INTRODUCTION TO RECYCLING

A guidebook to the field for the newly-appointed recycling official

by Arthur R. Boone


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INTRODUCTION TO THE SECOND EDITION

Outside of the academic world (and maybe including them too), I have probably taught more people working in recycling about the basics of recycling than anyone else in the USA. I started teaching recycling topics about 1988 and got serious about it in 1996 when I realized that a lot of people attending our more advanced conferences did not have a command of the basic information in our field.

In the summer of 1997 I wrote an earlier version of this material which has been on the website of the Northern California Recycling Association since about 2001. In the spring of 2006 I received a small grant from the Altamont Education Advisory Board to update my written text and what follows is that work.

As to its length, about 40% of this second edition is based on teaching materials that I have developed since 1997; I would have preferred a shorter text but it seems that innovation and refinements are everywhere in this still-emerging field and I left in anything I thought was important. There is no careful analysis of the economics of recycling, it hasn’t been my interest and my thoughts in chapter eight I recognize as a little thin.

I have often remarked that anyone working full-time in recycling should know within 18 months of their date of hire everything that’s in this book, but my experience has been that this assumption is in error. We all start work in recycling actually knowing very little and are frequently excused by the press of daily business from learning all we could. May this book shorten the time from your date of hire to when you know what you’re doing; think of it as basic training in a chair.

The preface from the first edition (with revisions) is included in this text as Appendix D, and, if you’re interested, you’re welcome to learn more there of my background and history. If you’re really new to recycling, some of the discussions of key words and phrases found in Appendix B should be read before you start the text.

Best wishes for your work and career in recycling; we have begun a mighty act.

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Chapter one: - 2nd edition
MATERIALS CONSERVATION CYCLE:
A CIRCLE OF MOVEMENT

In about 1989, a friend at my church, a second grade teacher in San Leandro, asked me to talk to her students about recycling. I got to her class a little early and walked about the room while she had them working on something else. On one wall was a crude diagram made with poster paints of the water cycle: streams coming down off the mountain and flowing into the sea, evaporation taking water up from the ocean, clouds drifting over the mountains and dropping down rain. On another wall was an equally simple drawing in poster paints of the oxygen-carbon dioxide cycle: on the left was a boy and a bunny rabbit breathing out carbon dioxide and on the right was a tree (with red fruit as I remember) breathing out oxygen; the word respiration and the other big word were written in big letters. No other similar posters in the room.

When it go to be my time to go on with the students, I asked the kids where the materials cycle was; I reminded them of the water cycle and the air cycle but asked where the solids cycle was. After a few more questions they finally got the point that I was talking about creatures, that creatures are born, they flourish, they die, they rot, and their materials come back in some other form. The materials cycle looks like this.

Insert Drawing #0

What we frequently forget is that this is how the earth has been from the beginning; as soon as creatures came to be on this “island home,” they were born, flourished, died, and rotted. All the remains of all the fauna and flora have degraded into simple molecules and in many cases been taken up by later creatures. “I could have a piece of a dinosaur in my leg,” my five year old once exclaimed; she got the point.

For better or worse, human beings made a dramatic impact on the world on which they live during the several million years of our existence (I trust the creationists will excuse me). As our species developed, our brain power increased and our ability to transform our environment grew. One writer characterized us as homo faber, man the builder, the maker. It was not always so; in our hunting-and-gathering days we wandered the earth, looking to find things to eat, to clothe ourselves with, and to provide shelter (protection from our enemies and the weather). By dint of our intelligence and opposable thumbs, we have achieved impressive power. It was not always so. We were originally, simply, humankind:
As human society became more complex, more inter-related, with the division of labor creating occupations in which human beings specialized in various crafts and tasks, as people organized multi-group structures to provide governance and to secure order, we came to think of ourselves as citizens and as consumers:

Encouraged by the more complex social systems, such things as cash money, contracts, etc., it became possible to develop a long chain of activities moving and enhancing materials for which we are visualized and in fact become customers: all over the world people are taking raw materials from fields, forests, and mines, first converting them by industrial processes to finished materials, and, secondly, making things (the end products of the manufacturing ventures) from these materials that people will someday buy, and, thirdly, moving those finished goods through the distribution chain to warehouses (wholesale) and ultimately to retail operations where we as citizens and consumers buy what we want and what we think we need. Collectively, this activity is our economy and it is one half of the great materials movement cycle.

It’s easy to forget when getting busy in your own field that what the economy consists of is extracting, manufacturing, assembling, shipping, storing and selling goods. Measuring that activity is measuring the gross national product; it’s what we do. And there are more and more of us all the time:

The growth of human populations, from 300 million in one A.D. to one billion in 1900 to 6 billion in 2000 is a major event in human history. Taken together, the increasing population of the world and the increasing ability to extract from the natural world the things we want to buy to eat, to clothe ourselves and to shelter ourselves, these two facts of human history create a major change on the planet on which we live.

Aside #1: Some people say that the goods sector of our economy is shrinking and the services side is increasing. I would suggest that for our purposes here, that claimed fact is irrelevant. Despite all the attention devoted to the growing service economy, much of what we think of as a service activity is really based on a goods (i.e., materials) economy. While you pay a window washer to provide a service, you are really paying him to add materials (water, chemicals, etc.) to your window to remove materials (dirt, grime, etc.) that you don’t want there. When you spend money in a McDonald’s restaurant, it’s charted as a service industry income, but what you’re really paying for is goods: hamburgers, fries, and a soda. Medicine is considered a service industry, but a doctor’s ability to control access to a desired material (pills, ointments, casts, etc.)
is a major key to their market share. Because recycling is intimately involved with all materials, it is integral to the entire society and economy.

The next thing we need to think about is that all of the materials that come into our life will, one day, be discarded. What we ate goes out as urine, feces and sweat. For our clothing, none of us has the diapers we wore as a baby, very few of us have the clothes we wore as children, and the box our baby cereal came in is long gone. At least three of the houses I lived in as a young man have been torn down, some replaced by school buildings, others left as vacant space. We all get rid of things; this is not good or bad, it’s just the nature of mammalian life.

Insert Drawing 5.

The question then becomes what happens to our discards? And there are ultimately two choices: the discarded materials can be treated as a “waste” (a very complicated word that we will discuss in detail later on) and end up in incinerators and landfills or those discarded materials can be treated as a resource and are then moved, bundled together and ultimately find a home in our economy, back over on the left, as an alternative to virgin materials extracted from farms, mines, and forests. This circle of the movement of goods is called the materials conservation cycle, and it mimics the natural solids cycle which I talked about to the children in that second grade class. From a sustainability point of view, recycling in all its features, is a biomimicry (see Appendix B) activity. It looks like this:

Insert Drawing 6:

Making this path for materials, treating them as resources, is the recycler’s project. It’s our job to make sure that discarded materials end up going out as resources rather than as “waste.” For some people this is a difficult concept; it is discussed in greater detail in Appendix B. When the whole created materials cycle is put together, it looks like this:

Insert Drawing 7. (this can take a half a page in size)

The goal of all recycling is to provide for the basic industries (metal, paper, glass, paper, and wood) used materials that they can use in lieu of virgin materials extracted from nature. When we do this we are “closing the loop.” Theologians speak of the end of man, as in “What is his purpose, the reason that he’s here?” Your purpose as a recycler is 1) to make sure that discarded materials are treated as resources and not as wastes, and 2) to oversee the processes whereby discarded materials are moved from the point of discard to where they are ready to be used in lieu of virgin materials. If you do this, you are successful, if you don’t, you aren’t.

Aside #2: Measuring Your Success: The terms used to describe how well the recycling system is functioning are spoken of as the “capture rate” or “recovery rate” or the “diversion rate.” If there were ten million bricks removed from dismantled and torn down buildings last year and five million were put to a beneficial re-use, we would say that there was a capture rate of 50%. There are several different ways to calculate capture or recovery rates and they will be discussed in Chapter Thirteen.
What recyclers mostly do is to control the portion of the materials conservation cycle that we
divide into three different types of activity: a) collections, b) aggregations, and c) processing.
Each of these three areas is very separate and distinct from the other activities and needs to be
understood as such.

a. Collections: The part of recycling we know best is the collections activity. All of the
materials and objects that are no longer desired for use in our society are spread out at the
homes of 300 million people, at 50 million businesses, 150,000 schools, 8,000 hospitals, etc.
The process of getting all those materials from all these different sites to other sites where they
can be aggregated and prepared for the next stage in the cycle is collections and is comparable
to the distribution and retail function of the front side of our materials economy where we get
all those different goods out to all those different retail sites and then get them into the
consumers’ hands.

This work is essentially a trucking task. Anybody who knows how to run a truck can be
involved in this work. To the uninitiated, one trucking company may be as good as any other,
but there are many characteristics other than price that can distinguish the service providers.
When the garbage hauling companies first got into curbside programs, they frequently were
unable to develop good customer relations skills in their route drivers but over time have
improved those skills.

b. Aggregation: The next part of the loop involves unloading the collection trucks, working
over the collected material in a relatively small way, and reloading trucks (or occasionally
railcars) with material for shipment to the factory where the material will be converted into a
material that can be used as a replacement for virgin materials. I have chosen to call this work
aggregating (although many others call it “sorting” or “processing”) because the primary task at
this stage of the materials loop is to get big piles of a similar material ready to move to a
processing facility.

The term “aggregation” is not common in the recycling industry; many people refer to this work
as “sorting” or “processing;” I want to use the term “processing” to describe what is done to
materials in the next portion of the loop. The work performed here is primarily a materials
handling activity and parallels the warehousing activities of the materials-going-out part of the
cycle. It’s not trucking (collections) and it’s not manufacturing (processing). The primary
features of aggregation activities is a large, fixed, covered-space facility operated with forklifts,
balers, and, frequently, conveyors; see Chapters 16 and 17 for details on how aggregation
facilities operate.

c. Processing: The final portion of the recycling part of the loop involves processing large
quantities of used material into a material that can be used as a replacement for virgin materials.
With some materials, this is a fairly simple task; with others it is rather difficult. There are many
fascinating parts to the processing industry, much of it out of the public’s eye. Metal
reprocessing is done primarily by small firms, paper reprocessing by the virgin material
manufacturers, glass was originally done by the big firms but in the 1990s was sold off to
smaller firms that work exclusively in that area. There is no clear indication yet what will be
done with plastics reprocessing, as this activity is still very experimental. (The entire
reprocessing topic is much more thoroughly covered in the next chapter.)

Before leaving the processing area, though, it’s necessary to introduce two important terms:
“contamination” and “residue.” In the ideal world, as the materials flow back to manufacturers for preparation as feedstock for remanufacturing, nothing would be included in the material that could not be used in the finished product. Since most consumer goods are in some way a composite of different materials (a soda bottle includes a paper label and a plastic cap in addition to the glass plus some very sticky glue under the label, an aluminum can is covered with a painted label, cardboard boxes have plastic tape and ink, etc.), it is almost always necessary to (and here choosing the right word gets difficult) process/clean/cleanse/purify what is about to be moved by several different persons from the consumer around the loop to the finished goods manufacturer. At some point all of the mixing of materials that took place in the manufacturing-assembling-distributing part of the loop has to be unmixed.

**CONTAMINATION:** This term is applied to material that is offered to the next person in the loop that fails to meet that next handler’s standard of purity. If the consumer puts plate glass in the curbside bin and the collector has no place for that material, the curbside bin is “contaminated” and somebody, somewhere, has to make sure that the non-conforming material is separated from the bottle and jar glass it has most likely been confused with.

Never underestimate either the complexity of or the energy beneath the question of whose responsibility this cleaning is. Typically, the processor would like the collector and the aggregator to do the cleaning, the collector would like the aggregator and the processor to do all the cleaning, and the aggregator would like the collector and the processor to do all the work. What has developed in practice in each basic industry is a shared set of responsibilities so that each of the separate players knows what is his (or her) job; if the collector fails to perform according to standards, then she is trying to sell a contaminated product, and so on down the line. Successful recycling programs must define contamination standards for each stage of the loop; it doesn’t really matter who does the cleaning, it’s just necessary that at some point it gets done.

**RESIDUE:** Residue is another key word and refers to the material that is left over after the material intended for recycling has been handled at each stage of the loop; residue is material that leaves the loop and must either be disposed of as a waste or re-entered further up the loop for rehandling, reprocessing, etc. Like contamination, there are industry standards for residue at each stage of the loop, and failure to perform according to the standards gets you in trouble. The standards for residue will vary based on materials handling technologies and the markets for cleansed materials. Several examples might suffice: In City A, the curbside driver is supposed to pick up only rigid plastic containers numbered one and two; part of the driver’s job is defined as keeping the other plastics out of the stream. That’s done best by looking at what’s in the curbside bin and leaving the unacceptable materials with the customer. A driver who fails to work according to standards creates more problems for the aggregator and will create more residue at the aggregation center. On the other hand, if the driver is expected to look through each bin before dumping the bin in the truck, then the truck will make 300 and not 500 stops per day and program costs will increase dramatically, so some unsuitable materials will get by.

Another example of residue involves curbside glass programs. Many aggregators experienced 10-20% shrinkage in the glass material because many of the smallest parts of broken bottles would become trash rather than glass plant feedstock. Improved materials handling systems can often reduce glass residue dramatically.

In any case, successful recycling programs must define levels of residue for each stage of the
loop, and the various involved parties (generator, collector, aggregator, and processor) must each do their part to minimize residue.

**SOURCE SEPARATION vs. CENTRALIZED SEPARATION:** One of the great public policy questions in recycling today is who should be responsible for keeping materials out of the so-called waste stream. In America the concept of private property is very strong and it is generally believed that people can put anything they want into the so-called waste stream as long as they pay the bill and the material, if disposed of in a landfill, will not create a nuisance or a public danger. There is another concept among recycling proponents which holds that it is morally good for people to divert materials into the materials conservation loop themselves and that all the energy spent diverting materials from the so-called waste stream should be spent on educating consumers to do the diversion work themselves. Both of these factors encourage what is known in the trade as “source-separation” (abbreviated here as SourceSep) where the consumer who owns the material is responsible for keeping the material out of the so-called waste stream and getting the material into the materials conservation cycle.

In contrast to that position is the argument for centralized separation (abbreviated here as CenSep), where materials are picked up mixed together and the sorting is done at a central facility where the recoverable materials are removed from a mixed materials pile and the goodies are kept from going to a landfill, not by the action of the consumer, but by someone else. This activity is called “centralized separation,” or, frequently, “centralized processing,” but it is not processing as we have defined it here.

There are many virtues to centralized separation: you don’t have to educate a lot of people, only the sorters, when you have a new market for a new material. If people know you’re going through their garbage to recover recyclable materials, they will be more conscientious in keeping their household hazardous wastes out of the garbage (see BIOCYCLE, November, 1966, p. 65). (Chapter Seventeen has some notes about how CenSep is actually done.)

It is now quite common to take mixed loads of discarded materials from commercial establishments and remove the cardboard and wood from the incoming loads. The trucking company charges the customer as if the load were going to a landfill, with perhaps some lowering of the price as a reward to the customer for keeping the bin relatively free of contaminants. The hauler diverts 30-60% of the load and pockets the savings that’s come from paying lower tipping fees at the landfill and gains revenue from selling the recovered material. Hopefully the improved revenue will cover the sorting costs, and the growth of these type facilities nationwide, in many cases without public subsidy, suggests that they are financially feasible.

Speaking against the growth of centralized separation is primarily the old-line recyclers who believe in the moral goodness of source separation. “How will the people learn to do what’s right?” they ask. And I reply (and I have been in the middle of this argument for a long time), “Maybe recycling is too important to be left to consumer choice.” Never underestimate the resistance of old-line recyclers to CenSep; it’s a religious issue to them that they do the separating themselves and any other teaching is heresy.

My favorite analogy to support my position is a reference to the sewer system. Like a garbage system, the value of a sewer system is in getting unsanitary products away from residences. Unfortunately, where you end up dumping all this stuff in the water (a river, a bay, or the
ocean) it gets polluted and you need to take action. One possibility would be to set up a night soil collection route, so that instead of leaving human feces in a toilet bowl we would put them in pots to be collected by trucks for special processing. This would clean up sewage water and reduce pollution. But it would be expensive and cumbersome. So maybe it’s cheaper to build a sewage treatment plant to treat the sewage and avoid polluting the waterways that way. Source separation vs. centralized sorting; it’s a choice, a business and policy decision. And you can’t say that either way is wrong, only different.

My opinion, which is merely trying to distill what’s actually going on, is that we will continue with a mixture of source-separation and centralized separation programs. CenSep facilities never seem to work as well as they were planned to do, their costs continue to climb, and they are frequently unable to offer lower-cost disposal to the consumer who is then approached by an independent collector who offers to take all of the consumer’s source-separated material of a specific type for free, for cheap, or the hauler may even offer to pay a little. There are some wonderful stories, particularly with commercial materials, where CenSep facilities have gotten in big financial trouble because some source separating firm got to the generator and offered a better deal for direct flows of valuable material and removed it from the consumer’s “mixed discards” pile. But the debate will go on. And it probably won’t be settled soon.

There is no better time to introduce the concept of MRF. MRF, pronounced “murf,” stands for “materials recovery facility,” and is a general term to describe facilities where collection trucks unload and the materials are sorted into loads for shipment to processors. A “clean MRF” (most commonly in the eastern US called an “intermediate processing center”) is a facility that handles residential or commercial curbside materials, a “dirty MRF” is one that sorts through mixed discarded materials, in some cases even considered garbage by the generator, to pull out certain salvageable materials. If the collection firm collects what are known as “mixed recyclables,” they will be sorted in a “clean” MRF; if the firm sorts through unseparated discarded materials, then the sorting facility would be considered a “dirty” facility. Generally clean MRFs do not require state solid waste operating permits but “dirty” MRFs do require permitting like a transfer station.

MARKET DEVELOPMENT AND RECYCLED PRODUCT PROCUREMENT: Two of the phrases that get used a lot in the current recycling scene are “market development” and “recycled product procurement.” When I first started hearing people use these words, I was confused because they seemed to be talking about the same things but calling them different names. What I finally realized was that these two terms discuss the same activities but look at them from different perspectives.

Market development is the materials collector’s perspective on the loop: if I collect it, will anyone buy it from me? Is there a processor who can turn this product or material into something that is a substitute for a virgin material?

Recycled product procurement, on the other hand, is the consumer’s perspective on the loop, and asks “Can the consumer make his interests known up through the retailer to the wholesaler, the assembler and the manufacturer so that the reprocessing equipment will be built that will consume the aggregated scrap materials?”

Thus market development and recycled product procurement are really both concerned with the same material and processes, but just looking at what needs to be done from two
different perspectives in the circle.

**FAILURES IN CLOSING THE LOOP:** It was popular in the early days of recycling to blame the garbage companies and their love of landfills for the failure of society to close the loop for materials. Over the years I have had many different ideas myself about why the loop ever got unclosed. The more I’ve read about early societies and considered life in pre-industrial times the more I have become convinced that for simple societies, human labor was much more precious than it is today; when you made things by hand it took a lot more time and energy and you took care of what you had. The loop was ignored during the early days of the Industrial Revolution when we were able to feel that we could do anything, that used materials could be trashed, that there was a lot more where what we had came from and that we could enjoy the richness of our processes, the skill of our manufacturers, etc. and didn’t need to think of our discards as a resource.

At this point I have come to believe that a feasible materials reprocessing infrastructure and not collections is the main stumbling point in closing the loop. The reason such a small percentage of the post-consumer film plastic is being reprocessed in the USA is because no one has figured out how to process the material into something that is clean enough to be a substitute for virgin. We know how to collect it, we know how to aggregate it, but we don’t know how to clean it up enough to make it a substitute for virgin. If this belief is correct, then it must have a major impact on how resources in the recycling field are allocated; we can spend more money on collections or aggregation facilities but that expense will probably not, if my analysis is correct, affect the amount of material being recycled. What matters most is that we have a place to take material where it can be reprocessed into a substitute for virgin material. When that piece of the loop is in place, then the collections and aggregation parts of the loop will develop in time if the money is right.

**REUSE:** How does reuse fit into the loop? Reuse is, of course, the recycling of whole objects, where the form and the material of the original product is maintained, unlike recycling where only the material of the product is maintained but not the form. Reuse is intriguing to business because it gets to keep all of the production-added value in the product. Twelve empty, used wine bottles have about 40 cents worth of scrap glass in them, but washed, sterilized, sorted and stored in new boxes, these same bottles are worth $3.90-$4.50 and wineries will pay that fee to acquire the bottles. Since the new box and new partitions cost about a dollar, if the used wine bottle processor can pay more than 40 cents for his twelve whole wine bottles to an aggregator and do all that other work for less than the spread between his costs and his sales, then he should have a viable business. It works in the Bay Area in a Richmond-based firm called ENCORE.

There are numerous other reuse businesses: the public is most familiar with the major household goods reuse firms (St. Vincent DePaul, Goodwill and the Salvation Army) plus numerous second-hand shops (a twelve billion-dollar industry nationwide). A small firm in the Bay Area picks up fruit lug boxes (such as grapes are shipped in) from grocers and other retailers and repairs the boxes and sells them back to the growers. A similar business target used banana boxes used for packing fruit shipped to the USA in bulk. Pallets are collected, repaired, and resold. A small firm in Oakland buys used mattresses and, after stripping off some of the soft materials, rebuilds them from the steel and wooden frames. Other private firms will target for reuse plastic
five-gallon buckets, moving boxes, and many other industry-specific products.

**SOURCE REDUCTION:** One of the terms that is frequently hard to explain is this term, "source reduction” and it needs to be discussed in some detail. When the modern (post-1970) discussion of recycling began, the term “recycling” itself soon developed at least two meanings: one is the broad use that recycling is any activity that keeps used materials out of a landfill, the second, more narrow, meaning is the process of collecting, aggregating and processing used material so that the material can be used as an alternative to virgin materials.

Against this second, more narrow, definition, there needed to stand a term that described the other activities that enhanced the loop being closed that were not specifically designated “recycling” in the narrower sense. For reasons which I have never really understood, the words “source reduction” were drafted into service as a phrase to cover what are, in fact, a multitude of very different, (though nonetheless complementary) human activities that close the loop and make the materials cycle more complete.

Unfortunately, not everyone understands that source reduction is a catch-all phrase and will claim that the term means one or another of its sub-uses, but that is a mistake. My friend Bruce Nordman thinks that all source reduction reduces to materials efficiency, but that has never seemed to fit for me. Others have liked the term “waste avoidance,” (popular with USEPA in the mid-90s), but that term infers that recyclables are wastes, which I also have trouble with (see below, Chapter Six). The term “waste prevention” was invented in the late 1990s as recycling practitioners became frustrated with trying to explain the source reduction term;

The question of exactly how the term “source reduction” found its way into discussions about recycling is unclear to me. The term had a history in hazardous waste avoidance activities that precedes, I believe, its use in garden-variety recycling discussions. One meaning which is clear from construing the term from its words, is that source reduction is anything undertaken to reduce material flows at their source, be it raw materials extractor, manufacturer, assembler, distributor, retailer, etc. Most discussions between recycling practitioners that I’ve listened in on indicate that the term has no clear meaning to the general public. Government officials became interested in source reduction when they began to realize that recycling programs, as popular as they were, cost as much to run as solid waste programs and source reduction generally reduces the fees the public pays for materials disposition services, be they recycling or solid waste. Some of the common activities promulgated under the source reduction banner are:

1) **Reuse.** A good example of the inclusiveness of the source reduction phrase is the placement of reuse in this group. As discussed above, reuse is better than recycling since it saves all the value-added manufacturing acts imprinted on the material.

