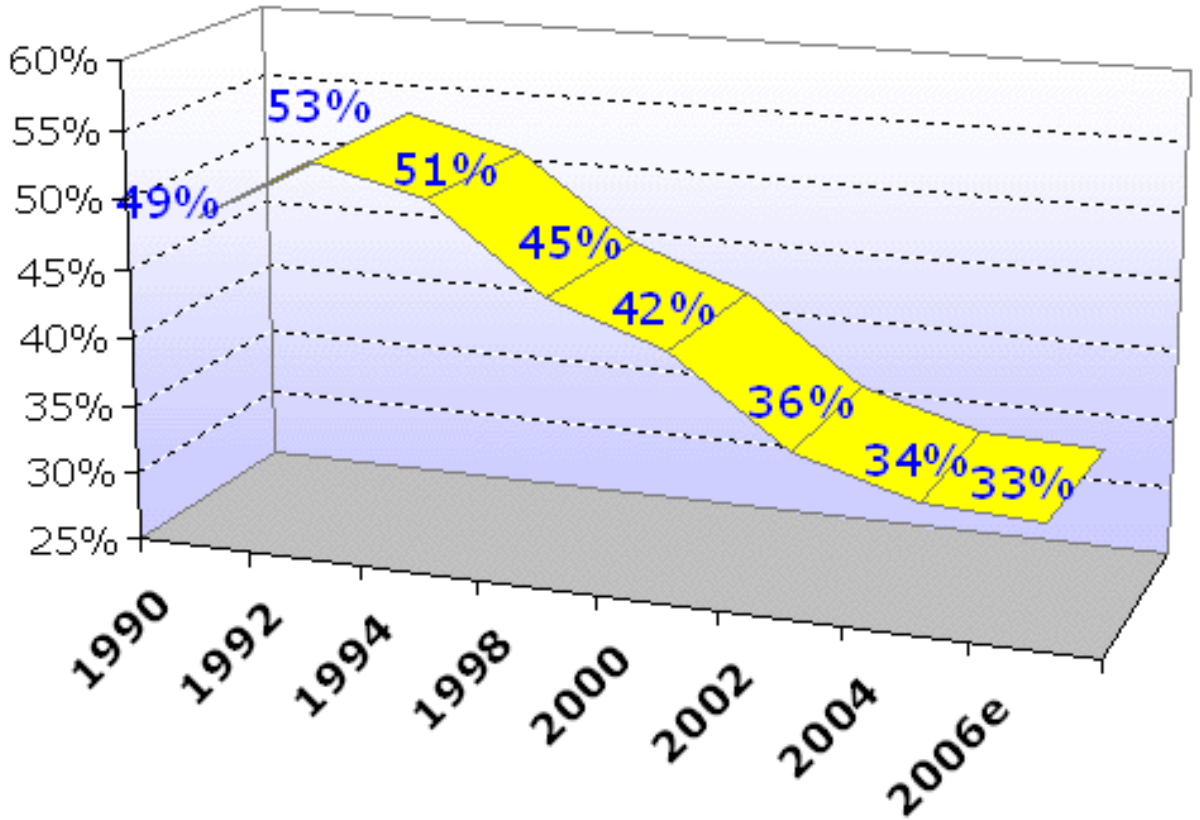


Source: data derived from the American Plastics Council and the National Association of PET Container Resources.

HDPE Plastic Beverage Bottle Recycling Rates, (%) 1996-2006e



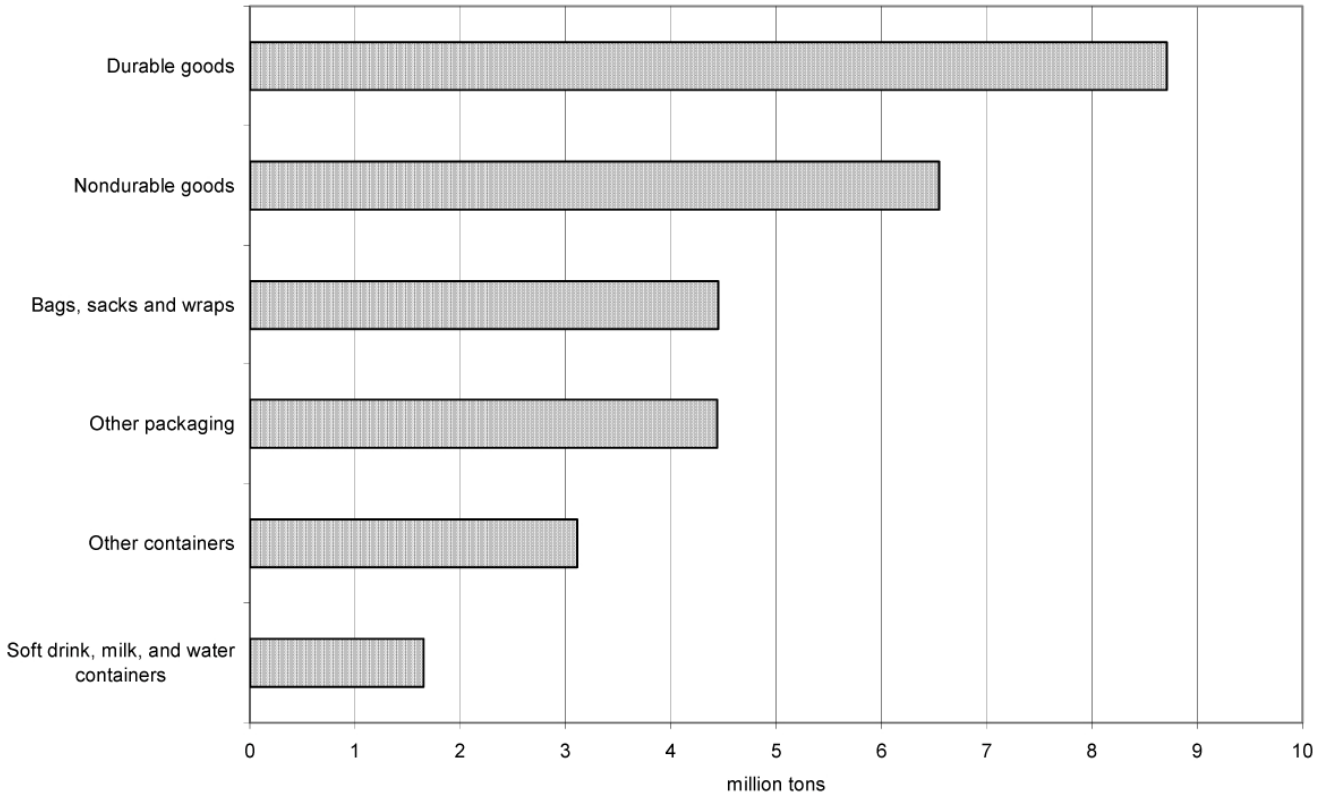
Overall Beverage Container Recycling Rate in the United States, 1990-2006