2) **Repair:** Clearly, from a materials efficiency point-of-view, it is better to repair a broken VCR than to discard the one you have and buy a new one. From a product cost factor, it may be cheaper to buy a new one than to repair a used one, but that is not materials efficiency and personal decisions can be based on other factors than cost.

3) **Living simply:** A woman well into her 80s once listened to me talk about recycling and came up after my speech and said, with obvious sincerity, “Well, I don’t really have a lot of things to recycle.” She implied that she lived simply and was not much of a consumer. People who buy all fresh foods and compost the scraps, people who drink local root and leaf teas rather than bagged (or worse, bottled) teas live simply. In the late 1990s there developed simplicity
circles where people met and traded stories on how to de-thing their lives.

4) **Materials Utilization:** Raw materials are expensive; in the process of turning raw materials into finished goods, a factory will make mistakes - things fall on the floor, get overheated, undercooked, too much of the wrong ingredient gets put in the batch, the Raisin Bran gets loaded by mistake into the Corn Flakes box, etc. There is truly no end to the ways humans in manufacturing and distribution can find to mess things up. The sum of all the human errors creates an inefficient use of raw materials, leading to higher costs for finished goods.

The most memorable example I’ve seen of this phenomenon was at the NRC convention in Charlotte, North Carolina in 1989. An industrial engineer working for the State of North Carolina had been called in to assist a McNuggets manufacturer (basically getting the meat off dead chickens and turning it all into little cubes) in reducing its materials loss. He showed pictures of chicken meat piled up on the floor where it had fallen out of a processing machine. He explained that by installing various guards, screens, etc., they now had something like 80% less chicken meat falling on the floor; his work reduced the plant’s garbage bill by some large amount. He was very happy, the company was very proud and more than a little better off.

My own experience in manufacturing is limited but I have seen enough to know that a workforce gets comfortable with a certain level of discards-going-to-the-dump and it’s very hard to change the organization to expect a higher standard of performance and a lower level of “waste.” In one factory where I worked, materials were mixed in a batch and then dumped into a second machine for further mixing. Because the second machine frequently was delayed in emptying its earlier load, and the first machine had no intermediate place to dump its next load, the first machine would dump its load into the second machine before that machine’s earlier load had been emptied; this created quality control problems, more stress on the machine operators, etc. If the plant had been designed so that the first machine could have been emptied into an intermediate storage space, everything would have flowed more smoothly and wasted batches would have been fewer.

5) **Process Redesign:** This category may be a subcategory of materials utilization, but there has also been a major effort to redesign industrial processes in order to create industrial by-products that are easier to manage than before. For instance, under the hazardous waste rules, the drums of certain printing inks had to be handled as a hazardous waste because of the residues. For a printer to switch to soy-based inks means that his used ink tubs can be disposed of as a solid, and not as a hazardous, waste. (Disposal costs for hazardous materials are 4-10 times higher than for regular solid waste.) There are many questions of process design that affect the ability of a factory to process materials efficiently. Much of this work is proprietary and rarely discussed in public sessions.

6) **Product Redesign, or “Design for Recycling.”** Starting in the early 1990s, stimulated greatly by the work of William McDonough (see Chapter 11), there has been a growing interest in redesigning the end product of a manufacturing process to make it easier to recycle that product when it has reached the end of its useful life. Automobile and consumer electronics firms are beginning to take this challenge seriously but, looking back over the last twenty ears, less is being done than you might think. About 15% by weight of a scrapped automobile goes to a landfill: the material is known as “shredder fluff.” It consists of the chopped-up rubber mats, the insulation under the carpets, parts of the seats, etc. If the average car made today has a smaller percentage of its bulk going to a landfill, I don’t know about it.
7) **Packaging Redesign:** Because consumer packaging is such a large part of many households’ discards, there has been intermittent pressure on consumer products manufacturers and retailers to redesign their packaging to create fewer materials for recycling or disposal. For years I brought pies at a pie shop in paperboard boxes which I could recycle; now I buy pies at a supermarket which pre-packages pies in plastic (polystyrene) transparent tops and black plastic bottom plates; only recently has a market for that material developed. I currently put all of my mylar candy bags in the garbage; if they repackaged the materials in polyethylene bags, that material could be recycling with the plastic film from the grocery store but so far they won’t do it, nor will they create a market for post-consumer mylar packaging either.

Source reduction, as a catch-all phrase, covers all of these activities that close the loop and present fewer materials for recycling or landfill disposal.

**IS CLOSING THE LOOP A PUBLIC OR A PRIVATE VENTURE?:** Many newcomers to recycling are impressed by all the big curbside trucks they see rolling around but fail to know that probably 90% of the of the loop-closing activities are conducted by private business ventures without any particular public support. Because the curbside collection trucks are out in residential neighborhoods, they achieve a certain cachet and a highly visible posture, but most of the materials are collected, piled up and reprocessed by private firms. Curbside collections nationwide account for less than 20% of all the materials that are not placed in the “waste” stream.” In the same way that the public library has a large presence in the public’s mind about providing opportunities for book-reading, most of the books that are read in this country are bought in bookstores or read in school classes. The government’s role in encouraging loop-closing activities is, of course, important (see Chapter 9), but it would be a mistake to think that the government’s role (any government: federal state, or local) is critical to this venture. Government today is as much an obstacle to closing-the-loop as it is an aid; that’s not the way government sees it but those of us in the industry see it that way.

**CAN A GARBAGEMAN BECOME A RECYCLER?:** This is a much more complex question than most people would think; several points need to be made:

1) All garbage collectors in the USA were originally recyclers.

2) Garbage companies were uniquely positioned to offer curbside services.

3) The record of garbage companies performance as service providers in recycling collections has been very mixed. The final aspect of the materials conservation cycle that needs to be looked at is how waste hauling companies have repositioned themselves as recyclers. Why is it that the waste haulers haven’t withered and died, like covered wagon and horse cart manufacturing companies did when the automobile got popular, or typewriter manufacturers falling to the computer companies? I think there are several reasons for this.

1) Waste haulers have many of the parts needed to build a successful recyclables collection company: they know the public client, they know how to run and repair trucks, they can do the kinds of financial recordkeeping necessary, write bid proposals, raise money, and they know customer service.
What they don’t necessarily know is how to pay attention to what’s in the truck (contamination issues) and warehouse-style materials handling issues (forklifts and balers instead of bulldozers). Fortunately neither of these two areas is difficult to learn and as long as the program manager understands their importance, it doesn’t seem too difficult for waste haulers to get and keep recyclables collection contracts. In the mid-90s, publicly-held large waste hauling firms typically reported to their stockholders that recycling was the fastest growing part of their business; unfortunately, making money in recycling has been harder than in garbage, leading to many adjustments, but that’s another story.

2) A less direct reason for this transformation is indicated in a statement by Joe Garbarino, an owner of Marin Sanitary Service and an early proponent of curbside. “Why do I recycle?” he asked himself rhetorically for publication. “Because I don’t own a landfill.” In recent years, landfills have become increasingly distant from the waste’s point of origin and the local hauler is increasingly unlikely also to own the disposal site. Recycling helps him keep more of the money he gets paid in his own pocket by lowering his disposal costs. So why not recycle?

WHAT ARE THE LARGER FORCES THAT MOVE RECYCLING FORWARD?:

Chapters 5 and 9 discuss this question from other angles, but asking why people recycle is a bit like asking why people go to church; in truth there’s a diverse set of sub-agendas that have moved recycling forward in the nation’s agenda. As the public awareness of different issues and opportunities has risen and fallen, so the public interest in recycling as an answer to a perceived problem has changed.

1 Enterprise: In Chapter Seventeen I suggest that over 90% of the moneys spent in recycling come from the private sector without public subsidy and serve to further the legitimate business goal of reducing costs and increasing profit. The paper companies save money by recycling; the glass and metalworking companies save energy (which costs money) by recycling; the farmers save on their soil amendment costs by composting, and on and on. If the business of America is business, and there’s nothing wrong with that, then most of the desire to keep recycling happening comes from new things to sell and lower costs (which is how people make money).

2 Avoiding Waste Fees: Americans spend about $50 billion dollars a year paying for waste disposal. If the material that used to go out as garbage is now recycled, it can usually be disposed of at no cost to the generator or the generator might even be able to sell the material for a small amount. Garbage has been an unacknowledged cost center for years and the push to recycle has caused millions of businesses to learn how to control their costs in this area. Nothing pleases a facilities manager more than to cut his garbage bill in half by recycling.

3. The Landfill Crisis: At various times between the late 60s and the late 80s, there was widespread speculation that the country was “running out of landfill space.” A commonly cited figure was that of all the landfills now open, half would be closed in ten years and they’d all be closed in fifteen years. What this analysis failed to consider was that we had been running out of landfill space for seventy-five years, but when push comes to shove, there’s always a way and the funds to buy some more space. What we were really running out of in that time period was close in landfill space, and the quantum leap that has occurred in the last twenty-five years is in the distance garbage must travel between its collection and disposal points; if it were possible to do a weighted average, I would guess that garbage now moves four or five times further across
the country before burying than it did twenty-five years ago. Since about 1991, though, decision-makers have realized that the “falling sky” argument on landfills is specious, and that, while garbage disposal will cost more (tighter regulations at disposal sites) and trucking it to these sites will be further away (at a rough cost of four cents per ton per mile), there will not be an end to available landfill sites in the foreseeable future.

3 The Coming Resources Shortage: Another major argument supporting recycling is the one that sees the planet running out of resources (mostly wood and oil) and recycling helping to preserve these resources. This has been a hard argument to sell to the American public because what appear to be shortages are often in retrospect merely temporary misallocations and shortsighted national policy concerns. An analogy is the hunger problem: some pundits see many starving people as evidence of a lack of food; others see starving people as the victims of short-term political conflict, genocidal disputes between neighboring warlords, and numerous other “games” that are not really evidence of a shortage of food. If we’re running out of trees, why do we sell millions of board feet of lumber to the Japanese every year? Each purported claim yields more questions than answers.

4 The Environmental Toll of Extractive Industries: Another argument for recycling is its indirect impact on the need to maintain a high level of materials extraction from the natural world and the heavy investment in energy, chemicals and numerous hard-to-manage materials for that task. Recycling saves lots of costs by taking the value of processed materials and preserving them in new products.

5 Community Economic Development [CED]: In the late 1980s a movement began that crested about 1993 that saw jobs in recycling collections, aggregations and processing as a new opportunity for old-city employment growth. Led in some ways by the Institute for Local Self-Reliance in Washington, DC and aided by the Center for Environmental Economic Development in Arcata, CA, the concept that recycling materials creates three times as many jobs as burying or burning them has gradually gained a following. Although the number of major programs nationwide that are cited as examples can probably be counted on two hands (Bronx 2000 in New York City; Sunshares in Durham, NC, TRI-CED in Union City, CA, and a few others), the dream of putting large numbers of the urban underclass to work in recycling has never died. CED also offers the strongest possible tie to the minority populations of our old central cities and the elected officials who serve them.

6 Overgrazing the Commons: The basis of all environmental law in the American system is an old English concept that while a herdsperson had the right to graze his sheep on the town’s common land, it was wrong to “overgraze the commons,” that the individual herdsperson had a responsibility to conserve the common spaces for all and for subsequent generations to enjoy. Some of us think that recycling is part of the human responsibility for the planet we live in, that our duty as citizens is to manage materials so that their disposal is not a problem for us or for our children, and that we are to reduce our impact on the planet by turning discards into feedstocks. In some ways recycling is nothing more complicated than cleaning up after yourself and your mother always told you to do that.

ALL THE EASY RECYCLING HAS ALREADY BEEN DONE: When I was young and just out of school, when someone asked me to do something, I assumed that whoever had tried to do this task before must not have been either very bright or very energetic. (One friend suggested that the blessing of a Princeton education is to understand that many people are not as smart as you are; the curse of a Princeton education is not to realize that a lot of smart people didn’t go
to Princeton, and that is much harder to learn.) The rude part of my education has been that a lot of bright people have worked very hard before me and around me, and most of the easy recycling has already been done. I would even venture to say that almost any bright idea that anybody can come up with today can be met with an “it won’t work,” “we tried it and it doesn’t work,” “Mr. So-and-so tried it and he couldn’t make it work,” etc. All the easy stuff has already been done; make no mistake about it. For the past five years I have worked approximately half-time on couch and mattress recycling. No one who hasn’t followed us closely would believe the obstacles to our success, but it’s all true. If it were easy, it would have been done before now.

**SOME RECYCLING IS BETTER THAN OTHERS:** In discussing the integrated waste management hierarchy in Chapter 3, I suggest that all loop-maintaining activities are not equal. Source reduction in all its manifestations (reuse, materials efficiency, process redesign, etc.) is better than recycling because it conserves work previously done and avoids redoing things. There have also been efforts to distinguish between various types of recycling. I first saw this analysis about 1991 in RECYCLING TIMES where the writer spoke of primary, secondary, and tertiary recycling. Primary recycling is where a used material is formed back into an object or product similar if not identical to the object it was formerly; e.g. glass cullet is remelted and formed back into more glass bottles; aluminum cans are remelted and rolled back into can stock. Secondary recycling is where a used material is formed back into a product which itself can be reused but is a lower value use of the material; examples of this would be cullet spun into fiberglass insulation or lumber shredded and made into particle board. Tertiary recycling is where a used material is given a use from which it cannot be recovered and by this use loses all vestiges of its former value; examples would include cullet used as road base or in glasphalt; shredded tires used as fill in highway projects, etc. For whatever reason this analysis has not become widely accepted and it’s unusual to find reference to it in the literature today, but it still makes an interesting point. This three-part analysis neglects the rare situation where recycling can take one material and fashion it into a product that is better (more value, lasts longer, etc.) than the first product. One example given was that shredded old railroad tie material (creosoted wood mostly) can be mixed with a plastic binder and reformed into a railroad tie that will outlast the original.

**OVERCOMING THE PREJUDICE FOR VIRGIN MATERIALS:** An untold story in the recycling industry has been how people in America have overcome their prejudice in favor of virgin materials. The ways that people find to reject the new in favor of the old is probably endless. I remember one woman who worked for the glass company in Oakland shuddering with horror at the idea that people could wash wine bottles, sterilizing them and refilling them. “Good God,” she said, “there could be pee or dog poop or God knows what in there.” I thought, “Gee, how stupid,” but I kept my mouth shut. In the early days people liked to complain about recycled copy paper; it caused the machines to jam, it was dingy, etc.; the most innovative recycling coordinator I knew just went in one night and took out all the virgin paper from the copy room and put only recycled content paper in the room and waited a week (no complaints) before he told them all that they’d been using recycled content paper for a week. Like most prejudices they die slowly from new experiences; it’s not as bad as it was.

**HOW REPROCESSING GETS PAID FOR:** We have talked about materials reprocessing in
general in this chapter but we haven’t discussed very much how it gets paid for; in fact there are several different methods, depending to a large extent on the industry’s practice. Most often in America the manufacturer of a finished good pays for the used material in some agreed-upon condition and prepares it for use as raw material in its own manufacturing process at its own expense; this way the manufacturer can affect some control over the quality of its raw (though not virgin) materials. In some cases the processor is a stand-alone business that buys used materials at one price and sells them after processing at a higher price; in Oregon one plant will turn old paper into pulp and then ship the pulp fifty miles by truck to another plant where it will be made into finished goods.

One of the unusual practices in the recycling industry is the practice of “tolling.” Tolling means that the owner of the material surrenders it to another person for processing but continues to own the material and will receive an equivalent weight (or volume) of processed material back from the processor. The processor charges so many dollars per ton (or cents per pound) to rework the material; it’s similar to farmers paying a fee to the miller to turn their wheat into flour. This practice is most common in the metals industry and doesn’t seem to be used elsewhere.

A SCHEMATIC HISTORY OF RECYCLING: I believe a short and coherent history of recycling can be written that sees in our human experience with recycling in three phases:

1. From the beginning of human civilization until some point in the mid-twentieth century, the dominant human attitude towards discardable materials was one of conservation and reuse. It took too much human effort and capital to bring goods to people that they could be easily abandoned without consideration or without some recovery. True, the very rich could abandon with disdain but most people were too poor for too long to treat what came to them with disregard. Most people had next to nothing, they recognized the value of labor in a product, and they took care of what they had. I call this the “save it all” period. Interestingly, the most flagrant examples of wasting in the ancient world came in the destruction of city walls, but this was almost always the act of a victorious enemy and not a sign of a society’s own profligacy.

2. The second phase of our experience with recycling in America stretched from the end of World War II until sometime in the early 1970s. Here the dominant human attitude was that making waste was a good thing, that many of us were wealthy and that we could afford to throw things away. Outdoor burning of trash became widely banned and “waste” volumes grew dramatically. Planned obsolescence was not considered an evil. I call this the “toss it all” period.

3. The third phase in America began in the middle 1970s as the shortage of foreign oil created a gasoline shortage and somewhat of an energy shortage; conservation was rediscovered by the grandchildren of the “save it all” Americans. Much of the innocent enthusiasm for recycling in the early 1970s has been replaced both with considerable success at some major accomplishments (recovered paper goes from 11.4 million tons in 1969 to 41.9 million tons in 2005) but also a sober realization that many raw material resources are still relatively cheap; as the landfill industry has been restructured to provide fewer larger facilities (not unlike the filling station shakeout), the landfill crisis of the 1970s has now more clearly been seen to be a shortage of near-by, convenient landfill space. As more and more raw materials processors are feeling public pressure to be involved in recycling and as technology solves more and more of the
materials reprocessing problems, saving rather than tossing becomes once again the dominant paradigm, undercut though by a large, wealthy, and well-functioning solid waste system.

**THE FUTURE OF CLOSING THE LOOP:** Being now a recycling industry old-timer (working in this business since 1983), I am occasionally asked what I think the future will be. Although the New York Times and the Wall Street Journal haven’t done any hit pieces on recycling for several years now, my own sense of the future is that we’re just getting started. For the reasons mostly listed in Chapter Five, I believe that we will gradually understand how to collect materials from 300 million people and 55 million businesses to maximize recovery. Just as new materials and products are coming into the marketplace nearly every day (true some are just simply new blends of materials for a "hot" shampoo item), other products and materials show a serious understanding of the limits of what else is on the market today and represent a new venture to “find a need and fill it.” I believe that the massive industrial intelligence of this country will gradually be applied to the task of maximizing the reuse of materials as a substitute for virgin feedstocks and I believe that the landfilling and incineration options will increasingly be seen as short-sighted and non-viable. I also believe that the continuing industrial development of the Third World will bring the kinds of materials shortages that some foresaw thirty years ago as common occurrences, and the continuing growth of population in this country will continue to expand the need for discards management services.

In the same way that we built a fence between hazardous wastes and non-hazardous materials in the 1970s and 1980s, we are now in the process of building a fence between recyclables and “garbage,” and the outcome will be the same; as the fence of the 80s has reduced the volumes of hazardous wastes, so the fence of the 90s and 00s will reduce dramatically if not end “garbage” as we know it. When recycling started it was perceived as an activity that allowed us to keep some materials out of a landfill, mostly newspapers, bottles and cans. As the industry has developed, there has been a paradigm shift so that we now ask, “What can’t this product or material be recycled?” Garbage is now the exception and not the rule.

Several years ago I sat down and read through some early issues of my favorite environmental journal, the Environmental Reporter; they try to cover Washington, the states, the courts, regulations, everything. I was reading in the early 1970s and what most impressed me about the discussions of recycling in those days was how much nobody had any clear sense that it might work. They were asking all the kinds of questions that are getting settled today: will the public cooperate, how much will it cost, will the raw material users want the stuff, etc., nobody knew any of this then, and yet they still had a vision of getting stuff out of the waste stream. The early workers in the field were bright, energetic and hard working. And it’s been just one thing after another, moving forward and solving the problems.

Another thing that has intrigued me in my reading was the feeling by many people in the 1950s and 1960s that what we needed in America was more of everything: more power plants, more highways, more landfills. But there was this other group that said, “No, that won’t work. We need to rethink how we get around, use energy, and get rid of things we don’t need anymore.” And that’s how it all got started and it’s amazing how even those thought of as “right-wing” forty years ago have adopted our agenda.

And I also hope that you, gentle reader, will help us do this.
Chapter two: - 2nd ed.
THE 12 MASTER CATEGORIES OF DISCARDS and Some Notes on Their Reprocessing.
One of the first tasks in working in recycling is to establish a standard language and a way of categorizing the materials that will be handled in a recycling program. In the same way that a doctor follows a set routine while performing the physical examination of a patient, students of discards needed to develop a standard way to look at those materials. Dan Knapp and Mary Lou VanDeventer first published their twelve master categories in 1989. It has been commended by various local groups and is probably the best protocol until a nationwide standard for categorizing all materials can be developed and accepted. In many industries, the National Standards for Testing and Materials [NSTM] organization develops testing protocols which are then circulated industry-wide, but the discards management industry has not yet come to their attention. I have slavishly followed the Knapp-VanDeventer list but have reordered their twelve categories. This chapter is devoted to characterizing the material and discussing some of the obstacles to recycling these materials; at the end of each section we discuss in some detail what and how the materials are reprocessed into an acceptable substitute for virgin materials.

1. METALS: Humans first extracted metals from minerals about 3,000 BC and the dawn of modern civilization seems dependent on our ability to extract, refine, and form metals. The most common ancient metals were copper, iron, tin, zinc, nickel, and lead. The precious metals, so named for their rarity, are gold, silver and platinum. The less common metals are aluminum, manganese, magnesium, chromium and antimony. Brass is a combination of copper and zinc; bronze of copper and tin; pewter is a mixture of tin and lead or now antimony or copper. Steel and stainless steel are made from low-carbon iron with other metals added.

The Industrial Revolution allowed for the large-scale extraction, refinement, and fabrication of metals and led to their omnipresence in modern life. American society currently consumes over xxx million tons of metal per year, of which about xx% goes into the infrastructure (steel bridge girders and office partitions, rebar for poured concrete and cast iron plumbing fixtures, etc.). Only a small amount of metal goes into packaging and other disposables: aluminum cans (about 1.6 million tons in 1995) for both beverages and food; steel cans (x.x million tons in 1995) for fruits and vegetables.

Recycling is considered well established in the metal industry, although the capture rate varies by material and source. Independent scrap yards and regional firms have been active since the late 19th century and get almost all of the discarded rebar, girders, and automobiles from our society. From consumer products, a fairly large amount of metal still goes to the dumps. The ferrous metal recycling rate in 1995 was 36.5%, in 2005 it was 63.3%.

Aluminum can recycling rates are stuck at about 50% meaning that 50% go to the dump. With steel cans and small appliances (toasters, irons, microwaves, etc.), the recovery rate is now somewhat higher.

Note: The term “strategic minerals” describes the minerals often needed in high-tech products for which adequate national reserves of those minerals do not exist; some left-wing scholars see America’s concern to protect its access to certain minerals in other countries as an important linch-pin in our national foreign policy.

Reprocessing metals is relatively simple because to reform metals, they must be melted
(always at high temperatures) and most of the so-called contaminants to the metal (paper labels, paints and varnishes, rubber and plastic cords, etc.), simply all go up in smoke. The mills that make aluminum sheet for beverage can stock usually melt the old cans down right in their plant; firms that make aluminum tube and heavier sheet stock frequently buy a block of solid metal weighing 300-600 pounds that have been melted down/reprocessed elsewhere.

Industry associations: Institute of Scrap Recycling Industries (formerly Institute of Scrap Iron and Steel), The Steel Recycling Institute (founded as the Steel Can Recycling Institute in 1971 and renamed about 1995).

2. GLASS: Glass, made from silica, soda, and limestone, was first invented about 2,500 BC for use as ornamental beads and later liquid containers. Early craftspersons developed an extensive knowledge of how to modify the color of glass through the addition of small quantities of colorant materials into the basic transparent feedstock. Glass is made by heating the raw materials together and cooking them until the xxxx of the xxxx recombine to form xxxx, which is glass.

Novices in the glass recycling field are often surprised to learn that glass is not one product but actually several.

1) Bottle and Jar (also known as packaging glass or container glass).
2) Windowpane:
3) Leaded Glass:
4) Pyrex (heat-resistant):
5) Cathode Ray tubes (TV tubes, etc.):
6) Art glass:

Because container glass is the most commonly discarded glass, most recycling attention has been focussed on this material.

Glass container manufacturing plants have always taken the mis-formed glass from their production line and tossed them back in the pot to make more molten glass. But handling post-consumer glass met with grave reservations from glass plant quality control inspectors (see next chapter).

The future of the glass container industry in America is rather unclear. Despite their slogans, “Beer tastes better in glass,” etc., plastic and metal packaging have made substantial inroads into the glass container’s marketplace. From twelve glass plants in California in 1988 we now have eight. Wine bottles made in Mexicali, Mexico can be at a Napa Valley winery in less than 14 hours.

Space does not permit a detailed discussion of other glass recycling efforts. Fiberglass manufacturing is able to consume many of the other grades of scrap glass and has created strong local markets where transportation costs are manageable.

Reprocessing Glass: Scrap glass from within a glass factory has always been tossed back into the furnace and remelted to be reformed. When the public started clamoring for glass recycling
services in the late 1970s, there were discussions and debates between the collectors and the aggregators on the one side and the consuming industries (mostly Owens-Illinois as it was known then) on the other about who would design, build and own the equipment that could process post-consumer glass into furnace-ready cullet. It gradually became clear that the collectors and aggregators were not going to get into this business and, in the early 1980s, Owens-Illinois commissioned some equipment that combined features of rock crushing equipment (to chop the post-consumer glass into usable bits), a fan (to blow off light-weight contaminants [usually the plastic wraps from soda bottles then in popularity), a magnet (to pull out tin cans lids and bottle caps), and an inspection station (where a worker could look for ceramic coffee cups, dead cats, dog shit, aluminum bottle caps and other things that people didn’t want in the furnaces). With various improvements this is the equipment in place today.

One of the most interesting talks I ever heard in recycling was from a glass manufacturing company official who discussed the company’s internal debate about getting into post-consumer glass recycling. There were arguments for and against using post-consumer glass as a substitute for raw materials: the quality control people said no but the accountants said yes (used glass takes about half the energy to melt down that virgin glass does to make from scratch; a typical glass plant saves one to two million dollars per month in energy costs by using scrap glass).

The quality control staff’s other major objections to post-consumer glass is the high level of solids contamination which will damage glass molds in the plant. This led to vigorous programs to screen out rocks, small pieces of metal, and mostly ceramics (you’d be surprised at the number of people who don’t know that ceramics are not glass) but in the mid 1990s the industry switched rather quickly to a “fine-grind” method of preparing post-consumer glass which reduced all feedstocks to sand (rather than pebble) size. The ostensible benefit was to end mold damage due to ceramics contamination but the side benefit was an even further reduction in energy needed to melt down the smaller particles.

[Why did it take the glass industry 15 years to figure out the virtues of the fine-grind system? Sounds like an industry case study in the waiting, ARB]

Industry associations: The Glass Packaging Institute (formerly the Glass Container Manufacturers Institute).

3. PAPER: Because paper is the largest manufactured commodity in the United States (xxx million tons produced in 199x), the largest discarded commodity (xxx million tons in 199x), and the largest recovered commodity (xx million tons in 199x, a 42% recovery rate), paper is often the first commodity listed in various materials lists, but for historical reasons I put it third.

Paper was invented about 1500 BC, probably in Egypt, where pressed together strands of the papyrus plant created a mat on which readable marks could be entered. For several thousand
years parchment was the favorite writing material, formed from animal skins. Paper made from cooked wood fibre is a relatively modern invention and has now largely supplanted the cotton, hemp and linen fibre papers of previous eras. Large scale paper production began in the 19th century and we currently produce in the world in one year as much paper as all human society consumed before 1800 AD.

Wood-fibre based paper today is generally divided into three groups: groundwood, ledger, and kraft/brown grades, and the old saying is that these three grades should never be mixed.

Groundwood: This includes newspaper, magazine stock, and paperboard. (post-consumer newspaper is called old newspaper [ONP], and post-consumer magazines are known as OMG).

Ledger: This includes white and colored ledger, all hard whites, etc.

Kraft/brown: This includes kraft paper (grocery bags, etc.), and corrugated containers (scrap corrugate is called old corrugated containers, OCC).

Increasingly common in our society is coated papers (hot drink cups and milk cartons are white ledger paper with plastic film wrappings; juice boxes are white ledger paper covered with layers of aluminum foil and plastic film). These papers create unique but manageable recycling challenges, the most common being the food residues left in the containers which soon degrade the paper. Disposable diapers are also composite products with paper being the primary component.

Early modern recycling programs focussed on newspaper from homes and old corrugated cartons from businesses. The San Francisco curbside (start-up, 1987) was the first to offer collections for other papers (magazines, phone books, mail, etc.) and found a volume of material equal to that of curbside newspaper. 85% of all paper recycled in America today is OCC, usually without the benefit of publicly sponsored programs.

Reprocessing paper for recycling is a relatively simple task. Old paper and water are mixed in a giant mixing bowl (10-15 feet across), with paddles mixing the mass into a batter-like consistency. Various techniques are used to remove the contaminants: string and packing tape come out on a wire-whisk type paddle, ink is floated to the top with bubbles of air coming up from the bottom of the tank, etc. Once the pulp is clean enough, it is blended with virgin pulp to make finished goods. The paper industry generally agrees that it would be unable to keep up with consumer demand for its products but for the recycled feedstocks now available. Special machines can separate paper pulp from polyethylene (as in polycoated paper) and there have been prototypes of machines to separate out the paper from a disposable diaper (See WASTE AGE, October, 1997, p.80).

Industry associations are The American Forest and Paper Association.

4. CERAMICS: Humans first learned to fire clay to make pottery and other ceramics about 2500 BC. Fertile Crescent business records on clay plates going back to 1800 BC have been
preserved. Sculptors have worked in clay for centuries and created objects of great beauty and utility. Today we see ceramics primarily in brick and tile, dinnerware, drain pipe, toilet bowls and tanks, living room lamp bases, and building ornamentation.

Because ceramics have been replaced today primarily with metal, plastics and wood, they are not a large part of the discards stream (less than 1%); the small amount that is available can easily be reprocessed into a rock-like material. Because ceramics degrade to dust faster than rock, especially when wet, they are frequently omitted from Grade A fill materials (roadbed, trainbed, etc.), but can be used in small quantities in other applications.

The Knapp-VanDeventer protocol first called these materials “crushables” but later used the title “ceramics.” For them this classification includes rock, asphalt, concrete, etc.

There is no organized system to deal with ceramics in America. While pottery companies regrind their failures into dust and use the dust in newly finished goods, they do not take these materials from the public. Most ceramic ends up in the rock-crushing industry. There is, of course, a large business in reprocessing used concrete, frequently at mobile sites, to turn it into under-pavement of some type.

5. PLASTICS: Plastics were first invented in the late 19th Century as a substitute for rubber and wood. Chemists working from a cellulose base feedstock were able to alter complex cellulose molecules to create material with increased density, hardness, etc. (Bowling balls are made from some of our older plastics.) The major growth of plastics occurred during and after World War II; there are now some 19,000 formulations in general circulation. Each compound has slightly different basic properties (melting point, flash point, viscosity, lateral strength, etc.). Many plastics can be formed into films, foams and blocks. Plastics are generally distinguished into thermo-form plastics (which can be melted and remelted for reuse) and thermo-set plastics (which, when once formed, cannot be remelted and reformed); the former would be soda and milk bottles; the latter would be TV and telephone cabinets.

While remarkable for their versatility, plastics are limited by their degradability (many in common use are polyolefins that degrade into paraffins in sunlight or air) and their gradual loss of fibre strength; many appear to “dry out” and get brittle. Many thermo-form plastics generally have a limited shelf life; PET soda bottles will lose 50% of their carbonation in six months through the CO2 gas migrating out through the plastic bottle.

While plastics are omnipresent in modern life, they are still manufactured at the rate of only xx million tons per year. Most plastics use the petroleum hydrocarbon molecule as their basic feedstock although recently cornstarch has come to the fore as a source of the hydrocarbons. Audits of the waste stream usually find plastics less than 4% by weight of the wasted materials. There is an active though small industry recycling post-industrial scrap plastics where the compound is known and the material is clean.

What has made plastics such a bogeyman for the current recycling movement has been the slowness of the industry to develop recycling systems for their post-consumer materials. While the metal and paper recycling technologies were pretty well in place before the recent rush to
recycling, and the glass industry came on board in the late 70s-early 80s, the plastics industry, despite studies twenty-five years old talking about recycling, has followed a “don’t ask/don’t tell” strategy until recently.

Since I recycle all my paper, metal, glass and organics, plastics make up about 75% by weight of my personal trash and that does not endear the industry to me although I do appreciate their problems.

There are three basic problems that have created this reluctance in the plastics industry to be involved in recycling.

The first problem is somewhat indirect and has to do with the way that the industry is structured. About seven companies produce over 85% of all the basic plastics feedstocks in America: Dow, DuPont, Exxon, Mobil, and xxx. And yet these seven companies make less than x% of the finished plastic goods in this country; most plastic feedstocks are sold to hundreds of small firms that fabricate for a few customers and work hard turning out proprietary shapes for their commercial and retail accounts. This structure leaves the industry somewhat impervious to criticism since the raw materials manufacturers say they don’t use the stuff and the fabricators say they don’t make the stuff and any one of them only makes a very little of what’s out there. (Unlike paper, glass and metal where a few firms have major retail market positions.)

The second problem is that plastics are in fact many different compounds and the prospect of trying to sort all the post-consumer materials so that like ends up with like is truly daunting. While to the outsider polyethylene and polypropylene may sound very much alike, they behave very differently and if you melt and mix them together in a mold, you get junk. You may be able to make car stops out of a mixed plastic feedstock, but not much else.

The third problem is that once you get all the like-structured plastics together, you still have to clean them; this involves washing rather than fire (as with metal and glass) and nobody has had much success justifying the cost of washing large quantities of plastics to recover raw materials of fairly low value.

All these negatives notwithstanding, it now appears that the plastics industry is on the verge of developing systems to handle the quantities of contaminated materials that can be collected, but those of us on the outside are still untrusting, since they fed us nothing but promises for a long time. The jury is still out on post-consumer plastics recycling. (In 1993, the American Plastics Council said that 15.5% of all plastic bottles and containers were recycled.)

I would be remiss to leave this topic without a few words on the chasing arrows symbol, printed on almost all rigid plastic containers. It’s much too complicated an issue to address briefly, but the marks, while not perfect and in some cases inaccurate, do provide the unsophisticated consumer with some information necessary to sort post-consumer materials.

**Reprocessing Plastics:** Almost all of the plastics reprocessed in America are clean, pre-consumer, materials. They are heated to a melting point, pushed through an extruder (a roughly half-inch die), and chopped off in half-inch long pellets. The plastic films and foams that are recycled in America are also processed this way. Polyurethane is a thermo-set plastic and cannot be remelted (although there is apparently a new (1997) procedure to do this); used polyurethane foam chunks are shredded and reglued to make rebond, a mosaic-looking material, commonly seen in carpet underpad.
In facilities that specialize in processing PET bottles or HDPE, the material is first checked for contamination (no PVC in the PET, no colored HDPE in the clear, etc.), then the materials are chopped up (like a big Cuisinart), then washed, then melted, extruded, and pelletized. If the washed shred is sold without repelletizing, it is called.

China has been an attractive market for American scrap plastics because people there have been willing to wash the film and sheet plastics we sell them. So far most of the American R&D money on plastics has been devoted to sorting mixed plastics rather than figuring out how to wash them.

Industry associations are The American Plastics Council (Washington, DC), Society for the Plastics Industry (Washington), National Assn. of Plastic Container Recycling, known as NAPCOR (Charlotte, NC), and the Assn of Post-Consumer Plastics Recyclers (est. 1993).

The next three categories involve materials with an organic base that are sometimes collapsed under the one heading, “organics recycling;” I prefer the original Knapp-VanDeVenter protocol.

**6. PUTRESCIBLES, also known as FOOD:** About seven years ago I was asked to do a waste audit of a restaurant and I realized for the first time that there are actually four different sources of discarded food products in a restaurant. I forgot most of this shortly thereafter but my colleagues now tell me that there are six categories of food to be managed:

1) “Trim” is material removed from incoming materials that would not be used in prepared foods. This would include onionskins, carrot tops, cornhusks, meat fat, etc.

2) “Unserved food” is food that was cooked but never left the kitchen; this is what now normally goes to soup kitchens, food reuse programs, etc.

3) “Plate waste” is food that has been on a customer’s plate or serving tray; food service operations do not distinguish between these two classes.

4) “Out-of-date” is food that has been purchased but has exceeded its shelf life in the kitchen; it could include meat, milk, and other perishables.

6) Probably the hottest topic in recycling today (mid-1997) is the development of large-scale, food-scraps diversion programs. Field trials are being conducted with on-site, in-vessel composting, special containment and collections systems leading to large-scale composting facilities, etc. When you realize that a good-sized restaurant will discard 700-1000 pounds of material per day, you can realize the value of focussing on this material. With 51% of the food dollar in America now being spent away from the home, the volumes of commercial food debris can be impressive.

Finally, the packaging industry says that although we have a lot of food packaging in our “waste stream,” we have much less food scraps because the food preparation is done elsewhere (at the cannery, the Tombstone pizza plant or at all the other ready-to-eat food plants); this makes it easier to recover foodstuffs for recycling because they are already...
collected at the factory that fixes ready-to-eat foods.

This category also includes animal bodies, including carcasses of chickens and turkeys, which would be found in household discards, as well as remains of slaughtered animals.

Reprocessing Food: One of the exciting developments in processing recyclables in recent years has been the phenomenal growth in home composting. Although all of our farm-based grandparents disposed of their scrap food materials at home forever, feeding animals and compost piles, our urban and suburban parents forgot the lessons that many are now relearning. I started home composting in 1977 and have consistently had the finest big tomatoes you could expect. Earthworms arrived in my bin naturally and have been making castings (the polite term for their excrement) ever since. Many waste reduction agencies offer home compost bins at reduced prices and teach home composting classes. The authorities seem uniformly fearful of an exponential growth in the urban rat population and consistently advise to keep meat scraps, fats, etc. out of the bin, but it’s never been a problem for us. Mudd’s Restaurant in San Ramon, California has been composting its food scraps out back at the herb garden for years. [Add details.]

Larger scale ventures to handle food scraps have been developing since about 1994. A pilot Alameda County program collected food waste from restaurants and produce sellers; the material was deposited on a bed of shredded yard debris and covered over with more yard debris (rat and fly control). After a suitable stewing time, the entire mass was worked over with a compost turner and the final product was quite suitable. Students at UC Berkeley have built 40 large worm boxes (8’ x 4’ x 4’) and are gathering the 1500 pounds a day of food waste from campus facilities to feed the worms. (Visible on the southeast corner of the Gill Tract in Albany.) In-vessel composting machines, about the size of an automobile, are now in pilot projects around the country. San Francisco State University and the City of Berkeley have machines now at work. Typically the machine sits on a concrete pad, is top loaded and some system to agitate the material is built in.

7. YARD DEBRIS: There was an interesting study several years ago about how the English country house grounds became the model for American single-family homes; regrettably, much of America does not get the 80 inches of rain per year that fall on England and we devote considerable resources developing non-native flora for our properties and then hauling away what no longer fits the ideal vision. Yard debris is what we haul away, be it palm fronds, bamboo shoots, grass, leaves, tree trimmings, brush cuttings, old plants (I can still remember the shock I first felt seeing whole potted plants with flower pots in residential trash).

During the 90s, the separate collection of these materials and their deposit in composting facilities and mulch yards became widespread. Many jurisdictions had discovered that this material comprised as much as 50% of the residential waste stream (hot and humid areas and wealthy suburbs mostly). The costs of operating a separate collection program were frequently offset by dramatically declining volumes of landfilled materials and the programs met with broad-scale public acceptance. Interestingly, nowhere in the country has there been a glut of compost and the farmers, the golf courses, the municipal groundskeepers and others seem to absorb all that can be made.
Reprocessing Yard Debris: Yard debris such as is collected in a municipal “green waste” program or is delivered to a site by gardeners and landscapers is usually shredded to two inch minus sizes and then taken to a composting facility. Often the same firm shreds as well as composts, but not always. Sometimes the material is run through a screening system (like a trommel) before grinding to get the grass and small pieces of yard debris to drop out; sometimes the smaller pieces can be taken directly for land application without composting (a mulch-type product). In California it seems that much of the value of this type of material in the soil is for water retention purposes and not as a plant nutrient; During the Golden Age of California agriculture (1920-1970) farmers got used to large quantities of chemical fertilizers and have been slow to break that habit. But nothing helps California’s sandy soils hold water applied from spray or ditches up next to the plant roots better than organic material in the soil.

Sometimes the larger pieces of ground material are sold as fuel. The buyer’s price is a function of the water content of the material; prices are quoted per “bone-dry” ton and a sample of the material is removed from the truck and dessicated before a purchase price is settled on. In a dry season cut brush and leaves can lose half their moisture in two weeks, encouraging the processor to work slowly through the material.  

8. WOOD: This category includes finished dimensional lumber, both pre-consumer (construction trim) and post-consumer (building tear-out, demolition work, wood roofing shingles, broken pallets, etc.). It also includes engineered wood products such as oriented strand board [OSB], medium-density fibreboard [MDF] and particleboard. Its third subgroup includes tree trunks and limbs removed from felled or standing trees and now made available for disposal.

The current markets for this material will vary from place to place. For a while much of the wood in California was shredded and burned to feed alternative-fuel power plants but many of those plants have been closed due to utility rate restructuring. Tear-out projects, often done by hand, frequently yield dimensional lumber suitable for used building materials yards. In the East Bay area, a large wood grinding operation feeds shredded wood to a particle board plant near Sacramento. In San Francisco a wood shredder feeds a MDF plant in northern California. Some wood is shredded and used as a bulking agent for sewage sludge or fine grind yard debris composting. Diversion activities are very spotty and vary greatly from wasteshed to wasteshed. Increasingly the shredding machine operators are developing a dedicated collection system to secure a reliable source of grindables.

A major stumbling block to more wood being recycled is the reluctance to handle painted wood. Lead-based paint (common before 1978) creates unacceptably high levels of lead in mulch, incinerator ash or incinerator smoke/emissions. There are simple but not inexpensive ways to test paint chips for the presence of lead but so far this is not common; used building materials yards are the only outlet for painted wood. (Stains, varnish, shellac and other clear finishes for wood do not present the same problems as paint and are generally acceptable in reprocessing facilities.)

It’s also true that particle board and medium-density fibreboard cannot be chopped up and reformed into their own kind and nobody wants to burn that stuff, so as their volumes increased (x.x million square yards of MDF in 1995), their management becomes a bigger problem.  

Reprocessing Wood: The destination of wood products depends a lot on local conditions. Where used building materials yards exist, used dimensional lumber has a home; a business in
Richmond, California has large supplies of 2x4s, graded into various lengths over four feet long, whole and half-sheets of plywood, and other sizes. Pallet repair businesses take wood from broken pallets to repair better pallets and sell the finished goods at xx% of a new pallet’s price. Firms have been known to build Adirondack lawn chairs from used lumber and many butcher-block and wood floor tile manufacturers work with smaller pieces of lumber, although not often used wood. Selling post-consumer wood as kindling is attractive but seems to have difficulty catching on. (One Bay Area firewood wholesaler sells end pieces from a box springs frame manufacturer as kindling but this is pre-consumer scrap.)

The most common market for odd lots of dimensional lumber is a shredding operation, where the shredder sells the resulting chips to a burn plant, a particle board mill or a medium-density fibreboard plant. Sometimes the chips can go to a sewage sludge composting yard as a bulking agent for the sewage.

Whole blocks of wood (tree rounds, etc.) are usually delivered to an independent firm that will sawbuck and split the wood for sale as firewood.

9. TEXTILES: Human society has manufactured textiles for about 9,000 years. People learned to turn plant material into thread (cotton, wool, hemp, linen) and then weave thread into cloth. Hand-powered looms were invented by the time of Homer; remember Penelope’s weaving and unweaving? The Industrial Revolution allowed thread and cloth to be mass-produced and, with the advent of synthetic fibres in the 20th century, the availability of textiles has become worldwide and relatively inexpensive.

Textiles are variously categorized as woven/non-woven (the latter being a mat of assorted fibres), or by the fibre of origin, (cotton, wool, dacron polyester, etc.). Textiles are graded by thread count per inch; e.g., 140 threads going the same direction in a woven sheet per running inch of cloth is spoken of as 140 denier (a French word meaning xxxx).

Textiles are most often thought of as clothing, but an equal amount of material is sold as towels, toweling, sheets, blankets, bedspreads, drapes, cover cloth in bedding and furniture products, etc. Some analysts consider carpeting a type of textile.

Reprocessing textiles: In cutting out rolls of cloth to make clothing, roughly 20% of the cloth will be scrap; this material can be further cut to make patchwork products, like quilts, handkerchiefs and throw pillows. The material can also be shredded to make “shoddy” (a generic name for shredded used textiles) and then reformed into 1) a non-woven mat product known as “shoddy pad” [what you’ll see under the floormats in your car or over the steel springs in your mattress], or, in a very few instances, 2) rewoven into new cloth.

In contemporary America a large portion of the post-consumer textiles end up in the hands of the reused goods store industries, like Salvation Army, Saint Vincent dePaul, and Goodwill. These stores remove from their inflow only the clothing they can resell in their stores; their standards are fairly high and reflect their experience as retailers (even poor Americans will not buy clothing with wear spots, rips, tears, missing buttons, etc.). The remaining materials are sold (often about half of what they have collected) to a “rag grader.” The rag grader then resorts the textiles into four classes: 1) export clothing (which goes most often to Central America and Africa; the Far East used to be a big buyer but people there now have more
money and are less interested in American cast-offs), 2) wiping cloths (usually t-shirt type material that is cut into swatches roughly a 12 to 18 inches square and sold to painters, machine wipers, etc.), 3) shreddables (being cloth for which no markets under one and two are possible; this would include overcoats, worn-out sport jackets, etc.), and 4) trash (this would be textiles that are hard to shred (like poplin and denim) or that have no use if shredded (like leather, plastic, rubber, neoprene, etc.). In some sections of the USA, the reused goods stores have a hard time competing with churches and other shelter-related programs that receive and give old clothing to the poor; cheaper is better.