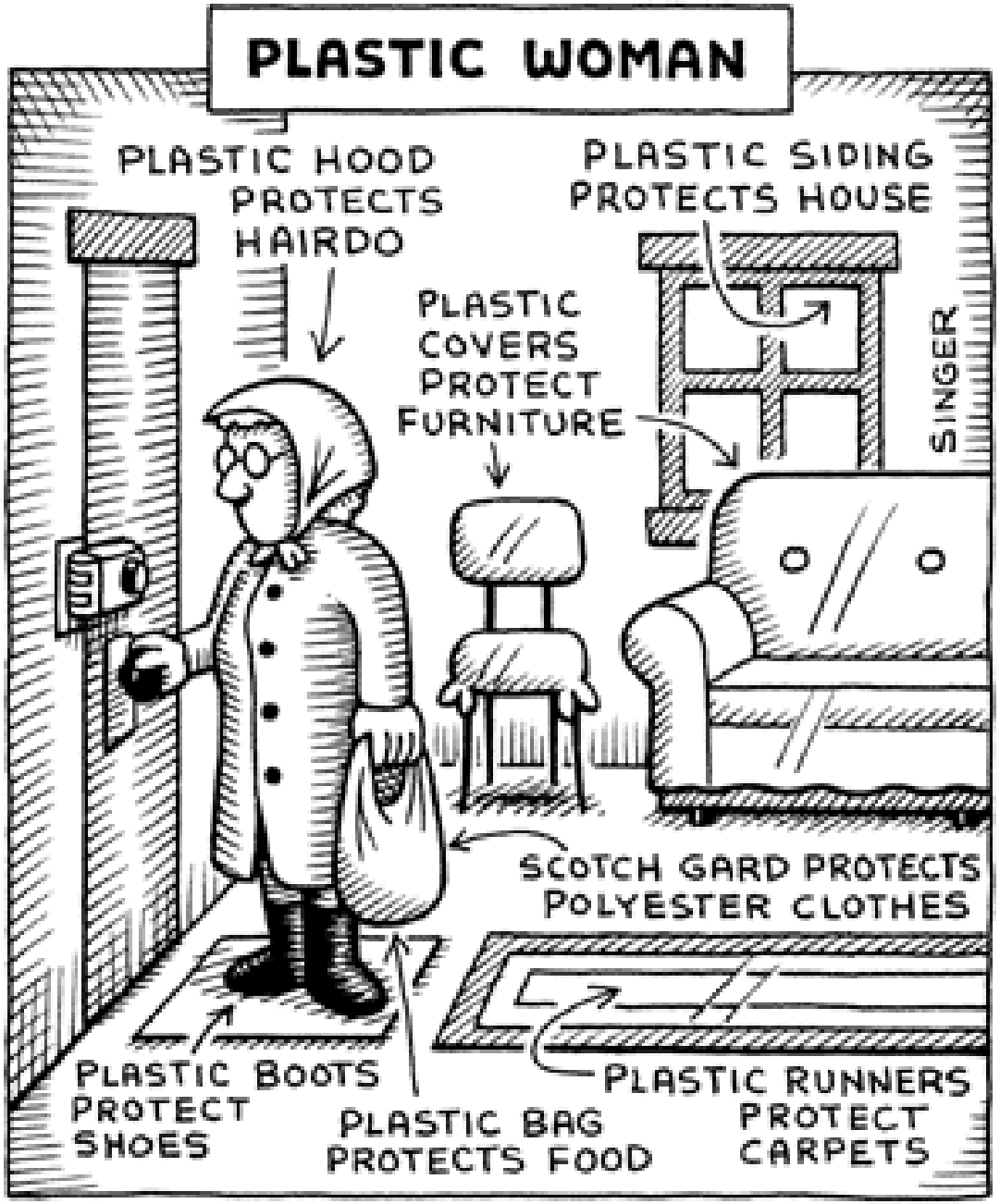


CRI data derived from Aluminum Association, U.S. Commerce Dept., U.S. EPA Office of Solid Waste, American Plastics Council, National Association of PET Container Resources. Indudes aluminum, steel, glass, PET plastic, HDPE plastic. Includes dairy.

Plastic Trash Generation

Figure 8. Plastics products generated in MSW, 2005




PLASTIC WOMAN
PLASTIC HOOD PROTECTS HAIRDO
PLASTIC SIDING PROTECTS HOUSE
PLASTIC COVERS PROTECT FURNITURE
SINGER
SCOTCH GARD PROTECTS POLYESTER CLOTHES
PLASTIC BOOTS PROTECT SHOES
PLASTIC BAG PROTECTS FOOD
PLASTIC RUNNERS PROTECT CARPETS