In recent years there has been an oversupply of post-consumer textiles in America, due mostly, it seems, to a slowly growing market for shredded textiles. Shoddy and shoddy pad have been limited to commercial carpet underpad, automotive floor mat underpad and automobile trunk liners, and some spill control uses but textile recycling desperately needs new markets to expand. The recent development of a shredded textile insulation product [the factory is in Chandler, Arizona] using some cotton batting as an add-in may foretell an industry where fiberglass insulation is the exception rather than the rule.

10. CHEMICALS: Modern life brings us into contact with numerous chemicals to clean our house, kill bugs, keep our pills dry, and shampoo our dog. Europeans speak of Americans as “chemo-phobic” but we certainly buy enough of this stuff at the consumer level. After use, most of these chemicals are dissipated into our immediate environment and break down chemically into simpler substances, vaporize into the atmosphere, or are washed down the drain. Generally, from households, there are only small quantities of chemicals needing disposal services, although continuing attention from air and water pollution prevention enforcement agencies may encourage programs that result in these household chemicals more likely being discarded as solids rather than as air- or water-borne materials. In a typical household hazardous wastes event or program, 85% of the disposed items are batteries, oil, and paints.

From industry, it’s a rather different picture. Most basic manufacturing involves the use of chemicals that are not hazardous and the many substances that end up in the trash rather than in the product require disposal. Once I worked in a rubber plant where we would fill three or four 55 gallon fibre drums a week with materials that were not hazardous but that we couldn’t salvage for our own use. There was once a company in the Bay Area that shredded used tin cans to remove the iron material they would put in paint pigment; the residue was a dark brown damp material a little thicker than a cake batter; it went to the dump in large quantities because no one knew what else to do with it. Recently a company in Berkeley, California was spending over $1,000 per week taking their used foundry sand to the dump; a new machine allows them to clean the sand and it’s now reused many times before being discarded, although the materials removed from the cleaned sand still go to the dump. There is no uniform system to manage scrap chemicals. Various firms have come along that would accept or purchase partially used chemicals but they seem to have troubles with insurance, resales, etc. A large collection of unhappy stories is told by Paul Palmer, Ph.D. who for many years ran a chemicals salvage and resale business in Oakland, California. His book, Zero Waste, 2004 chronicles the problems that USEPA and others made for him. The general absence in the marketplace of businesses like his would suggest that his experience was not unique; of the twelve major categories in this analysis, it is probably with chemicals that we have the lowest rating of available markets.
11. **SOILS:** This is another broad class of materials and would include dirt, sand, etc.

**Reprocessing Soils:** It is sometimes a surprise to students of discards that people throw away as much soils as they do. From potted plants to lawn tear-out, from back yard and cellar excavations to kitty litter (mostly diatomaceous earth), a small amount of unwanted soils need disposal. While soils in large quantities are almost always managed with great care, smaller quantities often end up in the solid waste system. (In some work in San Francisco in 1992, our team found that the largest quantities of materials by weight in household garbage that used the curbside program were kitty litter, paper diapers, and fruit tree spoils.) Smaller quantities of soils are rarely reprocessed; in some instances mixed solid waste is screened to allow soils and other fines to drop out; these small-sized materials can be blended into a compost feedstock or used as a landfill’s daily cover to reduce solid waste disposal costs. The great risk to this activity is that the untested soils are contaminated with petroleum by-products or other chemical spill materials; the cost of testing soil is frequently greater than the value of diverting it from landfills.

12. **REUSABLES:** The Knapp-VanDeventer protocol lists this category of materials first, possibly because their own business, Urban Ore, makes reusables its stock-in-trade. Also, reusables should be first in the hierarchy because reuse is better than recycling. For my own reasons, I have put it last. As a category, the term reusables can cover an infinite variety of things. At a reused goods store I have seen everything from old tennis balls (for Rover to chew on) to airplane auxiliary fuel tanks to church pews to toilet tank lids. In the Bay Area there is a tendency to separate reusables into three distinct classes: office supplies, building materials, and arts and craft supplies.

**Processing Reusables:** Because reusables span such a broad class of materials, no simple description would suffice, but I can give some examples:

**Wine bottles:** For wine bottles, after arriving at the bottle washing plant in pallet boxes, the bottles are handloaded standing upright onto a conveyor belt and go into a bottle washing machine. During loading, bottles that are obviously defective (scratches, nicks and cracks, objects stuffed inside, etc.) are rejected. Once inside the machine a caustic compound is introduced to the inside of the bottle and the outside paper labels are washed off. After inversion and rinsing, the bottles exit the machine and are hand-unloaded from the conveyor where the top edges are rechecked for nicks and cracks, the outside is wiped with a rag to remove any label glue, the bottle is held up to the light to check for solid items inside the bottle or irregularities in the glass and the bottle is color- and shape-sorted into the appropriate new box for storage and shipment to a winery.

**Styrofoam Pellets:** In the last five years or so it has become common for retail outlets selling packaging supplies to take styrofoam pellets from consumers who don’t want them and reload them into a standard size retail bag and sell the pellets to customers wanting them.

**Consignment Shops:** Many household goods now go to consignment shops, where the shop owner takes half of the sale price if the objects sell. Central Contra Costa has a chain of consignment shops with furniture as fine as most “all-new” stores.

**Yard sales.** This simple concept has a long tradition; the City of Mountain View, CA was the first, I think, to promote citywide yard sales out of its waste reduction office.
E-Bay: The development of on-line buying and selling has been the great success story of the early part of the 2000 decade. As much material is bought and sold through E-Bay in a day as moves in many retail chains. [Get the figures.]

Chapter three: - 2nd ed.

HOW DO WE DO RECYCLING? THE HOW TO OF THE ENTERPRISE

In Chapter One we looked at the big picture of how materials move about in our world; in Chapter Two we looked at the master categories of materials in the stream of commerce and at some of the more general recyclable materials in greater detail.

Now here in Chapter Three we will look at the various types of programs that have been developed so that unwanted recyclable materials can get into the recycling stream and out of the garbage stream. If Chapters One and Two speak to the “what” of the recycling story, this chapter speaks to the “how.”

First it needs to be remembered, as discussed in chapter one, that recycling is an ancient and honorable activity. A very delightful book called WASTE AND WANT: A SOCIAL HISTORY OF TRASH [by Susan Strassner; NY: Metropolitan/ Holt, 1999] recounts in amusing detail the practices of getting rid of unwanted things in colonial and early modern America. Recycling’s been around a lot longer than garbage.

The second point is that this chapter is not a history of recycling in America; it is simply an account of current practices so you can be oriented to what’s happening out there.

Most teachers see there are two basic ways of getting materials into the recycling loop; first is source separation programs where we rely upon the owner of the material to keep it separate from garbage and moving into the loop, the second is centralized separation, where someone removes materials otherwise destined for garbage disposal and put them on the path into the loop.

A. SOURCE SEPARATION PROGRAMS:

DROP-OFF CENTERS: As early as the latter parts of the nineteenth century this country had a series of local businesses buying scrap paper and metals in every major industrial area. They acquired material from individuals, push-cart operators, small trucking firms, and from businesses. But they were located in lower-class neighborhoods and we not much favored by the rising suburban type communities. (I remember as a kid in the late 1940s taking
newspaper to a local dealer on Riverdale Avenue in my city; I probably got fifty cents for the backseat full of the family’s Chevrolet.) When the modern environmental movement started in the 1970s, a simple and relatively inexpensive way to recycle was to establish drop-off centers near where people lived that would aggregate loads for the down-town buyers. By 1978 there were some 3800 facilities across the country, many open only a few hours a week, many staffed exclusively with volunteers. In the Bay Area we had at least three sites in Berkeley, two in Oakland, 13 in San Francisco, one in Fremont, one in Castro Valley, etc. The equipment was often primitive; the range of materials to be recycled usually consisted of what could be sold locally (typically cardboard, newspaper, tins and aluminum cans; a few locations dealt with glass bottles and jars although in the old days they could be sold only if the labels were soaked off the glass). The program supported itself on the sale of donated materials; only a few programs had public support in terms of free (or cheap) land, grants to cover operating costs, etc. If anybody who worked in these centers had benefits or retirement plans, I never heard about it.

I was myself from 1983 to 1989 the manager of one such facility in Oakland. New to retail, I was advised to keep the place clean and be nice to the customers. I did so and they rewarded me; about 1500 households (as I could best figure it), each on their own schedule with a few dollars worth of all of the above materials plus we were able to sell wine bottles to a bottle washing firm and a few other side gigs to turn a profit. My labor came from folks working off their welfare checks of the Southern Baptist community center next door. In good months we made a few thousand dollars; in bad months we lost money. My salary was whatever was left at the end of the month that I didn’t need for the next. We never made much money but, then again, we never went broke. But we were also never very successful; at some point I figured out that these 1500 households were about 15% of my market area; at one point towards the end I realized that I was handling 0.1% of the city’s waste stream and, even more discouraging, I realized that if I worked very hard and was very careful and didn’t go broke, that in five years I would do 0.5% of the city’s waste stream. I knew there had to be a better way than the path I was on.

As curbside programs came on line in our area in the late 1980s and early 1990s, the drop-off programs generally died. I think the only facilities currently operating that were in the same place in 1983 are the City of El Cerrito’s drop-off program at the top of Schmidt Lane and the Haight-Ashbury Neighborhood Center next to Kezar Stadium in Golden Gate Park in San Francisco.

In recent years, particularly as the cost of going to the landfill has increased, drop-off programs have seen a slight resurgence. I think particularly of the program in Walnut Creek that takes yard debris as well as the standard cans, bottles, and newspapers; if you live in Walnut Creek and want to get rid of yard debris now, you have to drive to Antioch, north Concord, or Pleasanton; there are no close and simple solutions. The city’s yard (off North Main Street, just next to its I-680 northbound on-ramp) provides a real service to its residents. Or consider the drop-off program at the Berkeley buy-back center at Second and Gilman Streets. Here the program accepts newspaper, cardboard, mixed paper, two types of plastic bottles, tin and aluminum cans, aluminum foil, three colors of glass, scrap metal, clothes, books, cell phones, etc., all without charge. Fifty yards down the street is the entrance to the Berkeley Transfer Station where it costs five cents a pound or more to get rid of things. For anyone to whom time is less important than saving money, the Berkeley drop-off site offers a quick and convenient place to “lighten your load” and save some money at the dump gate.

What Berkeley does somewhat casually, Sonoma County designed with great care. The Central Landfill, now a transfer station with the surprise closing of the landfill in 2004 due to unanticipated leaks, was originally just a dump, but in the early 2000s was redesigned to allow all manner of material drop-off on the property as a simple swing-off side excursion from the main traffic line into the dump. A grade difference of several feet allowed a small truck operator to pull things off his truck and toss them into waiting, but lowered, debris boxes for metals, glass, paper, etc. The most recent estimates are that about xx% of the total tonnage brought by self-haul vehicles into the facility is being diverted by this up-front drop off program.

Certain progressives are predicting that at some point the state will require that all facilities with solid waste facility permits (incinerators, landfills and transfer stations) will be required to offer prior to the pay area free disposal services for a range of materials commonly thought of as the standard recyclables. I have no idea if this will happen but it should. The best thing about making these services available for free is that it rewards the people who take the effort to keep things separate. Not everyone can take advantage of lower fees for spending more time but many people can and they should be remembered in all facility planning.

BUY-BACK CENTERS: Buying used or scrap materials from the public is not a new idea or practice; photos of immigrants with pushcarts in New York City at 1900 rounding up cardboard boxes and glass bottles are common. As a Boy Scout in 1951, I participated in my first paper drive. One Saturday in March we leafleted about 4,000 homes near the church that was our sponsor and two weeks later we went with Mr. Stefanik’s box truck and brought in about 11 tons of paper. We sold them for $220 and that was enough money to buy all the camping gear we needed (pots, pans, tents, etc.) to take 20 people camping; we were very proud of ourselves.

The modern buy-back center owes its origin to several factors. The commercial scale buyback is, of course, a real business. Material is purchased from the public in small loads, baled and/or aggregated into large, 25 ton, load, and moved to market. A working buyback center I know in Oakland moved 75 tons of cardboard a day, 50 tons of
newspaper, 12-15 tons of glass and several tons of plastic soda bottles and milk jugs. It has a payroll of about 30 people and probably (a privately held company) grosses $4-5 million per year. They’ve been in business for 30 years and have never been broke. They always pay less for the materials than they can sell them for, the spread becomes their operating income. As expenses are insurance, facility costs, new equipment, labor, etc.

Another major factor in the development of buy-back centers was the development of the sheet aluminum beverage container that hit the market in the mid-1970s. From the beginning the aluminum industry touted the high value of the material in the cans (usually 15-20 times more valuable than a steel can) and several of the aluminum manufacturers set up scrap collection divisions, especially Reynolds and Alcoa. In Alameda County, a consortium of beer distributors built a string of buyback facilities starting in about 1978 as a way both to encourage aluminum can recycling but also to convince the public that a bottle bill was not necessary in California. With my little drop-off center, I added a buyback capability for aluminum cans and glass bottles to encourage kids especially to collect materials and make money (any little kid doesn’t like to make money?). We operated our buyback only on Saturdays but it was well received. My margins were a little thinner than the commercial sites but I was trying to ingratiate myself with my neighbors (which I did).

What really changed the buyback business in California was the enactment in 1986 of the California bottle bill. Rather than requiring the grocers to take the bottles back in the stores as earlier laws in other states had required, California law required only stores with annual sales in excess of $2 million dollars to provide a “recycling opportunity” within a half-mile of their store. Out of this law some 5500 buyback facilities were mandated in the state; details on this program are in Chapter 11.

CURBSIDE PROGRAMS: Soon after Earth Day 1970, as drop-off facilities were sprouting up all over the country, several policy leaders concluded fairly early on that the level of service for recycling and recyclables must be equivalent to the level of municipally-sanctioned garbage service for the programs to be successful. This led, in the great progressive, liberal communities of this country like Berkeley, Palo Alto, Boulder, Ann Arbor, Madison, Wisconsin, etc. to the start-up of at-your-door recycling services, commonly known as curbside. For people who are raised today with a full range of curbside programs visible everywhere [in 2006, there were 3800 curbside programs with 25 of the 30 largest cities in the country having some type of household collection program], it’s hard to realize that as late as the mid-1980s, there were as few as 200 curbside programs nationwide. (In 1985, 4 million people had access to curbside programs; in 1995 125 million had access.) San Jose came on line in 1987, San Francisco in 1988, Oakland in 1992.

One very fascinating section would be here on how the shape of curbside programs has developed. There have been a variety of studies over the years on various topics that have shown things that today seem very simple and expectable but which at the time of asking these questions were matters of great discussion and ignorance. Questions that are today as simple as these elicited great interest when first begun:

“Will people put more stuff out if you give them a container to put their materials in?
“Will they put more stuff out if you pick it up on the same day as garbage service?
“Will they put more stuff out if you give them a burlap bag rather than a five gallon bucket?
“Will they put out more beer and whisky bottles if their bin is covered so their neighbors can’t see how much they drink?
“Will they put out less stuff if you only collect it every other week?
“If you now choose to pick up plastic bottles #1s and 2s, will you use up all of the space in your collection trucks too soon?
“If you tell people to forget about looking for #1s and #2s, will you get more 1s and 2s, and will you get too much stuff (#3s through #7s) that you don’t know what to do with?
“Should you offer plastic film collection programs even though most of larger grocery stories already have programs that collect all this stuff?…. and on and on and on. Some of these questions have been answered with studies and data; others have just gone away as the recyclables collection industry has gradually come to define a series of “best practices” (a very popular term today although of questionable validity).

What, in the final analysis, does curbside do? It makes recycling of a type easy for people; it makes it hard for them to say no to the publicly-sponsored program. What does curbside not do? This has been a much harder question to explore because the public investment in curbside has been so immense (probably $12-15 billion nationally), and the general awareness of other ways to accomplish the same goals has been so weak, that there’s been a terribly thoughtless insistence that everyone like and use curbside. Can we describe the resisters; yes, it’s the people who want to take care of their materials themselves (like the drop-off center users cited above) and the people for whom the cash value of their materials is a real value indeed (like the numerous patrons of buyback centers, also cited above). My own opinion, which is very indebted to Richard Gertman’s insight of 1984, is that the three different programs appeal to three different groups among the citizenry, that for some exercising personal environmental responsibility is important and they will find time to do it, for some the cash value of these discarded materials is important, and for others the convenience of the collection at the house is important. Gertman’s point is
that if the goal of recycling requires three different programs, why not use them? I have never thought poorly of this advice and perception.

Before leaving curbside, it’s valuable to run a few numbers. There’s no typical community, but in many towns and cities, the commercial trash outweighs the residential trash two to one. That means the world’s best curbside would deal with 33% of the LPA’s trash. Then consider that 30% of the public won’t participate under current rules, so you’re down to 70% of 33% or 23%. Then consider that not everything people get rid of fits in your curbside program; people have carpets, painted wood, old computers, etc. to get rid of that can go in the garbage can but not the recycling container; so let’s say 70% is eligible for inclusion in the curbside and 70% of 23% yields 16%. Then consider that not everybody who does participate puts everything they could in the curbside container; there’s plenty of room in the garbage can, they think they have to rinse out the mayonnaise jar before putting it in the curbside bin and they don’t want to take the time, etc. That means you lose another 20% so you have 80% of 16% which is a little under 13% and that’s what a typical curbside program draws, usually 8 to 14% of the total discards in a community. Should we be discouraged? Not necessarily, but we do need to realize that a curbside program is not going to do everything. If we need brushing and flossing and flouride and regular check-ups from the dentist to keep our teeth in optimal shape, maybe we need more than one way to keep materials from the waste stream and prevent their loss.

COMMERCIAL COLLECTIONS: The fourth type of source-separated collections is rarely discussed (I think) because most of it takes place with no public support or intervention. If you operate a business in any industrial section of any city in California, at some point soon after you open someone will come to call on you with a pick-up truck and offer to haul away one or more of several commodities which they will sell to the existing metal, glass, paper, and plastics aggregation businesses. The driver will most often not provide containment for your materials but will show up on a regular schedule and will provide satisfactory service. No level of government has any direct knowledge of these materials transactions; they leave no trail with the IRS nor with the municipal business licensing boards. This is free market activity at its purest. Each truck driver is an entrepreneur and works very hard to gain and maintain clients, to keep his/her truck running, all the details of staying alive in your work.

It’s a sad fact that local governments don’t do more to encourage all this free market activity. In the early days of California’s rate and date law (see Ch. 11), local representatives were trying to penetrate this web of service to be able to quantify it; at every point they were rebuffed and, in 1991, got the legislature to change how local recycling practices were to be measured. In many of my waste audits, I have asked facility managers if they ever looked in the yellow pages under recycling centers and called to ask if someone could be sent to pick up the cardboard, or the glass, or whatever. Almost always the answer was no but those facility managers also testified that while they were thinking about what to do that somebody showed up who solved the problem.

This country needs a book about all the little people who make commercial recycling work with not one penny from the government. This is not that book but the public at large will be greatly aided by seeing better how this fleet of little trucks works its territory and makes a living. If you stand at the west of the Bay Bridge in San Francisco and watch the fleet of pick-up trucks that cross the bridge each day to sell their glass and cans and cardboard in Oakland, you will gain some sense of how these ventures work.

In each of the four types of programs discussed above, managers are relying upon the good will and the positive intentions of the person in control of the material to keep that material out of the waste stream and to direct the material into the recycling stream. Each of these four source-separation methods covers part of the territory and does some of the work that needs to be done, but each of these techniques relies on the goodwill of the person who can and will set aside the material for separate collection and management. Fortunately, the conservation of materials does not depend on the positive actions of 300 million different people. Unlike smoking cessation or losing weight, you can hire other people to conserve your materials, and now we look at the centralized separation programs.

B. CENTRALIZED SEPARATION SYSTEMS:

SORTING MATERIALS ON THE TRUCK: From the latter part of the nineteenth century until about 1950, open-top garbage trucks were the norm and the youngest or the feeblest member of the collection crew would stand in the back of the wagon or truck and sort recyclable materials; the famous phrase, “Rags, bottles, or sacks” will focus on their interests: textiles (all natural fibers in those days, sold to papermakers), glass (sold to glass plants or for sterilization and refilling), and pager bags (sold to the paper reprocessor). When the packer truck replaced the open-top truck (by about 1960 all the open-top trucks were gone), the waste haulers abandoned on-board sorting.

This style of recycling is practiced today, such as it is, in the self-haul fleet. The City of Berkeley has operated a drop-off recycling program in front of and adjacent to its disposal site since at least 1985; a person with scrap metal or a lot of cardboard will drop off those items at the drop-off yard before driving 75 yards down the roam to the
transfer station; the city gets the materials recycled, and the hauler saves 5 cents for every pound diverted. There are problems with this system because the drop-off’s hours are not the same as the transfer station, but it generally works pretty well. People using this system regularly know to pack their truck so the recyclables come off at the drop off location; saving them money at the tip gate. Sonoma County has what is probably the state of the art for this type of recycling service delivery system in its Cotati facility. Opened in the mid 1980s as a dump, in the early 2000s it was reconfigured to allow extensive drop off from self-haul trucks before the tip fee gate allowing access to the dump (now transfer station).

DIRTY MRF: For years garbagemen have recognized that things in their truck could be recycled and didn’t need to go to the dump. The first plant of its type in northern California in the modern period was the 17th Street and Rhode Island Avenue facility in San Francisco. Here mostly drop boxes and front loader routes from the financial district were brought and tipped out on the floor; bucket loaders pushed the material onto sunken conveyor belts where it was carried up and workers removed the true trash from these loads, leaving on the conveyor belt the office paper from the office buildings. The material was then conveyed to a baler which compressed and baled the material for sale to a plant in San Leandro that made wallboard paper from this feedstock. (The Rhode Island facility was moved in the late 1990s to Pier 96 where these activities continue to this day.)

In 1989, I was hired as the sort system supervisor at a factory on 77th Avenue in Oakland; we received certain drop-boxes from the Waste Management Inc. accounts in the Oakland–Hayward area and removed the wood (chipped for boiler fuel), cardboard, office papers, plus cans and bottles that came through for recycling. We also had a direct haul from the NUMMI plant in Fremont and would sort out the plant’s trash for cardboard, plastic film, rigid plastics, and others.

There are now probably 15 dirty MRFs in northern California (north of Fresno) where waste haulers remove from the inflowing materials the common recyclable materials (wood, cardboard, metal, glass, some plastics, etc.) before sending the rest of the stuff on to the dump. If you want to tour you can contact: [at present I can count seven] Pier 96 and the I-MRF in San Francisco, Marin Sanitary in San Rafael, the SmaRT Station in Sunnyvale, Davis Street MRF in San Leandro, the Pleasanton Garbage Service’s Transfer Station, the Transfer Station in San Carlos, and Blue Line Transfer Station in South San Francisco.

MIXED RECYCLABLES: At some point leaders in the recycling and waste hauling businesses realized that source separation had serious limits; it was in fact simpler for the client and the hauler to pick up one container which contained all the recyclable materials and then bring those materials back to a specially designed facility for separating the materials and aggregating them for market. Leonard Vinci brought the concept of mixed recyclables recycling to northern California in 1985 with the establishment of East Bay Recycling on 77th Avenue in Oakland. He was able to finance the construction of a processing facility and some collection trucks and bins and told his potential clients that if they would keep certain specified materials out of his bins, he would charge them what came out to be 80% of the local garbage hauler’s rate for the same sized container. Within a few months he had several hundred accounts and was capturing a large portion of the materials discarded in his bins and boxes for recycling. At that point the local waste hauler wrote a letter to everyone who had stopped commercial garbage service within this period of time, threatening the former customer that if they were contracting with an illegal waste hauler, they could suffer punishments. Within a few weeks, most of Mr. Vinci’s customers withdrew from doing business with him and went back to garbage service. (The waste hauler had no dirty MRF at that time.) Mr. Vinci then sued the waste hauler, saying it had intimidated his customers; the waste hauler counter-sued, saying Mr. Vinci and his company had infringed upon their exclusive garbage hauling franchise in Oakland and other cities. The matter was settled out of court in 1988 with Mr. Vinci agreeing to get out of the collections business and the local hauler agreeing to bring him any of the 1200 drop boxes then in their service area. (My job in 1989 as Mr. Vinci’s employee was to figure out which of the 1200 boxes Mr. Vinci could most profit from.) At this point Mr. Vinci is a client of the waste hauler and got a solid waste facilities permit to operate his facility.

The question then came, “Well, what if he had won in court and was in fact hauling only mixed recyclables?” To look at that most carefully, we need to go back a while in time. Prior to 1972 there were no such things as solid waste facility permits; landfills were regulated by the water quality board and that was it. In 1972 the state’s waste management law was enacted and required landfills to have solid waste facility permits [SWFP]. Two years later, the law was amended to require transfer stations also to have permits. Almost immediately the question of whether scrap yards were to be considered transfer stations arose under the law and in 1975, largely guided by the scrap yards’ association, the Institute of Scrap Recycling Industries, the legislature modified the definition of a transfer station in the old Government Code to read that any facility whose “principle purpose” was to “recycle materials.” would not be required to hold a solid waste facilities permit. The question lurking under the dispute between Mr. Vinci and the waste hauler was whether or not he met the test of the law. In the early 1990s, the California Integrated Waste Board wrestled with this problem and delineated by agreement the rule that if a sorting facility has more than 10% of what came in as unrecycled residue (that went to a dump or an incinerator), then this facility
was in fact a transfer station and must have a SWFP. There was broad-scale opposition to this rule-making at the time but the board went ahead with it; the rule is now found at 22CCR Section xxxxx. The concept and practice that Mr. Vinci espoused has now been picked up by other firms and the concept of a mixed-recyclables hauler who is not a waste hauler is now firmly in place. Both California Waste Solutions in Oakland and Pacific Rim Recycling in Benicia offer mixed recyclables hauling to a wide variety of commercial accounts; neither has a SWFP and neither considers himself in the waste hauling business.

CONCLUSION: PART ONE: At this point we have seen seven ways to get and keep recyclables out of the waste stream and back into the stream of commerce. Will there be more ways? I have no idea. Clearly what we’re doing now doesn’t work too well, considering we have as much garbage as we had 15 years ago and nobody at the state level really knows how much of all our discarded materials are being recycled. We have a lot of numbers from the LPAs subject to the CIWMA but when the CIWMB counts up all the garbage, we still have a lot of good stuff in the trash. Chapters 7, 8, 9, 10, and 14 will suggest some of the reasons why we are still at the middle of the beginning rather than reaching the end of our quest.

PART TWO: SOLID WASTE AND RECYCLING; THINKING ABOUT THE RELATIONSHIP:

It’s appropriate now to look at the relationship between solid waste and recycling, and particularly to look at some of the conceptual developments in the period after 1980 that might be said to lead to the rise and fall of integrated waste management. I have not seen this story told anywhere else the way I tell it so what I write here may be in time seem very wise and prescient or possibly ridiculous and wrong-headed.

It’s important to realize that recycling as it was practiced in this country before 1970 was not considered a noble activity. None of the cachet that the current upper middle class attaches to “doing green” or “living sustainable lives” applied to the mostly unskilled, low labor cost activity of getting together the scrap paper and scrap metal of a growing industrial society. But people made a living at it, and for many, it was a pretty good living. Some of the most prominent Jewish and Italian families in America have in their family tree, a hard-working man with little capital who built a business supplying foundries and paper mills a cheaper feedstock that what could come from the forests or the mines.

The development of recycling among the bourgeoisie in the 1970s, primarily through non-profit drop off centers but also through curbside programs in those areas able and willing to support such programs, added an entirely new dimension to the recycling industry in this country. It came to be seen not as simply a business activity but as a moral good. And added to this was a growing realization among an ever-larger group of people that what they were now recycling was in fact a large portion of their so-called waste stream. If you get out the newspaper, the cardboard, the mixed paper, all the bottles, jars, and cans, what’s really left in the trash? Not very much.

So, building gradually through the late 1970s and the early 1980s was the sense that recycling has legs, it can do the job. But it (being the part of the industry that the bourgeoisie was most familiar with) has no money, it has no long-term contracts, it owns no real estate. So, the question coming to be raised was why do we have all these publicly-funded benefits for garbage companies (long-term contracts, municipal plans that describe the business several years into the future, in many cases guaranteed profit rates, bankable arrangements that can be relied on to borrow money and sign purchase agreements for property, buildings, and equipment) and nothing like it for recycling ventures.

The initial proponents of integrated waste management [IWM] were people who believed that recycling deserved a place at the table for service contracts and municipal benefits in the same way that the garbage-as-usual interests had in several previous decades. There was initially very little sense that recycling would replace garbage, but there was an emerging consensus that recycling could take care of some of the major volume materials and get them to a better destination than a landfill or an incinerator. IWM was perceived by the leaders and sold a larger constituency as a multiple program activity: some things should be recycled, some buried, some burned, and maybe a few things should never have been made in the first place (this last option was never very prominent in this cadre of thinkers and writers).

Garbagemen, to my knowledge, were neither supportive of nor opposed to IWM. In the early 80s, most of the garbage company leaders had, in their youth, spent time on the back on an open-top garbage truck, sorting rags, bottles, and sacks. When they transitioned to packer trucks and becoming disposal companies, most of them were probably quite happy about it and they also knew that if the public really wanted a lot of recycling it was going to be expensive and they would stand to make a lot of money, as long as the hippie-recyclers didn’t get in that way.
In 1984 or 1985, I was at a public meeting in Oakland; also present was Peter Bergero, then President of the Oakland Scavenger Company (it was sold a year or so later to Waste Management, Inc. for $90 million dollars; my operation was worth about $7,000 in the value of our equipment). He told me how much he admired what I was doing, how I was doing recycling as it needed to be done. What he didn’t say but by his tone I inferred, was, “Yea, this is the way it should be done: no public money, no long-term lease, no bankable contracts on which to buy equipment, etc.” In other words, if I wanted to work my butt of for nothing, feel free.

I have personally come to believe that it was the disparagement of the role of recycling in the mix of services to be offered in a community that was suggested by the IWM concept that led gradually to the second concept of the hierarchy. The hierarchy teaches that all materials disposal options are not equal, that some are better than others, and that source reduction is best, followed by recycling and composting, followed by landfilling and incineration. The concept of the hierarchy was invented when the garbage interests denigrated recycling and saw it only as a feel-good activity for a few of the green bourgeoisie who espoused it.

The other factor that pushed the hierarchy concept forward was the developing difficulties in siting new landfills and incinerators that reached a peak in the mid-1980s. By the mid-80s, the esoteric options that had been floated after RCRA was enacted in 1976 had been largely discarded (deep-well injections, burying garbage in old mine shafts, etc.) and the public (remember, there were twice as many people in the county in 1980 as in 1940) couldn’t seem to find a place that it liked for a landfill or an incinerator. Recycling had by no means proven that it could end the so-called waste stream but there were a lot more people every day who weren’t eager to see another disposal facility built, especially anywhere near them. In 1983 the State of California proudly announced that 34 incinerators were on the drawing boards in the state; by 1988, 31 of those proposals had been defeated by either 1) grass-roots opposition from people who didn’t want to live next to or down wind from an incinerator, or 2) the inability of the incinerator facility developers to convince some local government entity to a long-term contract to deliver garbage at what was viewed as a high price. California had three incinerators in 1990 and, despite creating 650 million tons of garbage in the last 17 years, still has only three incinerators and no plans for any new ones. (Appendix G has some words on what’s specifically wrong with landfills and incinerators.)

By 1989, when the California Integrated Waste Management Act [CIWMA] was enacted, confirming the role of waste reduction and recycling in state law, both IWM and the hierarchy were at the peak of their reputation and fame. “This is the future,” a lot of people said. But, as time went on, it became clear that neither IWM nor the hierarchy was good for much. I would say the decline in the fortunes of IWM and the hierarchy (these are not ideas that can be proven right or wrong; they are concepts that help people organize their experience and make plans for the future) has been (the lowered prospects for IWM is an on-going issue; we are now, in 2007, still in the throes of re-evaluating these concepts) based on four factors.

1) The achievement of 50% recycling, hoped for by year 2000 and announced in July, 2006 as an event of the year 2005, has not decreased the amount of garbage in California. The CIWMA pronounced in 1989 that 40 million tons of garbage annually was a sad event; the language of Stats 1989, ch. 1095, section xx said “……” (After measuring the amount more carefully the next year, that number was changed to 44 million tons, see Stats. 1990.,chxxxx, sect. xxx.) After watching the tonnage decline gradually to 34 million tons in 1994, the tonnage has, pretty consistently, increased so that in 2006 there were again 44 million tons of garbage. With a certain magic that maybe only Hollywood could admire, the state has grown its discards stream from 50 to 90 million tons per year (an 80% increase) while the population has grown only 15%. (This issue is the topic of your author’s separate manuscript on Measuring Recycling in California, now in draft form.)

2) The cursory inspection of any 100 garbage cans will reveal that a large number of materials commonly thought of recyclable are still being delivered to the trash man, not to the recycler. A few examples will suffice: About 1996 or so, the Bay Area Rapid Transit system set up a series of separate collection bins for newspapers. Various well-marked receptacles were placed in random locations around the stations. After the events of 9-11, BART removed most trash cans from the station platforms. As a veteran dumpster diver at BART stations (at various times in the last ten years I have probably assayed 10 of the 37 stations), the existing program gets about 60% of the newspapers disposed of in BART’s system; the rest go in the trash. Does anyone want to change that; not that I can tell.

In 1994, the City of Berkeley, commonly thought of as a leader in recycling, arranged a contest, looking at one household each week to find a garbage can free of recyclables. If I remember correctly, there was a winner the first week and then the City went 13 weeks without a winner. If Berkeley is such a hot town for recycling, what are the odds of randomly picking 13 households in a row with insufficient recycling practices to win a $250 prize?
The programs are there, but people aren’t using them. There is a broad-scale absence of will among the citizenry; a lot of people don’t want to do the right thing, and there seems little ambition in those with the power to make the citizens behave to do so. (Further attention to this issue is in Chapter 10).

3) During the last twenty years, the cooperation of industry and local government, at lease in our area, has created a publicly-subsidized system that delivers recyclable materials to reprocessors for conversion to used materials that will substitute for virgin ones (see Chapter 2 above). What hasn’t happened is that a number of industries have not developed the policies and practices that will make them responsible for creating a market for the goods they have profitably put on the market now and in times past. What the producer responsibility or product stewardship movement envisions is that each consumer product would have a home when it has reached the end of its useful life. Products and materials like carpet, painted wood, particle board, upholstered furniture could have a home but they don’t; many people are realizing that the captains of these industries will continue sitting on their hands and letting modest waste reduction goals pass them by. It seems that now, at least in California, the legislature is slowly adopting the idea that products and materials should have an end point in their life that is environmentally responsible and that the legislature will, in its piecemeal fashion, push industries into programs that will create that home.

4) While USA was getting excited by IWM and the heirarchy, other parts of the world were more openly frustrated by the failures of their own waste reduction and recycling efforts. The City of xxxx in New Zealand adopted a “zero waste” policy in 1994 and several cities in Australia did likewise soon thereafter. Dan Knapp and others brought the concept back to the US about year 2000 and soon a number of cities, particularly, again, as the early innovators of curbside programs, the progressive, university-based cities proclaimed themselves as “zero waste” cities and were developing detailed work plans to implement the policy. In California this whole enterprise got a shot in the arm from the World’s Mayors’ Conference in San Francisco in June, 2005 that promulgated a host of solid waste reduction goals for the world’s “green” cities.

5) In my own opinion what is happening now is that public officials are gradually realizing that the garbage industry does not know how to solve the waste problem. The garbage industry can pick it up, transport and transfer it, and burn or bury it, but they haven’t really made a commitment to solve or end the problem. They dance around the edges but it’s really too big a problem for them. If I’m right in Chapter Two that garbage as we know it is a simple solution for the Industrial Revolution, then it’s not difficult to believe that the waste hauler is no key to waste reduction and recycling. What we need are visions that have nothing to do with waste, that garbage people have no more to do with waste reduction and recycling than a whore house has to do with the love of two people together. A very interesting story: last fall the Recycling Board that I sit on in Alameda County California, invited (against my better judgment) a group of waste haulers who operate curbside programs in the county to tell them what needed to be done to get to 75% diversion. Their first message for us was “we don’t know,” the second message was, “it’s going to cost you a lot of money.” At some point in the conversation, one of the men, thirty years in the waste business, was complaining about how the people who were taking his organic materials kept changing their standards; he was frustrated by their quibbles and their shifts. It flashed back to me a not dissimilar conversation ten years before one of the leading independent paper recyclers in the West bragging about having been in over 200 paper plants around the world. He knew who would buy what, and he tried to sell it to them. Garbagemen, who are used to having non-verbal markets (dumps rarely talk back), are unsuited for the materials handling businesses which recycling demands. None of the carriage businesses survived long in the automobile business; none of the cigarette makers survived as independent companies when they started losing market share. As his term as President was ending in 1960, President Eisenhower warned the nation of a military-industrial complex in our midst that would forever fan the flames of conflict and aggression. Several years ago I similarly suggested that we had a municipal-waste hauler complex in play that would ruin waste reduction and recycling. Nothing I have seen recently has altered my view, and when I learned in 2006 that one-third of all the garbage company revenues in Oakland come back to the city to fund litter collection programs, a ten person program office, and numerous other public benefits, I again felt that the golden ties will kill the goose yet.
Chapter four: - 2nd edition five pages, as of 1-18-07.

SPECIALTY ITEMS:

Back in the late 1980s, recycling as it was publicly known was mostly about cans, bottles, and newspapers. Now, twenty years later, it’s about almost everything. In this chapter we will look at some specific materials and products that have received special attention for recycling in recent years, especially from the California state legislature which appears to be on an uneven path to require recycling practices when appropriate pressure is brought to bear. Much of the information here is very detailed and not really relevant to the new program manager, but it is important background information. This is not my own special area but several friends have helped me get this pretty much right. There is no particular order to the items in this chapter.

A. APPLIANCES: In 1991, in the first act of the California legislature to direct that specific items should be kept out of landfills, the CIWMA was amended to require that all “metallic discards” (defined to include washers and dryers, refrigerators, stoves, microwaves and heating furnaces) were not to go into a landfill. The language of the law [now at PRC, ss. 42160 ff.] is a little archaic and says that only those appliances “which contain enough metal to be economically feasible to salvage as determined by the solid waste facility operator” should be targeted, presumably excusing many vacuum cleaners with plastic cases, etc. To my knowledge, no subsequent law has allowed the facility operator to decide whether or not a specific item needs to be out of the garbage. I don’t think the “economically feasible” term has appeared again in state law.

    My experience working around transfer stations is that this law is generally followed. Things as small as a microwave might be overlooked in the self-hauling section, but anything as a big as a washer or a dryer will be pulled out for metal recycling. It’s common that a tired bucket loader will snatch up the designated items from the tipping floor. After the requirement developed that refrigerators be carefully stripped of their refrigerants, there was a learning curve that the equipment operators had to go through to make sure that the refrigerators did not have their cooling coils punctured by the loader’s blades which would cause the refrigerant gas to escape.

    On this topic the issue of refrigerators should be addressed. One of the early pollution issues related to solid waste was the realization that freon escaping from old refrigerators eventually found its way into the ozone layer of the atmosphere and degraded the ozone, increasing the flow of ultraviolet light into the lower atmosphere and down to the ground. There were skin cancer effects of this loss of ozone and in the early 1990s the federal policy was established that all refrigerants in the freon class needed to be vented and captured from a refrigerator leaving service. For some reason which I have never understood, the scrap yards where the hulks would end up decided that did not want to be in the freon recovery business. Initially the person delivering the refrigerator carcass to the scrap yard was required to certify that the freon had been removed but there was so much deception and error that shortly afterwards, the scrap companies required that the refrigerator motors must be removed; it is easy to check visually that the motor has been removed and if the motor is gone then the freon has to be gone as well. You can’t have freon in the chest if there’s no motor. (Most refrigerator motors in California are apparently shipped to the Phillipines where they are rebuilt and inserted in other refrigerators there.)

B. CONSTRUCTION AND DEMOLITION MATERIALS: The amount of material in the waste stream that is considered construction (buildings going up) and demolition (buildings coming down) material varies with the community but is generally in the range of 15-30% of what’s going to the dump. Construction and demolition materials are actually very different but have generally been lumped together by the industry; they have large quantities of low value wood, significant amounts of drywall and metal, blocks and pieces of concrete, asphalt, shingles, and …… There has been a certain interest in this topic from the state but most of the interest has been from local governments and private service providers; there is no law specifically targeting these materials. A few points:

    1) Under California law, inert materials can be buried in unlined pits which work like landfills but are not considered solid waste facilities. In the area southeast of downtown Sacramento and in the Irwindale
area of Los Angeles County, there are very large former quarry pits where old river sand and rock was excavated years ago which are now being refilled with C&D materials. Landfill policy people currently think this material is safe, that it will not spontaneously combust or form a harmful leachate or create migrating methane gas explosions. Whether this will continue as state policy remains to be seen.

2) The most creative management of C&D materials, certainly in California and possibly in the county, is the Zanker Road facility in San Jose. Developed initially as a landfill in the 1950s, for the last fifteen years Zanker has had an ongoing technological development project that has improved their ability to receive mixed C&D materials from haulers and fractionate the mixed materials to create wood for boiler fuel and composting, steel for the scrap yard, and concrete and asphalt for reuse, relying heavily on wood’s ability to float in water and thus to be separated from steel, rock, concrete, etc. which would sink. Why there isn’t a facility like this every 25 miles or so in the built-up areas is a mystery to me.

3) One of the more creative approaches to materials salvage with C&D is practiced by Beyond Waste in Sonoma County and the xxxx of Paul Gardner in East Palo Alto. Gardner will get a contract from a regular house demolition business and go in a few days before the housewrecker and either remove the valuable items himself and return them to his yard or hold a scrappie’s festival and allow people to come in and take desirable items (doors, windows, lintels, tubs, toilets, sinks, electrical fixtures, etc.) and remove them with their own labor and pay him a small fee for a product which new might cost 10 times more.

4) Gardner also retrieves a large amount of lumber from older homes that he offers for retail at his East Palo Alto operation; there have been occasional interests expressed in using old lumber more widely but issues involving certifying the lumber as meeting certain market requirements has retarded that issue. It seems that there are plenty of folks out there who don’t worry about the lumber’s code numbers and the building inspectors apparently don’t pay attention either. Caldwell’s on Bayshore Avenue in San Francisco has also been in the used lumber business for years and the Reuse People on San Leandro Boulevard in Oakland have developed a sophisticated used lumber business.

5) The CIWMB is requiring LPAs that have failed to meet the 50% goal to adopt a C&D ordinance as a way to discourage landfill disposal of C&D materials.

6) Asphalt shingles have been high on many lists of items to recycle but there are no working facilities for this product in northern California at this time. Business people have been trying to make a cold patch road repair material out of old shingles but none are working now.

7) Acoustical tile: If you can stack, palletize, and shrink-wrap 30,000 square feet of ceiling tile (pre-approved as to type but not unduly restrictive [no asbestos, other brands OK, etc.]), Armstrong Acoustical/Ceiling Tile [google it] will haul away for recycling and pay shipping and transportation fees but without charge or payment to you; apparently the used material is chopped up and fed into new product. Six million sq. ft. since 1999 (as of late 2006).

C. UNIVERSAL WASTES: With the RCRA law of 1976, the federal government established a cataloguing system that identified materials that would require treatment as hazardous; these materials and the products that contained them were banned from disposal in Class 2 or 3 landfills – it’s a long list. A small group of materials were not included in the original hazardous wastes category but subsequent work led the hazardous materials people to decide that it would be inappropriate to put these materials in a normal, Class 3, landfill; for reasons which I have never understood, they called this class of materials “universal” wastes [UW]. In 2002 the California Department of Toxic Substances (known as DTSC) identified these “universal” wastes that, while they were considered hazardous (dangerous in several ways), they were not to be managed immediately in the full, hazardous, manner (some parts of this group were immediately banned from Class 3 landfills, other materials had a four year “phase-in” program. There was also no immediate state requirement that these materials must be accepted at a household hazardous waste site so confusion reigned.

What went into the UW classification were: 1) common household, alkaline-type, batteries, 2) fluorescent and other light bulbs containing mercury, 3) most consumer electronics, including cathode-ray tubes (CRTs, with lots of lead and cadmium), cell phones, VCRs, etc., and 5) partially-filled aerosol cans that contain hazardous materials. Unfortunately there was some kind of breakdown in communication in Sacramento so that neither the legislature nor the CIWMB was prepared to deal with the fact that on February 8, 2006, all of these materials could no longer, by DTSC order, go to a Class 3 landfill. It was a mess. Gradually the legislature straightened it out with the Electronics Waste Recycling law of 2003, the Cell Phone Act of 2004, and the Rechargeable Battery Act of 2005. We still have no clear policy on fluorescent bulbs, and I think the practice is still that you can put a few bulbs in any trash can but if you have a lot, they have to go to as registered processor (not the way to run things but that’s how we do it here). [1-26-07: This is still not right.]
D. ELECTRONIC WASTES: In 2002, the Basel Action Network with the assistance of the Silicon Valley Toxics Coalition, produced a short film called EXPORTING HARM. The main thing shown in the film is the primitive conditions under which Chinese peasants in a coastal area northeast of Hong Kong attack various units of electronic wastes to recover the small amounts of silver and gold in them. The government has some kind of a system to manage the unused materials but it appears not to be enforced. The film shows hazardous materials being handled with great disregard to human health and the environment and caused an uproar. The result, in 2003, was that the California legislature enacted the Electronic Waste Recycling Act (EWRA, now at PRC, ss. 42460-42486). Although entitled broadly, the law is actually a cathode ray tube (CRT) and a few other items recycling act; the law speaks of a “video display device” which includes all types of projection equipment besides the standard CRT. The law as written would include a so-called flat-panel screen or a rear projection unit which are not CRTs. The law sets up a fee to be paid at time of purchase of $6, $8, or $10 (depending on the size of the screen) and leaves it in the hands of the CIWMB how to spread these funds around to get units collected and reprocessed into usable materials. The law prohibits local governments from charging any fees on these units (PRC, s. 42472).

The electronics area is a new frontier in recycling, it seems to me there are a lot of cowboys out there and a certain amount of lawlessness. In rolling out their services, many private businesses have cut corners and since they deal with only a small part of the recycling stream (usually collections and aggregation), they really don’t know what happens to the products and materials further down the line. The recent news (late 2006) is that at least one of the three electronics recycling associations has defined a Code of Best Practices which will limit their members to negative connection to the types of scenes now found in Africa (in 2006 the Basel Action Network did a film in Nigeria with scenes equaling those of China in 2002) and maybe in Mexico.