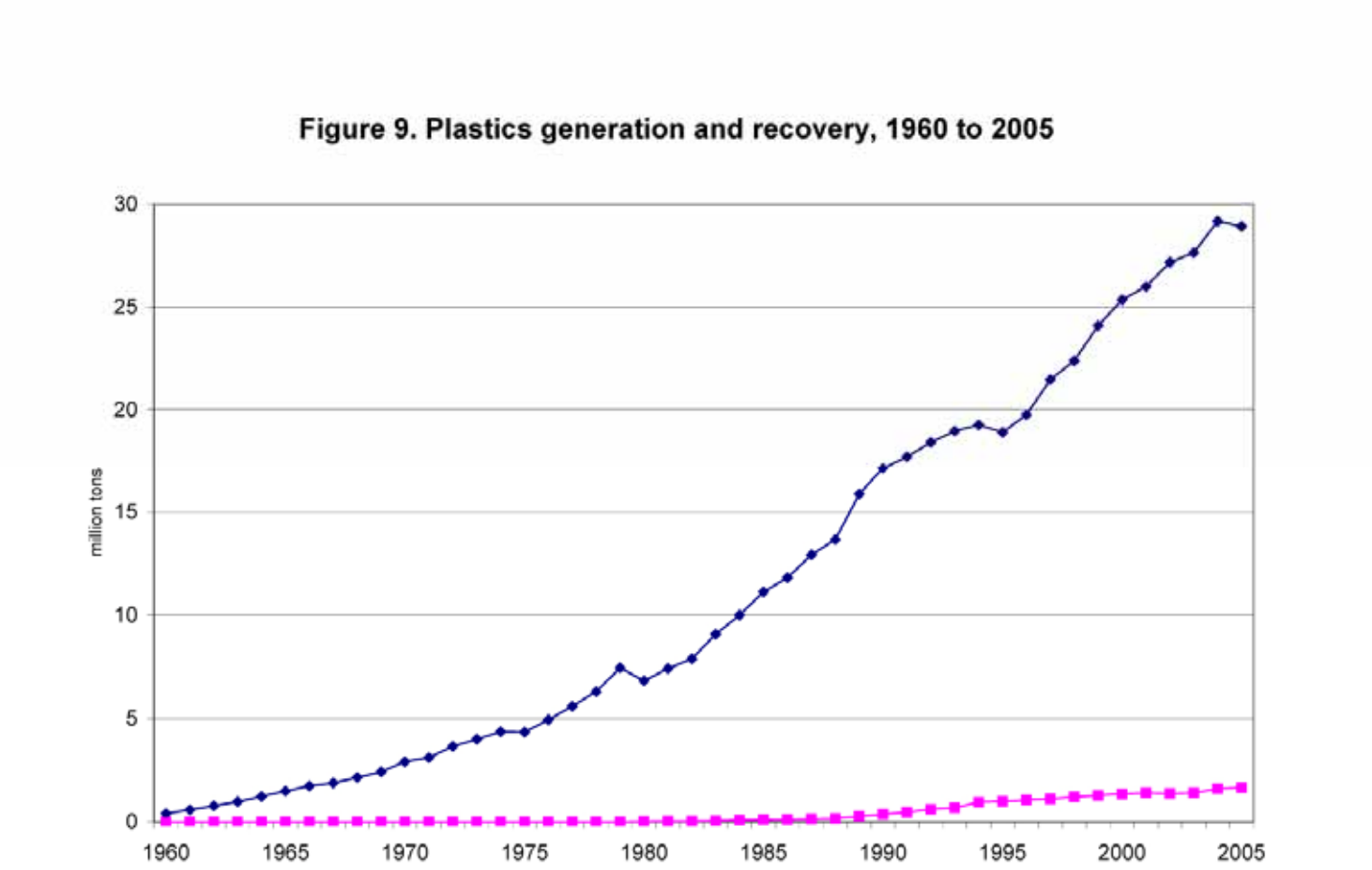
Hydrocarbon Plastics – (The Myth of) the Chasing Arrows

Recycle Logos

Here's what the numbers represent:

#1 - Polyethylene Terephthalate (PET)
#2 - High Density Polyethylene (HDPE)
#3 - Vinyl (Polyvinyl Chloride or PVC)
#4 - Low Density Polyethylene (LDPE)
#5 - Polypropylene (PP)
#6 - Polystyrene (PS)
#7 - Other (which commonly includes: Polycarbonate, ABS, Nylon, Acrylic or a composite of 2 or more resins)

Plastics generated and recovered



Only 4.2% of Durable Fossil Plastics get recycled.

Table 7

PLASTICS IN PRODUCTS IN MSW, 2005
(In thousands of tons, and percent of generation by resin)

Product Category	Generation (Thousand tons)	Recovery (Thousand tons)	Recovery (Percent of Gen.)	Discards (Thousand tons)
Durable Goods				
PET	480			
HDPE	650			
PVC	510			
LDPE/LLDPE	770			
PP	1,370			
PS	730			
Other resins	4,200			
Total Plastics in Durable Goods	8,710	370	4.2%	8,340

Rigid Fossil Plastics: only #1 (PET) and #2 (HDPE) get recycled.

PLASTICS IN PRODUCTS IN MSW, 2005
(In thousands of tons, and percent of generation by resin)

Product Category	Generation (Thousand tons)	Recovery (Thousand tons)	Recovery (Percent of Gen.)	Discards (Thousand tons)
Plastic Containers & Packaging				
Soft drink bottles				
PET	850	290	34.1%	560
Milk and water bottles				
HDPE	800	230	28.8%	570
Other plastic containers				
PET	1,040	210		830
HDPE	1,410	230		1,180
PVC	90			90
LDPE/LLDPE	40			40
PP	80			80
PS	0			0
Other resins	450			450
Subtotal Other Containers	3,110	440	14.1%	2,670

Fossil Plastics Film: only #4 and #2 get recycled

PLASTICS IN PRODUCTS IN MSW, 2005
(In thousands of tons, and percent of generation by resin)

Product Category	Generation (Thousand tons)	Recovery (Thousand tons)	Recovery (Percent of Gen.)	Discards (Thousand tons)
Bags, sacks, & wraps				
HDPE	790	40		750
PVC	70			70
LDPE/LLDPE	2,680	190		2,490
PP	710			710
PS	0			0
Other resins	200			200
Subtotal Bags, Sacks, & Wraps	4,450	230	5.2%	4,220
Other Plastics Packaging**				
PET	250	40		210
HDPE	1,530	20		1,510
PVC	310			310
LDPE/LLDPE	530			530
PP	940	10		930
PS	350			350
Other resins	530	20		510
Subtotal Other Packaging	4,440	90	2.0%	4,350