From the consumers’ point of view, the problem appears to be solved: facilities are in place that will take CRTs (at the Berkeley, CA transfer station, they take them without charge) and there are numerous special drop-off days for dead units. etc. How well the “system” works in rural California or elsewhere is beyond me. In the time between when the DTSC ban on landfill disposal of CRTs and this law got in place, there were a lot of horror stories. I was working at a transfer station at the time and when told they could only leave a TV if they paid us $20 (then the going rate for the transfer station’s costs and those of the firm taking the units away from us), they put the TV back on their truck and later we would see the units dumped alongside the road not too far away. The EWRA stopped all that and that’s a gain.

For many people operating drop-off facilities for these items it becomes simpler to say “anything with a cord” than to enumerate what is and what isn’t acceptable. Much of the rest of the stuff (e.g., toasters, microwaves, etc.) has a lot of metal that the metal reprocessor likes and the stuff that is mostly plastic with a motor or a small amount of metal (hair curling irons, electric toothbrushes, vacuum cleaners, etc.) is small in volume and seems to get managed, although how much ends up at the dump at the end isn’t well known.

E. CELL PHONES: In 2004, the State legislature took notice of the cell phone industry and by enacting the Cell Phone Recycling Act of 2004, (now at PRC, s. 42490) essentially encouraged the voluntary programs already in place. Not a strong law.

F. BATTERIES: Cousin to the electronics issue are batteries, generally divided into lead-acid (found in vehicles) and “household,” which group is then sub-divided into rechargeable and “other.” Lead-acid batteries have been banned from Class 3 landfills for many years and, because of the shortage of virgin lead, there is a vigorous market for old units. State law (PRC, s. 42440) requires the state to buy batteries with recycled lead but the market seems to have taken care of this concern.

As to rechargeable batteries, in 2005, the State legislature enacted the Rechargeable Battery Recycling Act of 2006 (see PRC, s. 42451) and defined a rechargeable battery as any one made of nickel-cadmium, nickel metal hydride, lithium ion, or sealed lead-acid battery. The law is unusual in that it sets up no state fee but requires the users and the sellers to cover the costs at the point of sale. The law acknowledges the ground-breaking work of the Rechargeable Battery Recycling Corporation and specifically exempts smaller shops and grocers from participating in the take-back program, a questionable loophole. So, Longs Drug and Target will offer the opportunity for you to return your dead rechargeables but Safeway and Vons won’t; go figure.

So-called regular batteries, most often alkaline, are considered a universal, hazardous waste and, by law today, ineligible for disposal in a Class 3 landfill, but the RBRA does not include them in its group of eligible units. Many HHW centers take alkaline and lead-acid but not rechargeable batteries. [Check these facts, 1-26-07]

G. TIRES: There is roughly one tire discarded each year for every person in the United States, so that leaves 36 million tires in California to account for. Landfills don’t like whole tires because when they get buried, as the gas builds up inside the landfill, the gas accumulates inside the rubber casing and causes the tire to lift up
through the other rubbish throughout the landfill, tearing up the gas collection pipes. I think most landfills have banned the disposal of whole tires for maybe 20 years. For a while after the landfill bans it was common to build large stockpiles of old tires, usually in anticipation of a tires-to-energy plant coming on line or sometimes just to keep the money coming in from collecting them and not putting any cash out to chop them up, whatever. However, these piles have often caught fire, either set by malice, lightening, or a brush fire gone awry. The conflagration is immense, like a petrochemical plant getting hit by a bomb, the air pollution is immense, and large quantities of dirty chemicals drip into the underground aquifers; it’s a mess. A couple of major fires in tire piles in northern California in 2003 led to an increase in the fee paid at time of purchase of a new tire from 25 cents to $2.00 and the matter has been quiet lately. The national tire manufacturers group indicates that we are now finding markets for used tires each year that consume as many tires as are being “retired” (not a pun) from the road but there is still a substantial backlog of tires in piles around the country.

In my own opinion, this is a problem that is getting close to being solved; whether it is the government or the market that is doing most of the work, I would guess the market. People who run cement kilns, where you roast limestone to make cement, love tires for their BTU value when burned and can never seem to understand why environmentalists don’t like what they’re doing. Gradually we are seeing a growth of rubberized asphalt [known as RAC] used especially in repaving work that makes the road quieter and in most weather conditions safer and it lasts longer. CALTRANS has been way behind the national learning curve on RAC and an embarrassment to the state. Hopefully someday soon the cement kilns and the RAC guys will be fighting over the old tires but I don’t think it’s happening yet. Minor markets for tires, e.g., chopped up rubber under playground structures or mixed with dirt in athletic field soils, or remolded to provide pads between the highway and the rails at a grade crossing, or cutting strips out of sidewalls to tie up newly-staked trees, are just that, minor and can’t, at present, hope to keep up with the ongoing onslaught of old tires coming off the highway.

The state law on tires is extensive and complicated. See PRC, ss. 42,800 and following. Embarrassed by the tire fires, large stashes of abandoned/dumped tires, and the presence of certain shady characters in the business, the law is excruciatingly detailed and requires various players to be registered with the state, inspected, manifests, etc.

From the local programs perspective, tires are managed by “tire jockeys” who bring their truck to new tire stores and filling stations and haul away the old tires for a fee. On retreads, very few passenger car tires are rebuilt in this country but most truck tires are rebuilt at least once; new car tires are too cheap to justify the investment in an old casing. The State (PRC, s. 42400, enacted 1990) wants retreaded tires used on fleet vehicles but on police cars only if proven safe. Tires probably won’t attract much attention until we have another fire at a tire pile. The state is currently using satellite photos to make sure it knows where the existing tire piles are. None of the funds raised by the tire fees get back to local governments.

H. MOTOR OIL: Unlike the other recycling laws discussed in this chapter (which are found in Part 3 of the CIWMA), the California Oil Recycling Enhancement Act is found in Part 7, at PRC, s.48600. This law requires that all motor oil sold in California will pay a fee of four cents per quart to the CIWMB’s California Used Oil Recycling Fund. From this fund the Board makes grants to LPAs to publicize and enhance used oil collection programs. For many LPAs this has been a major source of outside funding to promote recycling programs although the grant guidelines indicate the funds should be spent on used oil recycling promotion information only. Funds are also available to provide for a drop-off center’s equipment to store used motor oil. The law itself requires all that who sell motor oil at retail must be prepared and equipped to take used motor oil back and to pay the customer sixteen cents for each gallon returned, similar to a bottle or can redemption center. Municipal and waste hauler oil drop-off facilities are not required to offer the sixteen-cents-per-gallon rebate. In the early days of the law there was a lot of concern that the used oil would be contaminated with water or anti-freeze, etc. but that has not proven to be a problem.

I. MEDICAL WASTES: (FORMERLY CALLED INFECTIOUS WASTES): The Medical Waste Management Act of 1995 is at Health and Safety Code, ss. 117,600 and following, and is mostly a restatement of earlier law, often referred to as Title 22, referring to the section of the Code of California Regulations where the Department of Health Services had originally placed this information. Generally recyclers are not much involved with this law but when working on recycling programs in medical or health care institutions, it becomes important to understand how medical waste is defined and what its management requires. I would suggest the following:

1) Most people, even in the institutions, do not understand exactly what is a medical waste, and many who do know, don’t care, although the definitions in the law are very detailed and probably capable of wide misunderstanding. Many years ago I did a waste audit at a large hospital and going through the medical waste trash from the ER found that over 75% of what was in those bags was not really a medical waste. The facilities manager then began some new oversight procedures in the ER and was able to reduce
their medical waste volume significantly and, since medical waste cost about four times per pound what MSW cost for disposal, saved a very large amount of money per month as well.

2) Most health care institutions have self-contained compactors to receive their MSW; because the compactor itself is getting hauled back and forth to the disposal site, the size of the trash receptacle is smaller, leading to a much higher cost-per-disposed ton than a stationary compactor that can be affixed to a 40 yard drop box. This type of equipment was required by the waste hauler because in detaching a compactor box from a stationary compactor, the waste hauler staff was subjected to loose needles, infectious agents, etc. flowing loosely out of the open end of the compactor box. Now that the medical waste requirements are better understood and better practices prevail (hopefully), it might be time for hospital waste managers to reconsider whether a regular compactor is appropriate on the theory that medical waste is no longer in the garbage box. The waste hauler would presumably resist this change but it would result in much lower disposal costs for the institution.

3) It is particularly likely in medical office buildings, where numerous practitioners contribute to the common trash, that medical waste laws can be ignored. Increasingly nobody, even people sick at home, are exempt from the medical waste disposal laws.

4) Another problem here is that some hospitals will autoclave (roasting materials in steam above 212 degrees Fahrenheit to destroy potential pathogens) medical waste and place the autoclaved materials in the regular trash. When they cool off they look like regular garbage and you can’t always tell they’ve been “cooked.” Hopefully this problem has been solved by now but it was a problem in the early 1990s.

J. SPECIAL WASTES: The term special wastes is a bit of a problem in state law because the term is used both in MSW law and hazardous law but with apparently different meanings. Although the term is not specifically defined in the CIWMA, the term is used at PRC, ss. 41250 and 41450 to refer to “asbestos and sewage sludge that is not hazardous” that must be planned for in an LPA’s SRRE and a County’s CoIWMP. The term appears to have a rather different meaning in the state’s hazardous wastes law where the term is defined by examples of materials that would be called special wastes, all of which are also “hazardous” but not too much so. (See 22 CCR ss. 66261.120 to 66261.122.).

K. NEWSPRINT: In 1990 the legislature was concerned that newspaper publishers in California would not be buying recycled content newsprint [RCN] and enacted this so-called minimum content law (now at PRC, s. 42750) to require them to do so. Modelled on some East Coast legislation, the law requires that recycled content newsprint must have “40% of its fiber consists of post-consumer waste paper (PRC., s. 42756) and that all “consumers of newsprint” must buy 25% of all their newsprint with recycled content after 1-1-91. The law escalated the requirements over time so that by year 2000 50% of all newsprint purchases should be RCN. The CIWMB was to audit the publishers’ purchases and report to the legislature. My impression is that the law has worked pretty well and after some initial resistance, compliance is well established. Not an LPA concern.

L. OFFICE PAPER RECYCLING: In the original AB939 (now at PRC, ss. 42560-42563) there were sections requiring the state to set up office paper collection programs at state and local governments; this is, I believe, the only occasion where the state is required to do something defined for the LPAs (mostly you’re doing stuff for them). The law is very clear that the elements of the program should include “desktop collection containers” and “metal collection bins for intermediate storage.” I have never heard of the CIWMB expending state funds to develop office paper collection programs (in a large city this could be thousands of containers) but the law stands nonetheless.

L. PLASTIC NECK-RING DEVICES: In 1996 the State enacted PRC s. 42350 that required that “no container shall be sold that is connected to any other container by means of a plastic ring … that is not degradable when disposed of as litter.” To my knowledge this law has had no effect on the stream of commerce; The old plastic six-pack carrier seems to have largely left the market and when I went looking for them lately the few I found had no indication that they were degradable under state law.

M. PLASTIC TRASH BAGS: In 1993, the State enacted its first plastic trash bag, minimum content law (grocery bags exempted) that required that all plastic trash bags sold in the state above a certain thickness (0.75 millimeters at the time) would have a minimum content of 10% recycled material content (specifically post-consumer, not post-industrial scrap). The law required the recycled content requirement to increase to 30% in 1997 (which it is now) and in 1998 the law was amended to specify 0.7 mills rather than 0.75. The CIWMB is supposed to enforce with reporting and registration requirements. This law was much resisted in the early days but probably had a major role in getting some early post-consumer plastic film collected.
N. THE PLASTIC CARRY OUT BAG: In 2005, following the Republic of Ireland’s example in setting a high fee on plastic store bags at the point of acquisition to discourage their use, the City and County of San Francisco began to consider a similar fee. Late in the year the Board of Supervisor and the Mayor worked out a compromise bill that gave the grocers and retail outlets some time to figure out what to do. What they did was run to the state legislature where, in exchange for a moratorium on any local fees (see PRC. s. 42254) the retailers and grocers agreed to establish an in-house plastic film bag collections program. The law (now at PRC, ss. 42250 to 42256) now requires that any retail operation in the state above a certain size (the law requires that any site with at least 10,000 square feet of retail space or is a supermarket) that uses plastic bags at all must create an in-store aggregation point for its customers to leave their plastic bags, irrespective of point of origin; up until now, all in-store programs have been voluntary. To be effective on July 1, 2007. Recyclers were heartened by Governor Schwarzenegger’s comments in approving the bill over loud objections from some environmentalists that at least he heard what they said. At the end of his comment he said, “The bill sunsets in six years and this will allow locals time to develop additional programs or the legislature to consider a more far reaching solution.” What San Francisco leaders wasted no time in doing was proposing that all grocery store plastic bags be made of compostable plastics, a movement aimed at angering the grocers who had, from the proponents’ perspective, tried to do an “end-run” on them, see SF Chronicle, 21 January, 2007. Stay tuned on this one.

O. STYROFOAM TAKE-OUT CONTAINERS: The first bills to ban styrofoam were enacted locally in the 1980s and they lost in court but starting about 1992 or so, several communities banned the use of styrofoam in in-store and take-out applications. Berkeley was the first community in the Bay Area to do so but Oakland followed suit in 2006 and San Francisco in 2007. At the center of Oakland’s argument was the persistence of styrofoam in outdoors environs and its large presence in the trash removed from Lake Merritt, Oakland’s downtown “jewel.”

Chapter five: - 2nd edition

NINE REASONS WHY RECYCLING IS USEFUL:

Recycling is little bit like apple pie; everybody thinks apple pie is a good idea but people have different reasons for liking it. Some like the taste, some like the smell, some like it with ice cream, some because it reminds them of mom, etc. Jerry Powell likes to remind people that more Americans recycle than use public libraries, attend major league baseball games, send Father’s Day cards, etc. If you can think of other reasons, let me know.

1. We Conserve Resources Because We Need Them: There is only a finite amount of stuff in the world, especially only a finite amount of stuff in our country. If the stuff is used up and then piled in places like landfills with all other sorts of stuff and not usable or burned up in waste-to-energy facilities, then we don’t have the stuff anymore. A senior executive with a major paper company said twenty years ago (and I overheard), “We don’t have enough trees to make all the paper our customers want; we need to recycle paper because otherwise we don’t have enough.” Several years ago at the National Recycling Coalition’s annual conference, representatives of the steel, aluminum, glass and paper industries all got up and said, “We want more used feedstocks. Please go get them for us.” They didn’t say that they would raise the prices they pay for those materials, but they said they want more stuff.

2. Recycling Creates Jobs. Back about 1992, some people figured out that for every hour of labor it takes to bury things/materials, it takes three hours of labor to recycle that material, calculating in the collection, aggregation and reprocessing time. When the economy gets slow and the big shots are trying to figure out how to find new work for people, recycling can chime in that it makes more jobs than garbage. In about 2003 there was a national study done of the job impacts of recycling. Rather than looking simply at the jobs in collections, aggregations, and reprocessing, the study took credit for the percentage of jobs in an industry that uses recycled feedstocks; in other
words, if a paper plant uses 40% recycled furnish in the mill, then 40% of the jobs in the mill get credited to recycling. Using this methodology (not agreed to by all), the “recycling” industry is bigger than the automobile industry in America.

3. Save Landfill Space: For many years Americans burned their trash in the back yard or in apartment incinerators. Since the 1950s the nation has preferred landfills as the most benign method to “manage” multi-material discards. However, landfills have become increasingly difficult to site. Pristine areas where a dump could be sited now has people living nearby; they don’t want the odors, the truck traffic, etc. Recycling is useful because it decreases the reliance of public works officials and their lackeys, the garbage companies, on landfills. According to the much flawed California state calculations, in 1990 there were 49 million tons of discards of which 5 million tons was recycled and 44 million were landfilled. In 2005, there were 78 million tons of discards and 44 million tons landfilled. But for the 34 million tons recycled in 2004, there would have 29 more million tons of garbage in 2005 than in 1990, (assuming recycling hadn’t grown in the intervening 15 years).

4. Make Money By Selling Materials: Over 90% of the materials that get recycled in this country do so with no help or direction from the government; it’s one of the great unregulated businesses in our country. Businesses with a lot of old cardboard and scrap metal regularly see a net income from the sale of their “scrap.” The list of products and materials that are sold is very long and the markets are robust.

5. Save Money on Disposal Charges: Because recycling takes materials that would otherwise become solid wastes (see Chapter 7), and diverts them from the solid waste enterprise, the person who owns the material and is responsible for the management of the material, can save disposal fees which, at the point of collection in the Bay Area, are about $125 per ton and, if delivered yourself to a transfer station, costs about $95 per ton, and about $40-70 per ton delivered yourself to a local landfill. In some situations, especially where the costs of moving the material to a point of sale is lower than the value of the material at the point of sale, the individual or business owning the material can, even after paying trucking costs, see a net income from the sale of the recyclable material; in other cases the net cost of disposing of the material through recycling is less than paying a transfer station or landfill to take it.

6. Preserving Virgin Resources: This reason may sound similar to number one, but it’s different. In number one we conserve resources because we need them; here the reason we are using old resources is so that we don’t have to deflower nature to get the resources we need. The arguments here are not economic; they are the beauty of wilderness, free of clear-cut forests and piles of mine tailings, with eroded habitat for wild species, etc. The early modern recyclers weren’t called tree-huggers for nothing.

7. The Law Says So: Many people today recycle because the law requires it. As you will see in Chapter 14, there’s a lot of problems with the way we measure our recycling, but we all give credit to the legislature which mandated the recycling of our discards, first at the 25% level, then 50%. Byron Sher was the state senator who authored AB 939; he reportedly remarked when he introduced the idea of fining cities up to $10,000 per day for not meeting their AB 939 requirements, “Well, that’ll get their attention.” And it did.

8. Reduce Energy Consumption: The process of turning raw materials into finished materials ready to be formed into products ready for the marketplace requires a tremendous amount of energy; wood has to be cooked before it can be made into paper; sand, soda, and potash have to be heated very hot and very long before they will fuse into glass. Every finished material has absorbed a large amount of energy before it was ready to go into service in our economic system. In our country we get some of our energy from stateside sources but imported oil provides over 50% of our nation’s energy needs. By reusing materials, we save vast amounts of energy that would otherwise be involved in turning raw materials into finished materials. Starting in 1996, the USEPA began quantifying the amount of energy saved by recycling a ton of this or a ton of that. In the fall of 2005, our association invited the EPA staffer, Henry Ferland, who had worked up all this data, to visit California for a speaking tour. I asked him if we stopped making all these finished goods from finished materials today and had to go back to making all these goods from virgin materials tomorrow, how much more energy would we need. He did a little back-of-the-envelope calculation and he said, “80 to 100 new power plants tomorrow.” Then I asked him how much energy could we stop using if we recycled everything today; he didn’t have the numbers but it would be far greater than what we’re already saving. Most of us are aware that the big users of energy in our country are transportation and heating, but the amount of energy consumed in converting raw materials into finished materials is truly astounding. The effect of total recycling on the balance of payments in this country would be immense
9. Reduce Greenhouse Gas Emissions: Since the concept of global warming was first suggested in the 1960s, and as the scientific consensus has emerged that we are in the middle of massive climate change events due to rising CO2 levels in our atmosphere and the presence of additional airborne pollutants caused by our rapidly growing world-wide population (one billion in 1900; 6 billion people in 2000; 6.5 billion now, 9 billion by 2020, etc.), and the ever-increasing burning of oil as a fuel for autos, industrial processes, etc. (it took several million years to sequester all of the carbon in petroleum; all that carbon will be returned to the atmosphere in a 200 year period (1860-2060)), many forces are working to hold our nation accountable. As the largest single creator of CO2 (we make 21% of the GHGs with only 5% of the world’s population), our country is under a great burden as a world power to reduce our greenhouse gas emissions. The enactment of AB 32 in the California legislature in 2006 will hopefully lead the California Air Resources Board to develop programs that will meet the Legislature’s goals of reducing CO2 emissions to far-earlier levels. The recycling that has been done helps meet those goals; the recycling that still remains to be done (there’s as much material going in the dump now as there was when our waste reduction law was passed in 1989; the law has only had us hold our own, not make progress in the war on waste. Expanded recycling program will yield important GHG reduction results.

Chapter six: - 2nd ed.
THE LAW OF RECYCLING: WHO OWNS THE DISCARDKS?

In the 1990s, as the collection and aggregation of recyclables became a major growth industry, the right of solid waste haulers to a pre-eminent position in the recycling collection industry has been claimed and challenged. By the late 1990s, there had been a series of court decisions, both state and federal court, that have, at least for the time being, laid out the nature and character of the differences between recyclables and solid wastes. Just as, I believe, that we constructed a line between solid wastes and hazardous wastes in the 1970s and 1980s through a series of laws and court decisions, we have now defined the differences between solid waste and recyclables. Those of us who believe in maximizing the rights of persons intending to collect and move recyclable materials to markets are not necessarily pleased with the current law (mostly the result of some court decisions cited below) but we can live with it, or at least we’re making do with what the courts have allowed us to do.

Before reaching the particulars, it is necessary to say what this conflict is about; four points should suffice:

1) Recyclers are not quibbling about solid waste: The law in America is well established that the control of garbage falls under the “police power” of local governments and that a local public agency (LPA: this term is an inclusive one that includes any political subdivision with regulatory powers; it could be a county, a city, a special district, a sanitation district, etc.) has the right to collect all of the garbage itself or to grant a license to one private firm to do the work for the local public agency. Since recyclers are not interested in solid waste, they have no interest in
challenging these exclusive franchises. (One recycling wag said, “We run hospitals, not cemeteries.”)

2) **This conflict issue should not be confused with other flow control issues:** There are currently three separate issues being handled in the courts, only the third of which has direct relevance for recycling. The first is the interstate transport of wastes, particularly the right of one state or local public agency to keep somebody else’s solid wastes out of their landfill. Second is the right of a public body to direct that all wastes go to one specific transfer or disposal facility. Third is our concern that waste haulers holding exclusive garbage collection and hauling franchises with a local public agency somehow have a superior claim or exclusive right to the recyclables in that political subdivision.

3) **This conflict does not exist in open competition areas:** In most of the USA, there is open competition between local waste hauling companies for garbage service contracts with commercial generators. The local public agency gives no hauler any superior right to any other hauler. In those areas, waste haulers compete for clients and can offer “mixed recyclables” hauling arrangements at reduced fees as business opportunities present themselves. (The theory is that if the generator takes the extra effort to keep certain garbage-only type materials out of a disposal box, the generator is entitled to compensation in the form of reduced charges for that box’s hauling.)

4) **This issue has little impact on residential curbside recycling contracts:** Residential curbside contracts are written to provide a uniform level of service to a defined class of citizens, usually all residential property owners in a community. While people may be prohibited by local law from putting certain recyclable materials in the garbage, nobody anywhere is required to put their recyclables in the city’s recycling collection bin. It seems well established that residents have the right to dispose of their recyclable materials in any way they choose.
   
   In California a law was enacted in 1982 particularly to protect (typically) the Boy Scout paper drives from the then-developing curbside programs; the law now says, “Nothing in the chapter limits the right of any person to donate, sell, or otherwise dispose of his or her recyclable materials,” (Public Resources Code s. 41952). Although this concept is in the statutory law in California, there are no laws or cases anywhere in the country with the opposite holding, that a resident must place his or her recyclables only with the contracted service provider.