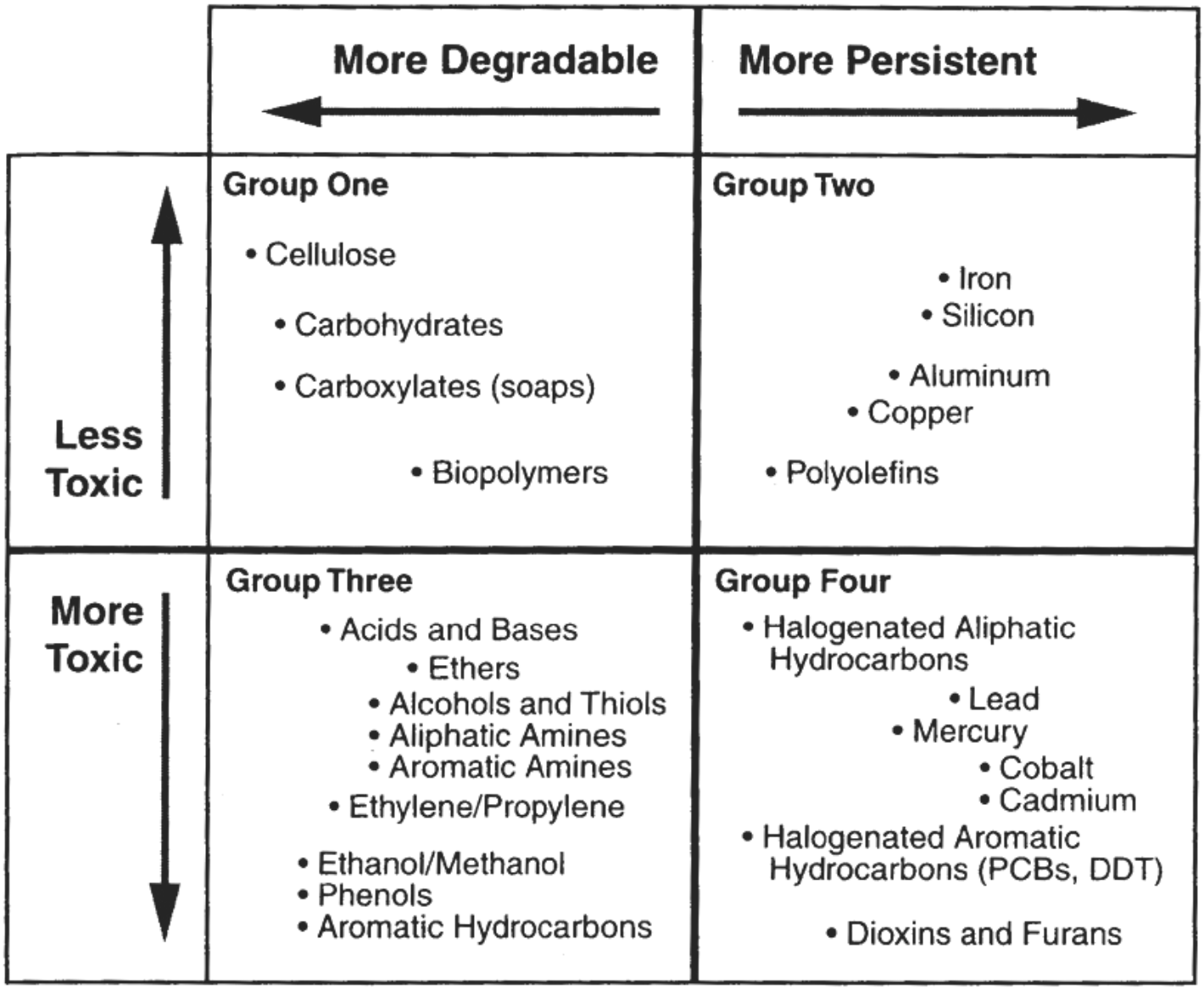
Plastics recovery: no PVC (#3) or PS (#6)

PLASTICS IN PRODUCTS IN MSW, 2005
(In thousands of tons, and percent of generation by resin)

Product Category	Generation (Thousand tons)	Recovery (Thousand tons)	Recovery (Percent of Gen.)	Discards (Thousand tons)
Total Plastics in Containers & Packaging, by resin				
PET	2,140	540		1,600
HDPE	4,530	520		4,010
PVC	470			470
LDPE/LLDPE	3,250	190		3,060
PP	1,730	10		1,720
PS	350			350
Other resins	1,180	20		1,160
Total Plastics in Cont. & Packaging	13,650	1,280	9.4%	12,370
Total Plastics in MSW, by resin				
PET	2,860	540		2,320
HDPE	5,890	520		5,370
PVC	1,640			1,640
LDPE/LLDPE	6,450	190		6,260
PP	4,000	10		3,990
PS	2,590			2,590
Other resins	5,480	390		5,090
Total Plastics in MSW	28,910	1,650	5.7%	27,260

Moving Materials Towards Sustainability

The following matrix describes a way to think about all the materials on earth. They range from very toxic and very persistent, to non-toxic and compostable. Sustainability implies making group four obsolete, and making group one the primary operating realm.


More Degradable
More Persistent
Group One
• Cellulose
• Carbohydrates
• Carboxylates (soaps)
• Biopolymers
Group Two
• Iron
• Silicon
• Aluminum
• Copper
• Polyolefins
Less Toxic
More Toxic
Group Three
• Acids and Bases
• Ethers
• Alcohols and Thiols
• Aliphatic Amines
• Aromatic Amines
• Ethylene/Propylene
• Ethanol/Methanol
• Phenols
• Aromatic Hydrocarbons
Group Four
• Halogenated Aliphatic Hydrocarbons
• Lead
• Mercury
• Cobalt
• Cadmium
• Halogenated Aromatic Hydrocarbons (PCBs, DDT)
• Dioxins and Furans

PLA is a molecule, not a brand.
(Polylactic acid **or** Polylactide)

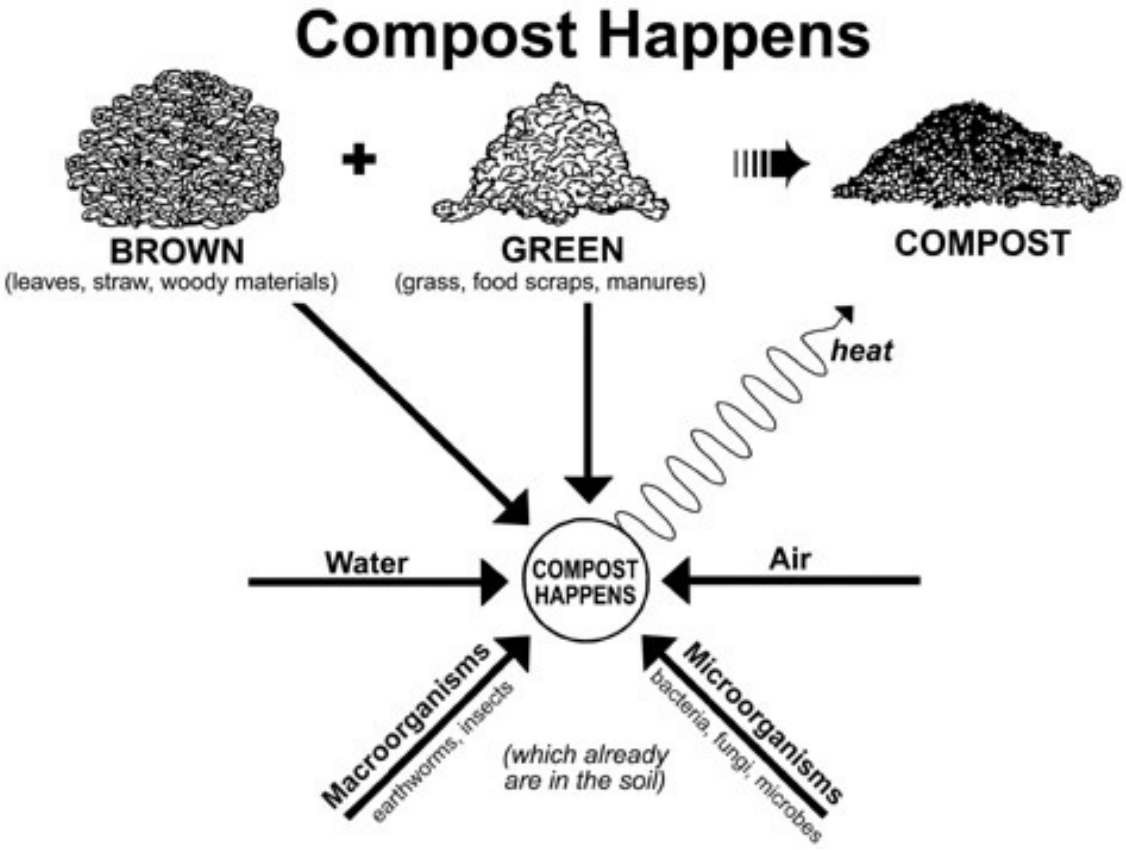
- PHA, & PHB are also molecules.
- Green cell based “bioplastics”
- Also synthetic and biobased hybrids that refer to themselves as “green”
- Certified compostable: BPI, DinCertco, etc.
- Goal: non-GMO crop source

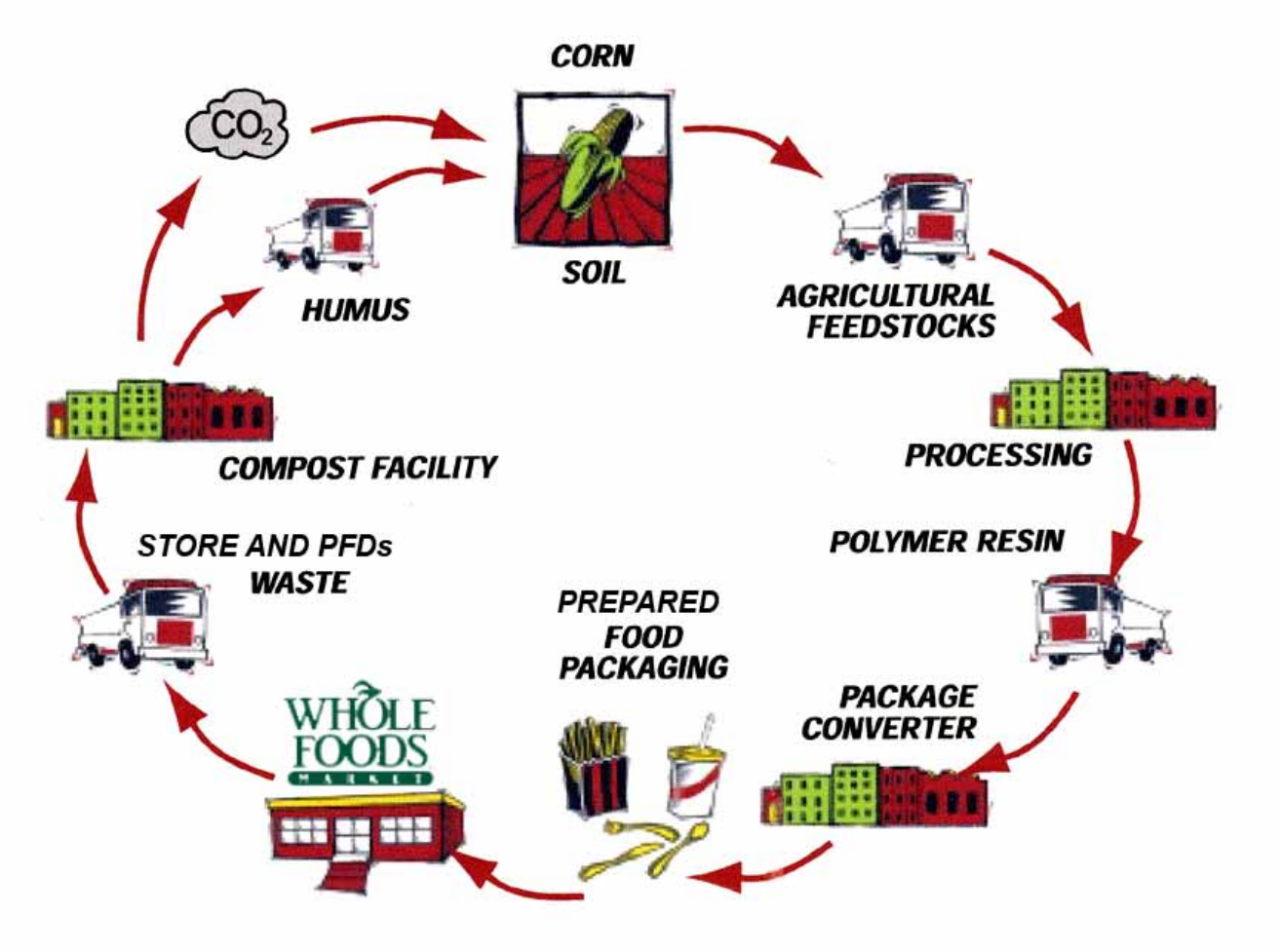
Compostable plastics deserve their own identity and number.