These distinctions having been made then, what is the conflict? In some local public agencies (mostly older strong-union areas and in newer cities where there was no pre-existing recycling infrastructure), the LPA has offered to the waste hauler an exclusive right to haul all the recyclables in that city as well as the wastes. LPAs have offered this deal because they know the hauler can make money-selling recyclables; that will reduce the hauler’s overall costs and the citizen’s fees for service. But some local recycling service provider objects to the agreement and litigation ensued.
In City of Rancho Mirage v. Palm Springs Recycling Center, 7 Cal. 4th, 478 (1994), the California Supreme Court held that recyclables were not solid wastes under the law and that the city could not prohibit Palm Springs Recycling Center from picking up bottles and cans at restaurants and hotels in Rancho Mirage. The principle of this case has been well accepted and is in general practice in California. (I am not aware of contrary case law anywhere in America.)

Left unsettled by this case was the question of whether or not Palm Springs Recycling could charge for providing this collection service to a client. The question was addressed two years later in the California Court of Appeals, where in another case, City of San Marcos, Mashburn Sanitation Coast Waste Management v. Liberty Recycling, 47 Cal. App. 4th, 320, (June, 1996), the Court ruled that Coast could pick up scrap recyclable materials only if it picked them up for free or paid the generator for the materials; if the hauling company charged for the collection, then the material was solid waste, even if the material was eventually recycled. The state Supreme Court declined to review this case (October 2, 1996) and also allowed the appellate court decision to be published. Those of us who believe the appellate court was wrong are waiting for the right case and that will lead to divided appellate courts and then a new state Supreme Court decision but now (2007), after eleven years, this is the law in California and we are still waiting for the right court decision.

What do we believe? We believe that what matters is what happens to the materials being collected. It's not a fee-for-service question; it's a question of where do the materials end up. If the materials, or a substantial portion of them, end up back in the stream of commerce, then the hauler is a recycler. If, during times of market slow-downs or market gluts because of a sudden infusion of new scrap materials, the recyclables hauler may need some cash from the generator to support his business; getting that money does not make the recyclables hauler a garbage man; what makes him a garbage man is where he takes the material and what he does with it.

The principle that only the franchised waste hauler can pick up scrap materials if a charge is assessed has also been put forth in many local laws. The San Francisco garbage ordinance, written and approved by the voters in 1932, says, “it shall be optional with the producer or landlord to deliver waste paper or other refuse having commercial value to a refuse collector, and the producer or landlord may dispose of same in any manner he may see fit.” (Section 3, in part, emphasis added). This section gives the building owner or tenant the right to dispose of commercial value materials as he sees fit. The waste hauler argues that the reverse is then true: that materials with no commercial value must be delivered to the refuse (read “garbage”) hauler. Some other local public agencies have similar language in their laws and this is where the question of who owns the recyclables is an important issue. Whether these local laws will withstand judicial scrutiny remains in question although nobody seems to be pushing the matter at this time.

The most important aspect of this ownership question is the LPA’s ability to choose service providers other than the waste hauler. Many waste haulers, particularly those with long-term contracts in strong union areas, have very high hourly labor costs which place them at a
competitive disadvantage with the non-union, lower paid, lower benefits, recyclables hauler.

Several years ago, I saw a roll-off truck on a local freeway hauling scrap metal and calling itself “Steel Mill Supply.” I liked that. When all the dust settles in the fight over discards, there will trucks running around everywhere labeled, “Glass Plant Supply,” “Compost Yard Supply,” etc. And that’s how it should be.

PART TWO: REDEFINING RECYCLING:

In 1996, I prepared the memo here following on how California law was changed during the drafting of AB 939 to no longer say that recycling is something you do with wastes but now reads that recycling is something you do with “materials that would otherwise become solid wastes.” I made this point briefly in chapter one but this is the details. There are minor edits here for this edition of ITR.

AB 939 CLARIFIED FOR THE FIRST TIME IN CALIFORNIA LAW THAT RECYCLABLES ARE NOT SOLID WASTE:

The terms “solid waste” and “recycling” have been used in California for several decades but are not of ancient or particularly honorable origins.

The term “solid waste” was invented in the 1960s to avoid the use of multiple terms such as “garbage, trash, debris, rubbish, etc.” which legislative drafters had often used in different ways and that generally lacked specificity. The term “solid waste” first appears in federal law in 1965 and in California law in 1972 (the Nejedly-Z’berg-Dills Solid Waste Management and Resource Recovery Act of 1972, Stats 1972, c. 342). This law required California counties to develop solid waste planning capabilities so no local public agency would run out of landfill space. While the 1972 law used the word “recycling” and encouraged Californians in a general way to do it, the law did not define the recycling word, and throughout spoke of recycling as something one did with solid wastes:

This law said that “methods of solid waste management emphasizing source reduction, recovery, conversion and recycling of all solid wastes are essential to the long-range preservation of the health, safety, and well-being of the public... [Gov. Code, s.66701(d)]; the law required establishing a “major state-directed research and development program, ... to develop technologically and economically feasible systems for the collection, reduction, separation, recovery, conversion and recycling of all solid wastes,... [Gov. Code, s.66785 (a)]; and it required “state pilot resources recovery projects, at the state institutions where such projects are deemed most feasible. Each project shall be designed to provide for the maximum possible reuse and recycling of the solid wastes generated by the institution.” [Gov. Code, s.66785(c.).]

A definition of recycling was first offered in the 1982 law [Stats. 1982, c.1158] that restructured the old State Solid Waste Management Board into the Waste Management Board with a different membership. In that act recycling was defined as follows: “Recycling” means the process of sorting, cleansing, treating and reconstituting waste or other discarded materials for the purpose of using the altered form. [then placed at Gov. Code, s. 66716.5]. The phrasing of this definition in 1982 follows the 1972 definition of “processing” where it says that “processing” means the reduction, separation, recovery, conversion or recycling of
solid waste. [Stats 1972, c. 342, encoded as Gov. Code, s.66716].

When AB 939 was first considered (the April 11, 1989 print of the bill was the first with the full language), the words used in the section defining recycling were identical to the 1982 bill with one addition:  “Recycle” or “recycling” means the process of sorting, cleansing, treating, and reconstituting solid waste or other discarded materials for the purpose of using the altered form. “Recycling” does not include burning, incinerating, or thermally destroying solid waste. [Section 40180 of the April 11th draft.]

The June first and the June seventh prints of the bill remain the same, but in the August 21st print, a major change has been introduced that is crucial to our argument that 939 is different than what many people said that it meant (emphasis added to new words): “Recycle” or “recycling” means the process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste, and return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace. (emphasis added)

“Recycling” does not include burning, incineration, aerobic or anaerobic digestion, or thermal deconstruction of materials that would otherwise become solid waste. The language printed in the August 21st print remained the same for the September 7th print of the bill, and, for the final version of this section (as passed by both houses of the legislature on September 15th and as signed by the Governor), the last sentence in the definition was amended to read: “Recycling” does not include transformation, as defined in Section 40201.

For seventeen years (1972-1989) the Legislature saw solid wastes and recycling as two intertwined issues; recycling was a subset, a derivative activity of solid waste handling and processing. But AB 939 as it emerged from the legislative process is different. Recycling is no longer something we do with solid wastes; it is something we do with materials so they don’t become solid wastes - this is a radical change in the relationship of these two activities.

We believe that the Legislature (by amending the standing definition of recycling) has spoken clearly here: recyclable materials, properly managed, are not solid waste; they can become solid waste if they are not managed properly, but the phrase “that would otherwise become solid waste” is unambiguously clear that recycling is separate and apart from solid waste and cannot be controlled under a local agency’s police power in the same way as solid waste can. Recycling activities then become not a subset of solid waste containment, collection, and disposal, but rather something altogether different.

PART THREE: MINOR LEGAL ISSUES:

There are two other legal issues that the reader should be familiar with.

1. EXTENT OF THE LOCAL FRANCHISE: The local garbage franchise covers most of the business entities in an LPA but not all. The courts have been very clear that public entities further up the chain of command from a city or a special district cannot be controlled by the local government’s exclusive garbage franchise agreement. This comes up most often with federal and state agencies operating within a city but also includes school districts which are
technically independent of their municipal restrictions. The well-known cases are City of Santa Ana v. Board of Education, xxx CalApp2d 178 (1967) and Del Norte Disposal, Inc. v. Department of Corrections, xxxx CalApp xxx (1985 or so).

2. SOLID WASTE FACILITY PERMIT: For at least 30 years it’s been clear that any facility that has solid waste on the ground requires a solid waste facility permit [SWFP]; the general requirements are in PRC, ss. Xxxxxx and include transfer stations, landfills, incinerators, etc. When transfer stations were brought under the permitting requirements in 1976, the scrap industry pushed for a revised definition of a transfer station in 1977 that explained that a facility “whose principal function is to receive, store, convert, or otherwise process wastes which have already been separated for reuse and are not intended for disposal” (PRC., s. 40200(b)(2) was not a transfer station. In the late 1980s, several waste haulers who sorted out the goodies from the trash were troubled that other firms were getting in the business and hiding behind this exemption to avoid getting a SWFP (which takes time, costs money, and also leaves the competition open to the charge that they are a waste hauler and not a recycler. During the early 1990s, the CIWMB attempted to frame what would be known as a “residue test,” arguing that if a portion of the materials flowing into these un-permitted facilities went on to the dump, then the facility was a solid waste facility and needed a SWFP. There were some loud and raucous hearings on this issue and the ultimate resolution was …..
Chapter seven: - 2nd ed.

RATING THE STAKEHOLDERS: THE POLITICS OF RECYCLING

Once in the early 1970s, I was the staff director of a small state agency. I was attending a conference with fellow executives from other states and one of them said he spent 60% of his time protecting his flank. I remembered thinking, “I don’t spend any time protecting my flank.” Six months later, I was fired from my job. I wasn’t stupid, I wasn’t lazy, but I wasn’t paying attention to what I needed to pay attention to in order to keep my job.

My sense is that many of the people who work in recycling on the administrative level are not very thoughtful about what it takes to be both effective and self-protective in an environment where you are the point person for a program and possibly the fall guy (or gal) when your superiors don’t think the program is going very well. While the recycling coordinator’s boss may not have a great respect for what the recycling coordinator is doing, I have yet to hear of a public works director who’s lost his job over the recycling program but there are a lot of recycling coordinators who have lost their job for the failures of the program to perform according to other people’s expectations.

On the next page following is the handout I use in class to teach a little bit on this subject. The instructions I give when passing out the sheet are as follows:

“A local recycling program, whether in a private business, a public agency, or in a community, is a change event. When you implement a recycling program, you expect people to do things they’ve not done before, and in many cases, the program manager has very specific expectations of new behaviours for certain persons. In the same way that the front lines of the troops in a war change as the various forces push against each other and the stronger overwhelms the weak, so in social change, behaviours change when the forces pushing for change overcome the forces resisting it.
“For example, once upon a time, you could smoke anyplace you wanted. Then at some point they said you couldn’t smoke in movie theatres; not for the health issues but because it obscured some peoples’ view of the screen. Then gradually more and more people learned about the health risks of second hand smoke, fewer people were smoking, and we developed a whole lot of new rules about where you couldn’t smoke. Some smokers objected, but they were overruled, and in many cases laws came on the books that prohibited what had previously been permitted.

“Recycling, especially source-separation recycling, is a behavioural change. It expects people to pay attention when they are discarding things to put them where they belong rather than where an individual might want them to leave them. Instead of putting everything in a trash can, now certain things have to be put in the right recycling container.

“In this exercise we are asking you to identify whether the person listed in the long column is a friend or foe of recycling. If they are a friend, then you give that group a +, if they are an enemy, then you give that group a -. if the person is irrelevant or the evidence is so mixed that you can’t tell whether they should be a + or a -, then give that person a zero [ 0 ]. If the person is strongly supportive, then you give them a +5, if mildly supportive, a +2. Similarly, if opposed strongly, -5, mildly opposed, -2. Use any number between one and five to express the strength you believe each person or group has towards the program.

“After you’ve made your personal rankings, then we will ask you to gather into small groups and discuss your answers; listen to what other people have to say and be prepared to change your markings if you are persuaded that your first judgment was incorrect. After you have talked for a while in small group, then we will discuss your answers in large group.”

“To my knowledge there are no right or wrong answers here; we are simply trying to understand who will help us and who won’t when we are trying to make a new program work.

ITR Exercise : RATING THE STAKEHOLDERS.

The following persons/organizations/businesses are concerned about the success of, and, in varying degrees, have a stake in, a local recycling program.

Rate each group on its support (as you perceive it) as a + (if supporting) or a – (if opposed) and give a numerical value between one and five to reflect the amount or degree of support/opposition.

GROUPS INVOLVED:

_____ Federal Elected Officials
_____ Federal Appointed Officials
_____ State Elected Officials
_____ State Appointed Officials
_____ Local Elected Officials
_____ Local Appointed Officials in General
_____ Local Recycling Program Managers
_____ Local Waste Hauler
_____ Local Recyclables Hauler (if different from waste hauler)
_____ Local Enforcement Agent [LEA].
_____ National Environmental Organizations
Comments on the Exercise.

In discussing their answers to this exercise, what I try to get students to understand is that recycling doesn’t really have a lot of strong friends or strong enemies.

Many of my students, especially the younger ones, think that the “national environmental organizations” would be +5s; in fact, most national environmental organizations devote less than 2% of their program resources to waste reduction and recycling or to the conservation of material resources, and, in fact, rarely show their head on these issues.

Others rank “recycling consultants” as strong program advocates, whereas many people working as recycling consultants are consultants first and recyclers second; they got in the business because there were contracts to be let and money to be made. Their major goal is to write up a program that the client will like and will be implementable with the limited resources that the client is willing to invest.

“Ratepayers using Public Recycling Services” would, you would think, be a key positive group, but in fact this is a very unorganized group. When the public libraries want the City Council to do something, they know how to get bodies in the council chambers when the vote comes down, very few communities have any kind of local interest groups on recycling at all. When the City of Oakland, California where I live recently adopted a zero waste policy and program, with goals up to year 2020, there was very little public discussion and almost no debate. “Sure, why not,” everyone seemed to say.

“Local Recycling Program Managers” are the bosses of the people in most of my classes. The students rank their bosses usually several points higher than I would. I remember reading to my surprise thirty years ago that a third of the people serving on local housing authorities didn’t believe in public housing; you might ask, “Well, what are they doing serving on those boards?” You may wonder, but they’re there. About ten years ago the private garbage companies in California got someone appointed to the Prison Industry Authority; his specific responsibility was to make sure than no more facilities with inmates sorting trash would be built. 160,000 people in prison in California, millions of tons of stuff needs to be sorted, but not with prison labor. Unbelievable?; no, it’s what happened.
The point of the exercise is to consider who your friends are, and knowing as well who your enemies are. Many years ago I was at an educational conference and someone said that support for public education is a mile wide and an inch deep; much of the support for recycling is of the same character.

It might be wise to say a few words about environmental justice (known in the trade as “EJ”) before leaving the politics of recycling. Environmental justice emerged as a political issue in the early 1990s that is concerned with “the equitable distribution of environmental risks and benefits across racial groups or economic classes” (borrowed from the literature). As an issue it began in 1987 when a church-sponsored study claimed that hazardous waste dumps and toxic sites needing clean up were concentrated in areas of heavy minority population. There has been a certain amount of quibbling over whether the issue is one of race or wealth. President Clinton’s Executive Order No. 12898 (February 14, 1994) legitimized the issue but hasn’t produced much action yet. Recycling facilities in inner-city areas have generally escaped political tribulation because the materials handled are not toxic and there are lots of jobs being created in these facilities to sort and bundle materials. Equity issues in the recycling field have tended to focus more on the minority ownership of recycling businesses and those businesses’ ability to sit at the contract table with the big haulers. A detailed and well-done introduction to the EJ issue is found in 14 Virginia Environmental Law Journal (summer, 1995), 567-784 and the President’s Advisory Committee has reports on the Internet.

PART TWO: MANAGEMENT ADVICE FROM AN OLD MAN:

As I’ve said elsewhere in this book, making a recycling program work is an effort of great skill; you have some, but not unlimited, resources, and you have a lot of shallow support. But you still have to get the job done. Even though you may not be a high-ranking official, because it’s your job to understand all of these persons and factors as they impinge upon your work, your job requires a lot of skill and ability if you are to do it well. In the field of organizational theory, you are called a boundary role person. Just as a frontier guard protects his country from invasion along a strip of boundary, your job is to protect your organization from surprise and embarrassment from the solid waste control and reduction forces outside your organization. You were hired because change is taking place in that outside world and your employer knows that it has to change too. First, you must understand that for change to take place, the forces pushing for change must overpower the forces resisting change. If you can identify which three power centers that most want recycling to happen more, and then which three are most resistant, then you should think about how you will enable the pushers and disable the resisters. Most people fail at recycling program work not because they are stupid or lazy; they fail because they fail to understand the territory in which they are working and fail to take sufficient action to head off the inevitable resistance to change.

People who understand small program management [SPM] generally are much more successful as program operators, operating any program, than those who do not. I would rather take a good safety officer or affirmative action officer and turn her into a recycling programs manager than somebody who may know the science of materials or how to run collection routes, etc., but doesn’t understand programs.

Well, what is it that you need to know? I would suggest nine things.

Nobody cares. The first thing to be comfortable with is that nobody cares about your program but you and the people who are getting paid to make it go. Everybody else is too busy worrying about their own stuff to worry about your stuff. They don’t mean any harm by it, but they just don’t care. It’s useless to get mad or disappointed, just start from zero. “Blessed is he
who expects nothing, for he will never be disappointed,” as my father used to say.

If you don’t ask them, they won’t say no, but if you ask them, they might say yes. SPM requires numerous short-term, teamwork activities to make an effective program. Everybody has enough slack in their time schedule to do some of what you want. Ask them, be clear, and want them to say yes.

Keep your bosses clear on what you’re doing. Bosses are evenly divided between those who want to look over your shoulder all the time (high anxiety) and those who could care less what you do as long as you don’t cause trouble for them (low anxiety). The boss’ ability to tolerate negative information about you and the program will vary. I have always enjoyed working most for people who feel a little overwhelmed by the difficulty of managing what they’re doing; those bosses were more appreciative of what I did than those who felt they had things under control or knew best.

Get top level commitment. A certain number of people inside your own organization won’t pay any attention to you because they think that when the chips are down, you won’t ever get what you want. It’s very important to have the top gun (city manager, mayor, council members, etc.) say that what you’re doing is important not just for your own program but for the entire agency. This can be done by policy statements, developing work plans with top gun sign-offs, getting top gun to show up at publicity events, etc.

Get a detailed job description with lots of authority. There should be a piece of paper approved by the powers-that-be that says you’re in charge of anything you want to be in charge of. Write it yourself. The Purchasing Manager shouldn’t have to wonder if she or you is in charge of recycled product procurement; spell it out. Make sure it gives you the right to stick your nose in anywhere you want.

The more you know, the less you get to tell. Working inside an organization means you become trusted to be told negative image stories, but it also means you can’t pull down the other guy’s pants/lift her skirts, even when she/he deserves it. But that background information allows you to put lots of pressure on people, as long as you have a personal relationship with them first. The real big shots will blow you away or call your bluff unless they can see something for themselves in what you want, but most people aren’t that self-involved.

Nothing succeeds like success. You were hired because you knew a lot about a certain small portion of the external world. If you’re lucky, you will get to use some of what you know on your job, but mostly you will be asked to do things you never did before. By spending time, medium-length blocks of time over a long period of time, with opinion makers, you will ingratiate yourself to them and they will tell you why what it is that you want to do can’t happen. Then you have to jump that hurdle and surprise them by how easy it was.

Set your own goals and timetables. About three months into the job you should be setting some goals and timetables for yourself. Write them down. Keep them in front of you. Tell somebody you care about what they are. Brag on yourself when you do well; find fault
with yourself when it doesn’t go right.

All the failures are your own fault. Small program managers control their own destiny. Anything that happens that is contrary to the good of the program you run is your own fault for 1) being under-prepared, 2) trusting the wrong people to do the right thing, 3) expecting too much of yourself. But it’s also your learning curve. Small program managers have many of the joys of entrepreneurship but the security of a regular paycheck. Things are always changing but in other ways comfortably the same. Enjoy your work and be good at it.

Chapter eight: - 2nd ed.
PAYING FOR RECYCLING AND GARBAGE

Ten years ago we calculated that the national garbage bill was about fifty billion dollars a year. I have never seen a concomitant figure to describe the recycling industry, but, based on a California estimate in the mid-1990s that garbage is a five billion dollar industry and recycling is two billion, it would not be unrealistic to estimate that the national recycling budget (moneys expended to move materials into and through the backside of the loop from collections through aggregation to their arrival at reprocessing facilities) is now about thirty billion dollars per year. This estimate does not include the prices paid to the public for materials but does cover all the expenditures for recycling in the largest sense and would include any activity in the collections, aggregation and transport to reprocessing areas.

Several years ago, the National Recycling Coalition created a study to measure the economic impacts of recycling and measured not merely the collection, aggregation and reprocessing of old materials but also took credit for the portion of industrial production that was dependent on previously-used materials. If a newspaper mill ran on 50% recycled materials, then the corporate expense in operating that mill was 50% included in the national expense on recycling. Using this methodology, recycling turned out to be an industry as large as the automotive industry. Not everyone agreed with the method chosen to calculate recycling’s value, but the study created
What many people fail to understand is that most of the expenditure for recycling is private funds, not public dollars. My own estimate is that at least 90% of all the money spent in recycling is privately raised and spent without any direct governmental involvement or investment and that the total public expenditure to support recycling, which would include federal, state and local government staff plus program costs (primarily curbside program support), would be about 2 billion dollars a year at the most (two out of 30, 6.7% of the total).

This $2 billion estimate is based on 60 million households spending $22 per year in curbside fees totaling $1.32 billion dollars nationwide. The rest of the total expenditures [about $700 million] is for public staff at various higher levels of government; for example, in California the Integrated Waste Management Board grosses several hundred million dollars a year thru fees attached to specific products (like CRTs, tires, motor oil, etc.) but spends only $35 million per year on itself. The Division of Recycling now sees over a billion dollars a year flow in (20 billion covered beverage containers at 5 cents each) but spends only $40 million on itself. What concerns us most in this chapter is delineating how the public funds are raised to pay for convenient recycling.

From the beginning of the modern recycling movement, there has been a concerted effort to make recycling as cheap as possible to the user-community. A guiding principle in all decision-making in this area has been not to recover from the citizen-consumer the actual cost of using the recycling system. There are five funding options that have been variously tried around the country.

1. GENERAL FUND REVENUE: All levels of government have the power to tax their citizens and those funds have supported recycling staff, particularly at the federal level. Because local governments have seen a continued demand for services at the local level but a new reluctance from citizens to pay for those services, it’s unusual, even rare, today for state or local governments to support recycling programs with general fund revenues.

2. LANDFILL FEES: State and local governments that have landfills within their jurisdictions usually have assessed a fee on the quantity of material entering that landfill; the fee will generally vary from twenty-five cents to six dollars per ton of garbage, with the daily cover materials usually being exempt from fees. These fees were originally established to cover the cost of inspecting and regulating the landfills but have rapidly expanded to cover other costs, including recycling, as well.