What is industrial-scale composting?

- Large-scale facilities designed to process organic “wastes” into stable, humified and re-usable products which can be used in landscaping, horticulture and agriculture and a number of specialized applications
- Controlled decomposition of organic “wastes” with minimum impacton air, soil and water quality
- Hot composting process –achieve pasteurization of materials (>60°C)
- Key infrastructure to recycle organic “wastes” into re-usable products, and to reduce our dependence on landfilling
- Facilities designed to process organic materials on a regional basis from municipal, commercial / industrial and construction/ demolition sources

Food wastes blend with yard wastes.

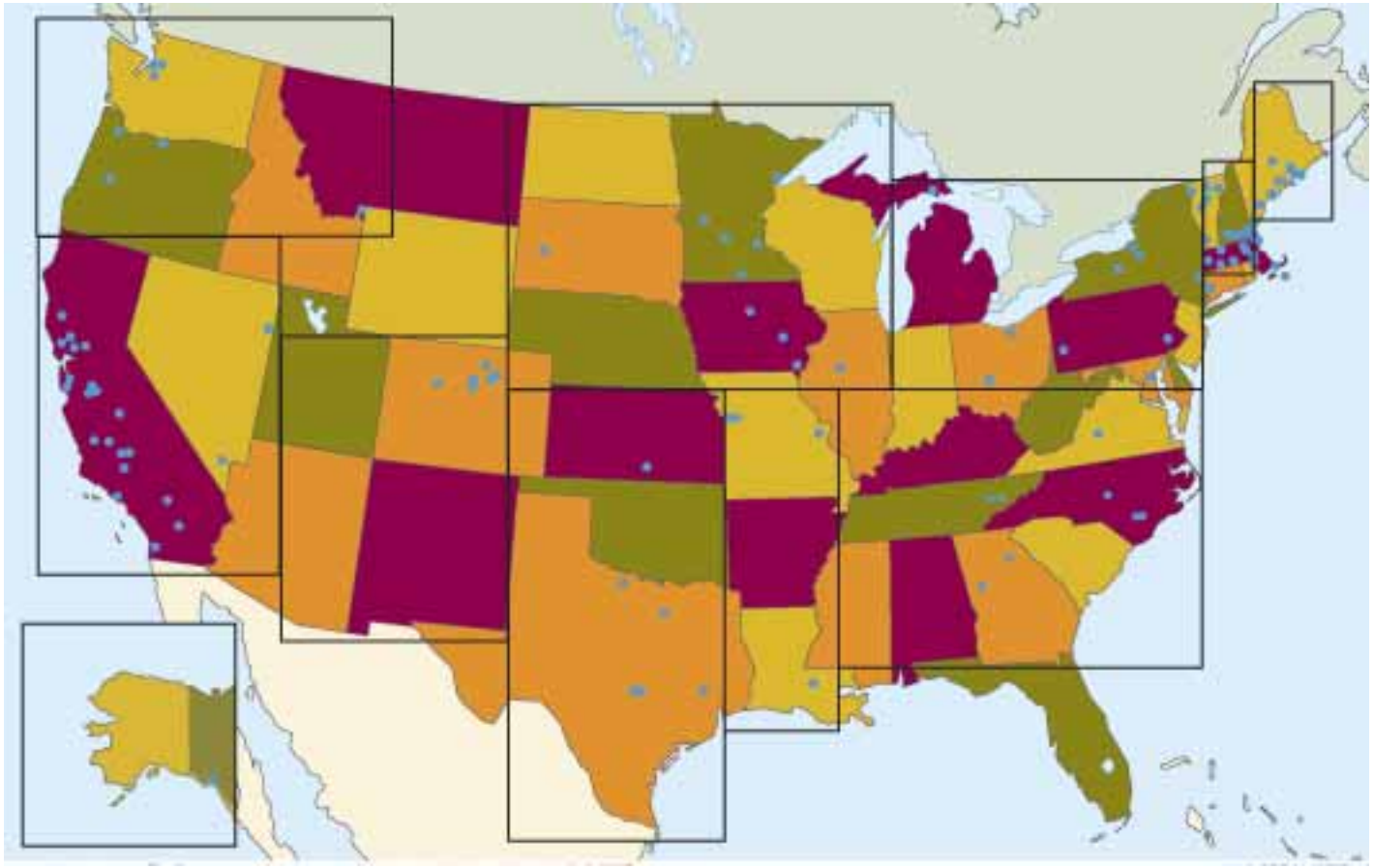




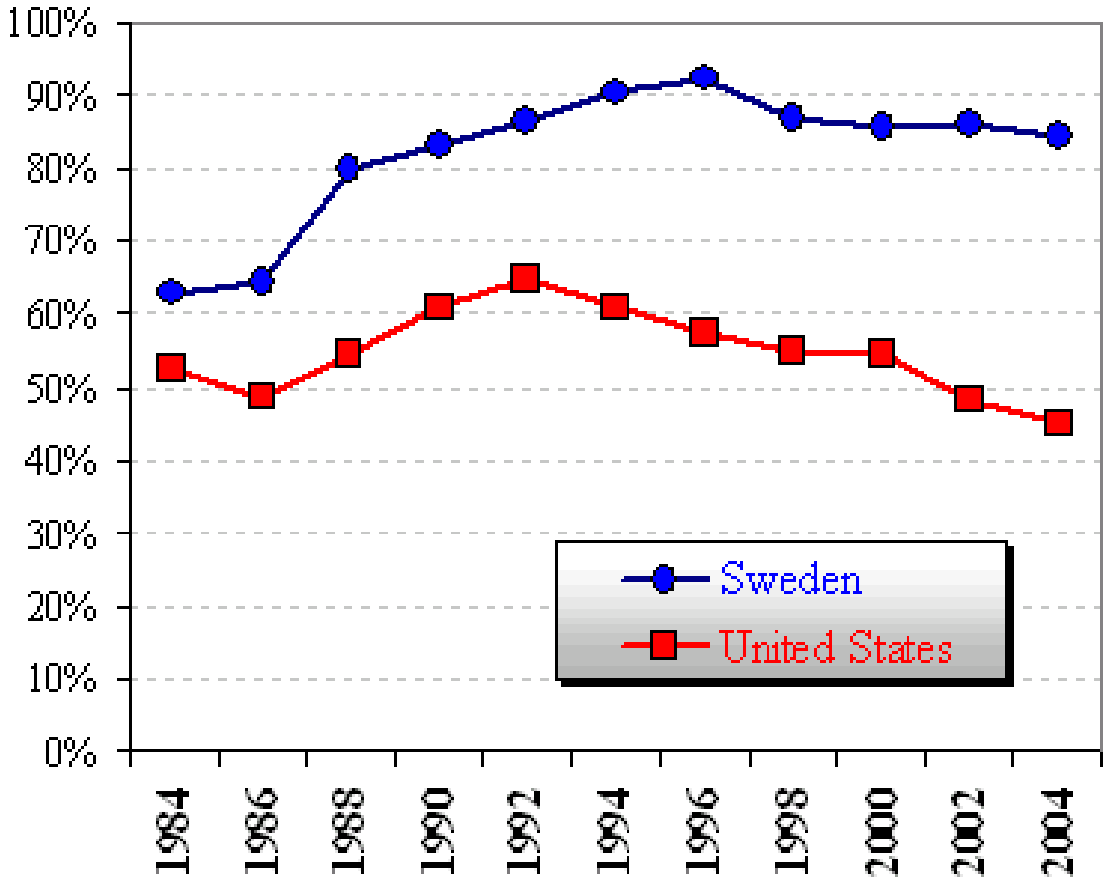
The Green Cell Packaging Cycle

This is an example of moving towards group one.

Food Composting Facilities

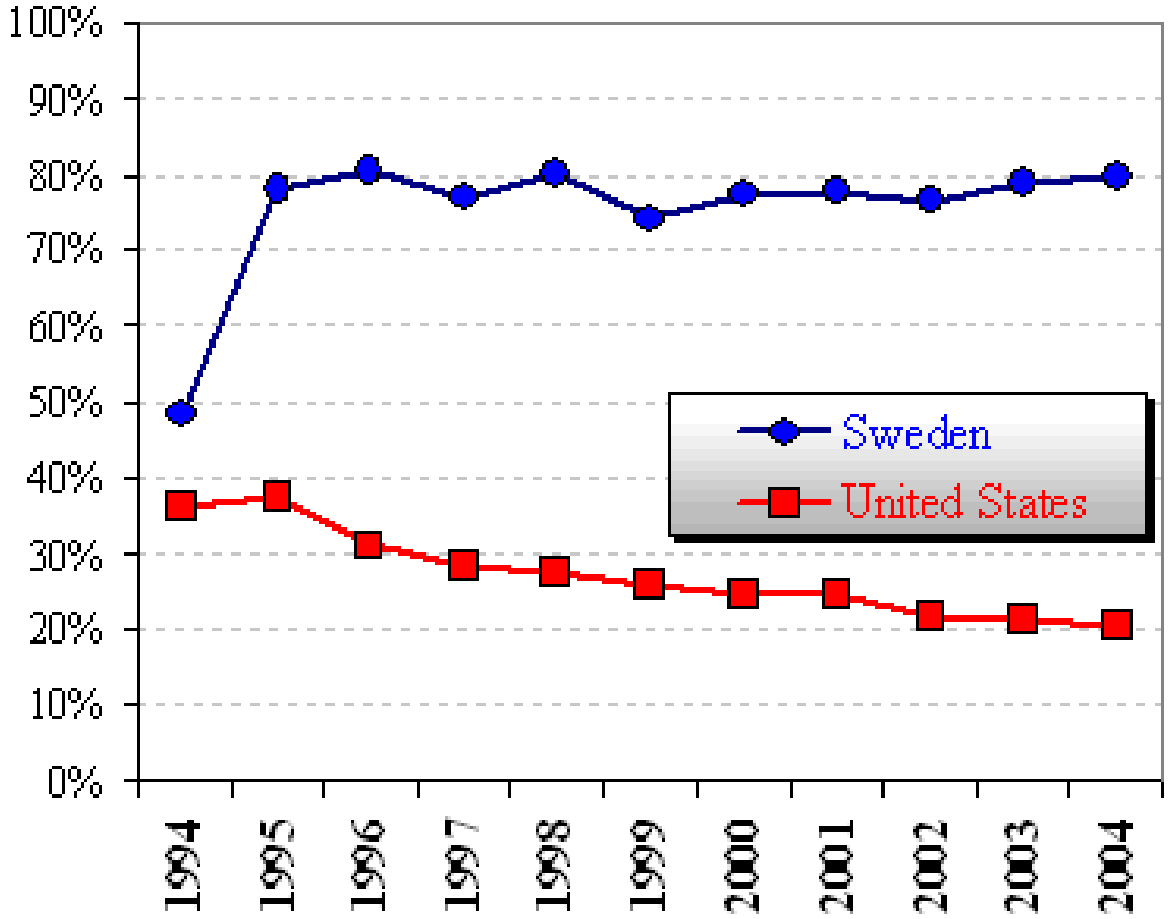


Deposits Work



Sources: The Aluminum Association; U.S. Department of Commerce; AB Svenska Returpack.

Plastic Bottle Recycling Rates



Sources: US data derived from NAPCOR and the American Plastics Council; Swedish data from AB Svenska Returpack

Reuse works.

Refillable container materials. Refillable bottles can be made from glass and from several types of plastics, the most common of which is polyethylene terephthalate (PET). Soft drinks, water, and beer come in refillable PET bottles. Polyethylene naphthalate (PEN), which is superior to PET in many ways, is being used for refillable beer bottles in Denmark. Refillable bottles can also be made of high-density polyethylene (HDPE), which is commonly used for one-way milk and water jugs and commonly called #2 plastic. For refillable plastic milk bottles, however, many dairies who operate refilling systems have used polycarbonate (PC) rather than HDPE.

Redesign

Rethink

Reduce

Reuse

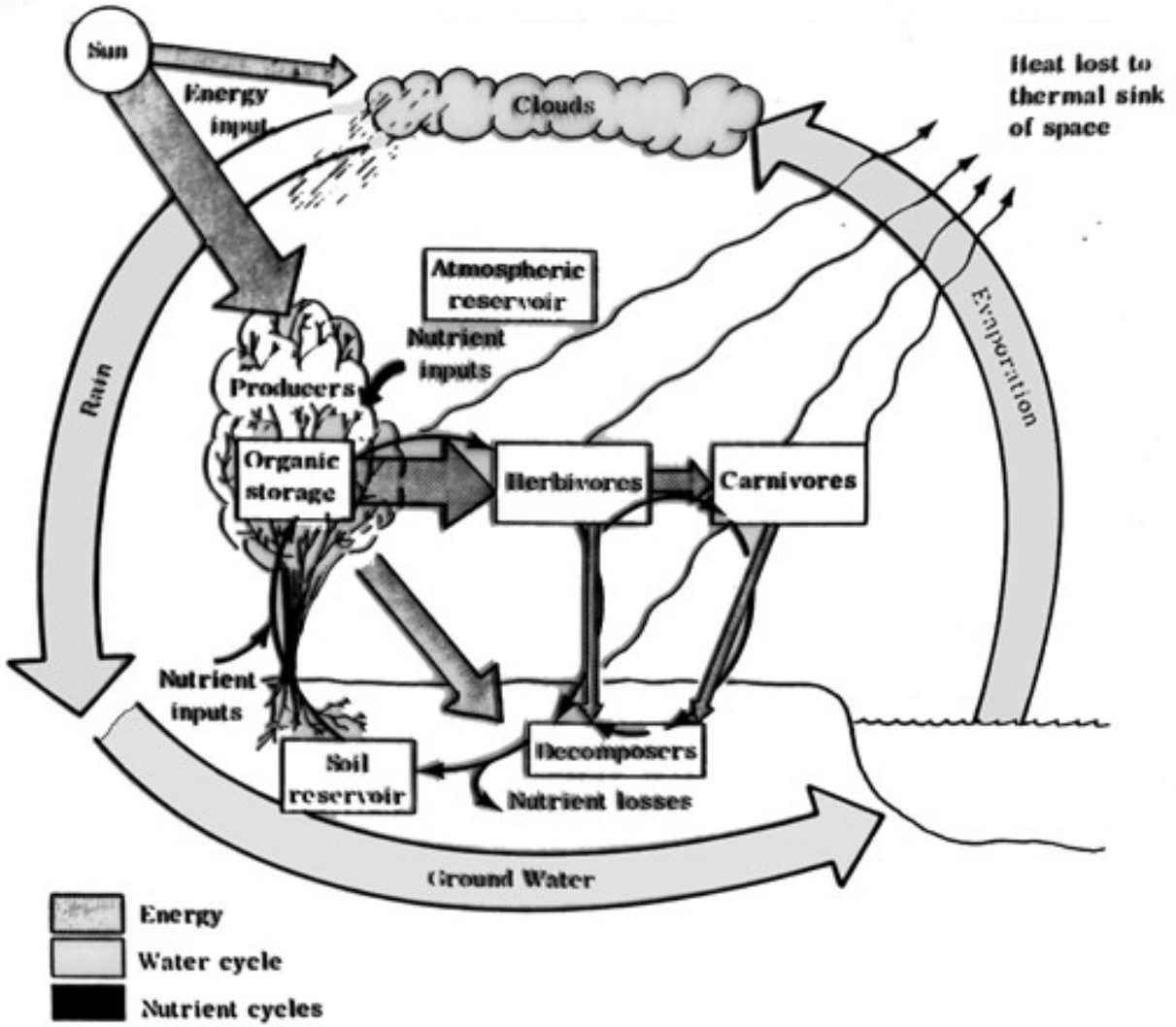
Recycle

Anticipatory Design

- “Significant competitive advantage lies with those organizations and individuals who anticipate well in turbulent times.”

  - Peter Drucker

The simple idea is to redesign commerce so that it mimics these ecological cycles.



A model showing the flow of energy, the cycling of water, and the association of biogeochemical cycles with both

Major change: A Paradigm Shift

- Industrial >> informed-ecological
- Ancient sunlight >> current sunlight
- Scarce resources >> regenerative resource
- Disposable >> recyclable and/or compostable
- Chemical Agriculture >> Organic Agriculture's Principles
- Reactive to the past >> anticipate the future needs
- Short term results >> long term planning

Infrastructure:

The lack of an infrastructure to close the technical and biological loop present huge challenges to sustainable packaging. This includes few industrial-scale composting systems, many different plastics in the waste stream, sorting problems, underfunded local government programs, etc.

What steps could the grocery industry take to address this "system" issue?

Trimtab Factors

- Industrial Subsidies head to zero
- Green accounting replaces GNP etc.
- Account for carbon, water, nitrogen, phosphorous, and oxygen cycles
- Goal is to understand

  human ecological footprint

Tom Wright
Sustainable Bizness Practices

925-376-0327

Green Mission Project
www.sustainablebizness.com