   For many tears the City of San Jose had a business license tax on landfills and collected a franchise fee on any businessperson hauling garbage for others (no restrictive agreements on commercial trash hauling in San Jose). However, many of the smaller haulers were not registering with the city and not paying the franchise fee to be recognized as city-approved haulers. Rather than spend a lot of time and effort chasing the small haulers, the City decided simply to raise the fees at the landfills [San Jose is unusual in that most of the landfill capacity in the entire county is within the city boundaries] and in 1993 raised its business license tax at the landfills from three to thirteen dollars per ton. When the other cities in the county challenged this action in court as being somehow discriminatory, the judge said all the other cities sending materials into San Jose-located landfills always had the option to go elsewhere and San Jose could charge what
it wanted, as long as the fees were applied equally to all garbage coming in. While degrading its own environment with other communities’ trash, San Jose was raising funds for environmental programs and its general fund thorough its business tax fee.

We are not yet in California to a point where people are putting fees on materials going into landfills to discourage the use of landfills. In the same way that it is easier and easier to add taxes on cigarette as fewer people smoke (the proportion of the voting age population that smokes is now about half of what it was in 1985), we are moving towards a time when landfill fees will be easier and easier to impose as fewer and fewer people sense a dependence on landfills. We’re not there yet but we’re moving in that direction.

3. GARBAGE FEES: In communities where the city provides garbage and recycling services through its own staff or a single outside contractor, it is common to underwrite the expenses of the recycling programs with funds charged to the garbage system users. Where garbage collection is private but franchised by the municipality, cities have for years assessed a fee on the garbage firm’s revenues to pay for the city’s own expenses that are considered incidental but necessary to the cost of garbage collection (e.g., street maintenance, regulatory oversight, etc.). In recent years these franchise fees have been expanded to cover recycling program costs as well. In communities strapped for cash, there has been a tendency to put all kinds of municipal services under the “environmental services” banner and pay for them all with revenue extracted from garbage collection fees. In Oakland, California, one-third of every dollar paid to the waste hauler goes to the city to cover the costs of many environmental programs.

4. PARCEL FEES: Some counties and cities will include a flat-fee assessment on each residential property to cover recycling costs; this is almost always collected in the twice-annual property tax bill. Santa Cruz County used this strategy because it feared that loading all of the recycling and solid waste disposal costs on landfill fees charged to the public where there is a lot of self-hauling to the dump would encourage illegal dumping on its many wooded mountain roads. In 1997 in the City of Alameda, a citizen’s committee recommended to the City Council that this system be used to pay for expanded recycling services but taxpayer objections led the Council to adopt a direct bill-and-pay system instead.

5. DIRECT BILLING FOR RECYCLING SERVICES: When the City of Piedmont, California started curbside in 1991, it selected a small, private hauler who had been operating a monthly collections program for several years at no charge to residents. The local waste hauler who had bid on the curbside contract but was not selected refused to put the City’s recycling fee on its garbage bill to its customers in the City so the City told the recycling contractor to bill the citizens directly for the service. Quarterly bills for $4.50 per household were paid only about 80% of the time and cost about $1.30 per bill to mail out; it was a disaster that eventually got rectified. In a similar situation in 1987 the City of Walnut Creek had figured out after a year of discussions how to get the recycling charges on the county’s property tax bill; it usually requires some coordination with the County Treasurer but is the cheapest and most certain method of collection. It’s also valuable where the city uses multiple service providers and keeps its funds close at hand.
All of these methods are legal and useful; the choices among various money-raising schemes give local elected officials a major role in directing how and to what extent recycling is to be subsidized.

PART B. A LESSON FROM HISTORY – PAY AS YOU THROW.

The term “pay as you throw” is occasionally heard in the recycling field and needs a little elucidation. In many parts of the East Coast, the cost of garbage service is included in the general municipal fees and people aren’t told what their garbage costs are. The municipal policy is that it’s up to the city to haul away anything you don’t want and if you put it out, they’ll take it away. In many cases there was a fear that if the city didn’t take everything or told you what it would cost, then you would build junk piles around your house (fire and rodent problems) or toss it out in some unmarked alley (then a public works, clean-up problem). In recent years commitment to this “don’t tell” policy has weakened but it is still common in much of the country. Not in California, however; for at least 30 years there’s been a law that prohibits LPAs from burying your garbage costs in some larger budget category.

Sometime, I think it was in the 1970s, some research work was done and it was discovered that giving folks measured garbage service, where the costs were proportional to the amount of material you set out, did in fact reduce the amount of material put through the garbage system and did not result in massive public dumping, a high level of citizen complaints, etc. Out of that research came the “pay as you throw” system which we in California think of as “old hat” but which is still a strange idea in places like Florida.

Once a community commits to measured service, the question then becomes how should the rates be structured, and there are three choices. In the declining block rate, the first unit of service is expensive but later units are cheaper because the first unit has included the costs of capitalizing the overhead (getting the truck out on the route and back to the processing facility, paying for the transfer station, etc.). In Oakland, California, where I’ve lived for many years, twenty years ago the first can of garbage was $6.50 per month and the other cans were $4.30 per month. The thinking was that since you had already paid for the truck to get there in the $6.50 can, you shouldn’t have to pay for the truck’s movements in the second can. The garbage company thought that rate was fair. (If you can’t guess, the second system is the flat rate system where all cans cost the same and the third system is the inverted rate where the latter cans cost more than the first as a way of discouraging the use (or consumption) of garbage services. The inverted rate system is the way electricity, telephone and water services are billed in most of California; you get a quantity of what you want at a low price (the so-called lifeline service) and you pay a lot more if you take more service.

My perception is that we have a patchwork of garbage rate systems in California. The current provisions of weekly disposal capacity space is sufficiently generous (the three cart system in San Francisco [organics, recyclables, and trash] provides three times as much disposal space as the old 32 gallon garbage can which was considered the standard of service for the mythical family of four for a week) that it’s hard to know now what the norms are. If people need a second garbage can today, the thinking goes, they really need an education or a conversion
experience, not a second can.

PART C: THE URBAN TRASHING PROBLEM:

As garbage charges have risen in proportion to the Consumer Prince Index, [dumping at my local transfer station was $19 per ton in 1989, now, in 2006, it is $95 per ton], as police presence has been siphoned off to other higher-risk crime areas, as the general sense of community responsibility has declined, the level of illegal dumping has increased in many areas. Unscrupulous materials haulers receive payment from homeowners and business operators to haul away unwanted discards and then save themselves the disposal fee by leaving the materials surreptitiously in little used alleys and underused streets. Very little seems to be known about this “illegal dumping” problem: is this fifty loads by one driver or one load by fifty drivers, does improved surveillance make people stop doing this or simply move them to a less-observed location, should even incidental scrap haulers be registered and certified like taxicabs, etc?

PART D: RAISING MONEY FOR THE REPROCESSING INDUSTRY:

Generally the money raised through citizen fees [PART A here] is used to pay for collections and aggregations costs whereas the funds used to pay for reprocessing research and development comes from other sources. Behind all this work is the assumption that recycling will pay for itself when 1) the value of scrap materials increases, or 2) when we (collectively) figure out how to reprocess a product or material so that the used, processed materials coming out of the loop will be sought by industry and the economy to perform some useful function.

An example might make this clear: if you ask people about insulation, they usually think fiberglass. In fact, particularly in hot climates where people can afford an all-house cooling system, fiberglass can be dangerous to your health, the fibers are airborne and can aggravate many pre-existing lung conditions. Doctors have told patients not to live in a fiberglass insulated house. Well, what else is available? For the last ten years there have been two firms, the first in North Carolina that went broke, and a second now in Chandler, Arizona, that makes batts that look much like fiberglass but are made with cotton fibers; they insulate just as well and they don’t irritate lungs. Where do they get the cotton? In part from the cotton processing factories in Arizona but they also can use some of the cotton batting removed from old bedding and furniture. So a certain arrangement has been worked out from people who dismantle upholstered furniture to keep it out of the landfill and the Arizona business. Is everybody happy? The seller would like more money for his used batting; the Arizona firm would like to pay less. If the buyer pays too little, the seller might go broke and go out of business; if he pays too much, then his costs go up and his prices too and everybody stops buying what he wants to sell.

What is well recognized is that all of these ventures must one day succeed without government assistance; all of these businesses must find a place in the economy (more or less) without subsidy. I say “more or less” because to a large extent large ventures in this country have ingratiated themselves to the people’s leaders and have found various ways to protect themselves from the naked competition that they sometimes espouse as appropriate. How all this should develop and proceed is well beyond my abilities to predict or control but I think it is always valuable for recycling developers to look forward to a time when they live without
Where is the money available to assist this? It seems there are seven sources:

1. BLOCK GRANTS: When a government agency has unspecified money in its budget, it is common for the legislature to require that certain funds be delivered to local public agencies for specific topics but irrespective of need or performance. Currently, California state law gives $5,000 from the Department of Conservation to each city in the state to assist in publicizing recycling programs. Did they have to ask for the funds? No. Do they need them? Maybe. Do they know what to do with the money? Maybe. It doesn’t matter. Because they’re a city in California, they get it. [Readers may forget that paying in to the bottle bill at 4 cents per container with a 55% recovery rates would leave $360 million at the DoC.] Under the California Used Oil Enhancement Act, each California city gets … Very little of this money gets into private hands.

2. GRANTS: The nice thing about grants is that you don’t have to pay them back; the bad thing about grants is that you have to apply for them and compete against others who also want that money. (No competition for block grants.) The CIWMB has a small grants program to assist reuse programs. The Department of Conservation has recently given large grants to two entrepreneurs who are building facilities to wash shredded PET and HDPE; these plants will allow California fabricators to buy used, post-consumer PET and HDPE that has been cleaned to market standards. The department’s goal is to close the loop here in California so that post-consumer PET and HDPE don’t get shipped out of state to Korea or South Carolina for reprocessing. Will it work? Will these plants find their place in an unsubsidized economy? Nobody knows for sure now. If it does, we’ll know more about what works in this field and future facilities can start-up with less grant money and rely on other funding mechanisms.

A number of local government also make grants. The Alameda County Recycling Board gives about $400,000 a year to worthy non-profits and some profit-making firms. The Department of the Environment in the City and County of San Francisco has a slightly smaller pot for grants. The Altamont Education Advisory Board gives out about $350,000 per year, mostly aimed at the Tri-Valley area but open to grants in other Altamont-wasteshed projects, including San Francisco. Waste management authorities elsewhere in the Bay Area also grant funds to competitive projects.

3. LOANS: The nice thing about loans is that you get the funds you need to start up a business, the bad part is you have to pay the money back. Since people don’t loan you money to give it away, their qualification requirements can be quite stringent. The CIWMB has a Recycling Market Development Zone loan program which allows a project developer to borrow money from the state at a cost and on terms not available in the private lending market. The catch is you have to have our plant located in an RMDZ although the area covered by the program has expanded over the years and seems not to be a problem. To my knowledge there are no other loan funds available on the state or local level specifically for recycling-related ventures.

4. SALES TAX EXEMPTIONS FOR PURCHASED RECYCLING EQUIPMENT: Several
5. TAX CREDITS FOR PURCHASING RECYCLING EQUIPMENT: Several states around the country have at various times allowed persons who have purchased equipment to be used in recycling ventures to deduct all or part of their costs or up to a dollar-amount limit the amounts expended for the equipment in either their personal or business taxes. I believe this provision existed at one time in California but does not exist now.

6. STATE BOND FUNDING: The California Pollution Control Financing Authority was founded initially to provide the capital costs of landfills and incinerators. During the 1980s the Authority funded some transfer stations with sorting capability and has also funded some clean MRFs used to sort recyclables. With the early 2007 appointment of Mike Paparian as its executive director, a former member of the CIWMB, the CPCFA might get more involved in various waste reduction and recycling ventures.

7. PRIVATE PLACEMENTS: It was recently in the newspaper that over a million people in California are worth in excess of a million dollars, not counting real estate. In many cases this is money looking to make more money and when you inquire about, there’s all kinds of brokers and middlemen moving this money around.
Chapter nine: - 2nd ed.
HOW TO CHANGE CITIZENBEHAVIOUR

Once the various policy leaders decided that recycling was good for us and that we should do more of it and not less, the next question was, “Well, how do we get the public to do it?”

Back in the early 1990s I was trying to make a list of what people actually did to move materials into the materials conservation circle. I had read a lot of articles and made long lists of everything I saw described there. But it didn’t make any particular sense; it was just random information.

Then one day, as often happens, I realized that everything I was writing down fell into one of four categories. I realized later that these categories were immutable, in that every time somebody up top wants everybody else anywhere to do something good, these are the stages the functionaries must go through to implement the concept.

The four stages of policy implementation are:

1. **Information and Education [I&E]**: Here the powers that be inform the citizenry that such and such a behavior is bad, that they, the citizens, should stop doing what is wrong and start doing what is good. Leaflets, brochures, billboards, press releases, public appearances by celebrities, etc. are the weapons to inform the public and change their behaviors.

2. **Create a Program**: At some point the citizenry wants more than exhortations, they want programs. And so public agencies dream up ways to organize people, land and equipment so citizens will find it easy to avoid the bad and do the good. The government doesn’t want you to drink and drive, so the police offer to drive you home on New Year’s Eve; that’s a program, it’s more than just talk. Several years ago local governments realized that it was not sufficient just to collect used paper, they also needed to buy recycled paper for their printing needs; that became a program to close the loop. The problem with programs, of course, is that they are expensive. Curbside is a nice program but it costs a lot of money to buy the equipment, run the routes, sort the materials, etc. In a typical curbside program the cost of public education and information is probably less than 1% of the total program cost.
3 **Financial Incentives:** Once the programs are in place, then the problem emerges of how you get people to use them. The I&E from Stage One is reheated but the powers that be now try to build in financial incentives to encourage people to do what is right. For instance, recycling is free but garbage costs money. More than one small can of garbage will cost you many more bucks. There are lifeline rates for water and electricity, why not garbage? We tax cigarettes to discourage their use, why not tax garbage? In New Jersey they fine you $250 for putting your newspapers in the garbage. In her 1996 study, Lisa Skumatz identified pay-as-you-throw garbage rates as the single, most significant factor in determining the market penetration of a recycling program; if you know garbage costs money, and recycling is free, you’ll do the right thing.

4 **Prohibiting Conduct:** The final way government gets us to do what is right is by threatening our freedoms. “Use a barbecue; go to jail,” became a rallying cry against a proposed Los Angeles clean air rule. “Drive drunk = go to jail;” that message also is very clear. In recycling this area is called up in the phrase “mandatory recycling.” In cities that have such laws, San Diego and Seattle are best known, the enforcement has been very modest and nobody seems afraid of the recycling police. Other states that have a longer history of working with mandatory recycling laws, like Connecticut and Wisconsin, also seem not to have disturbed the body politic very much by their bans.

In identifying these stages of implementation, I also came to realize that these stages are incremental, that various identified public goods move to different stages of requiring compliance depending on how serious the issue is and how well the first stages are effective in producing desired outcomes. As a kid during World War II, I remember crushing tin cans and “saving” (i.e., keeping out of the garbage) newspaper for “the war effort;” because everyone supported the war against Germany and Japan, there was little need for more stringent measures, voluntary compliance was easy. Or, if everybody would turn in their handgun during amnesty days and the murder rate went down, the powers-that-be might never get to stages three and four. If, during a drought, people simply use less water because they know there is less water to go around, the people in charge would not need to go to the latter stages of policy implementation to cut water use.

My perception is that in most areas of the country, recycling public policy is still in stages one and two. There is generally very little sense of how to use (or willingness to use) financial mechanisms to compel performance and certainly there’s almost no public will to reward and punish the non-performers. Someday we may get there, but we’re moving very slowly. Our failure so far to develop serious actions in stages three and four may also lend credence to the claim that the public’s interest in recycling is a mile wide and an inch deep. It’s also true that the proliferation of programs becomes very expensive and reaches a point of diminishing returns. Too many programs allow our efforts to get cluttered and we lose focus.

I would also suggest that a lot of the disagreements that exist within the recycling community about how to make more recycling happen depend on our view of human nature and the disparity of attributing significance to these four policy action areas in getting people to do the right thing; we all know that the public (and that includes us) needs information and education, programs, financial incentives and threats. But our sense of the relative significance of these
different policy action areas divides us.

A WORD ON INFORMATION AND EDUCATION: The differences that we perceive in identifying approved behaviors are exacerbated by of our sense also that we are dealing with a fractionated “public.” What we’ve learned in modern marketing studies is that a message that might resonate with me might not resonate with my young adult son or my Hispanic or African-American neighbor. The recent support for “social marketing (Douglas McKenzie-Moore has been a leading proponent in Canada and the USA) is an attempt to find a new common ground to sell these do-good programs.

For myself, I am always searching for analogies that will help people understand. I like living and dying analogies: MRFs are hospitals for materials; landfills are cheaper than recycling like cemeteries are cheaper than hospitals. Source reduction is preventative medicine, etc.

I also like anti-smoking analogies. Who would have believed twenty years ago that we’d have zero smoking allowed at worksites? I say the sanitary landfill is safe like filter tip cigarettes are safe (some of you are too young to remember when the cigarettes-cause-cancer message started going out, people would follow their cigarette’s tar levels very closely).

Or sometimes I like energy analogies. Curbside is like “shut off the lights” notices - visible and involving but only affects a small part of the issue. Or I talk about graduated garbage costs (the second can costs more than the first) as similar to “lifeline” gas and electric rates.

Recycling is like juggling; once you take the material out of the ground, you have to keep it in the air; that’s what recycling is, keeping the material moving.

Chapter ten: - 2nd ed.
The legal area of recycling is immense and there’s lots of esoteric information available if you’re willing to dig but most of it has very little to do with a recycler’s working life. Unlike the hazardous waste field where most programs and operating procedures have their basis in legal directives, in recycling there are a few broad legal issues (most of them discussed above in chapter six); otherwise the law, regulations, court decisions and administrative activity on recycling topics are not important. But a few general comments about this field of law may be helpful to your understanding of our field.

Recycling as we know it, to a large degree, a matter of buying and selling. It’s not unlike farming; you gather materials in quantities and quality peculiar to your situation and you try to find a buyer. There is no real national policy on resource conservation and most of what we do in this field is to save somebody some money; used materials provide a cheaper feedstock for an industrial process so business people gather, aggregate and sell those materials to an end-user. But for the curbside programs, it would be hard to find a local government interest in this field, any more than local government cares about shoe repair shops or flower stores.

The relative significance of the three layers of government in America for recycling policy and programs would probably be allocated as 85% local, 13% state and 2% federal. In a country where the question “What did the President do today?” is a daily question for the nightly news, this may come as a shock, but the federal government is almost completely and, to a large extent, the states also are out of the picture in our field. Recycling, and so-called solid waste management before it, are, from the legal side, almost exclusively matters of local government interest. Over the last twenty-five years various bills have been submitted in the Congress to broaden the federal role in solid waste management and recycling, but almost nothing has been passed, and the State of California’s AB 939 requiring all sorts of planning documents from LPAs leaves almost all implementation to the largely unregulated local governments that develop, pay for, and oversee many local programs.

Historically local government’s interest in solid waste had two, and only two, core areas of concern: containment and collections. Containment meant making sure that the fireplace or coal stove ashes didn’t get put out in boxes that would catch fire and burn and that wet garbage would be put in leakproof containers. The second area of concern, discussed from another perspective in Chapter Six, was that the garbage would get picked up on a regular basis and hauled away. And that was it.

As cities grew, the control of persons offering garbage and rubbish collection services came more to the fore, and many of the policy and program choices that are still managed in local solid waste management law were addressed and resolved: 1) Should the city collect garbage with
its own workforce?; 2) if not, should it allow one or more service providers?; 3) should residential and commercial garbage be treated the same?; 4) are people required to have garbage service? There is no consistency in how local governments addressed these issues and the great diversity in local practice reflects the freedom local governments have had in making these choices about garbage collection programs.

Early on, it was recognized that where garbage was disposed of (not a collection issue but disposal) should be a state rather than a local concern. Probably because a lot of garbage was used to fill in swamps, marshes, etc., and waterways have been mostly a matter of state law in America, disposal site regulations developed on a state, not local, level. As a hazard to navigation or to safe drinking water, garbage needed to be disposed of properly. (In the old days (pre-1970), if you ran a disposal site and covered the garbage daily, you were probably doing all you needed to do.)

Disposal site regulation (as we now know it) is relatively recent and almost exclusively a state regulation. Around 1970, with the problems of gases migrating from landfills and blowing up nearby houses, the open burning of garbage creating air pollution problems, and leachate from landfills poisoning downstream water sources, the issue of burying garbage better came to the fore. By the mid-1970s, the more active states had all the laws they needed in place to address these problems. To this day local government has no role in these issues, and federal law, mentioned briefly later on, is recent and will defer to comparable state law.

Waste reduction law, where the public is told to make less garbage and to recycle more, is, I believe, almost uniformly state law, not federal or local. Waste reduction law takes many different forms in the different states: the controlling factor appears to be the availability of landfill space in each state and the state legislature’s opinion about how this problem should be solved. A few states ban long lists of materials from solid waste landfills (Wisconsin and Connecticut come most quickly to mind). Most states require that local governments develop plans to have less wastes but don’t tell them what to ban or how to do it. Some states raise money to pay for recycling programs (mostly by surcharges on landfill disposal) but then grant the money back to local governments for waste reduction programs, other states (like California) leave the fund raising and program development to local governments.

To my knowledge, there is no city or county-level legislation mandating recycling. Local public agencies will encourage their people to recycle, they will enforce state laws which may ban the disposal of certain items in the garbage, and will occasionally ban items themselves, but LPAs are not likely to pass “ban-this/ban-that” type laws themselves. In the 1980s, there were several local laws banning the use of styrofoam in that jurisdiction; expensive lawsuits resulted where local governments did poorly in court and this experience may have discouraged local public agencies from enacting waste banning laws themselves although most anti-styrofoam laws today seem to be holding up in court. The most common local law in California affecting recycling is the ordinance that would prohibit persons from taking materials out of someone else’s curbside bin (so-called anti-scavenging law).

As most “social progress” legislation develops, the executive department treats the
regulated community initially as well meaning but ignorant. Most administrative agency resources are given over to technical assistance in all its forms, but the agencies are very slow to move towards fines or other punishments. In the California Integrated Waste Management Board, over 70% of the staff is involved in technical assistance of some type or other; only 20% would be assigned compliance duties and most of that involves landfill performance, not waste reduction. To my knowledge, Oregon is the only state in the country that pushes its waste reduction interests by limiting the amount of material that can be left at a landfill.

The consequent enforcement of waste reduction laws is very piecemeal or premature. For example, California law has, since 1989, directed local government to develop plans to reduce solid wastes. The wastes were to have been reduced by 25% by 1995 and 50% by the year 2000. Fines of up to $10,000 per day were to be levied on offending jurisdictions. At this writing (early-2007), the state has completed legal action against only seven LPAs for failing to meet the AB 939 requirements, a summary of the resolution of the disputes is found later in this chapter.

In the United States Environmental Protection Agency there is an Office of Solid Waste. Most of its staff is in Washington with seven or eight people in each of the ten regional offices. Most of the Washington effort involves solid waste facility regulations and the regional efforts involve Indian tribe waste reduction programs, some oversight of federal programs, and a general interest in information and education about solid waste and recycling. There are about twenty people nationwide at USEPA who are concerned for recycling policy and practice questions, mostly involving federal purchases of recycled products.

In summary, I would say that state and federal officials in our field may be helpful and are not likely to be harmful to your LPA’s interests (unless your LPA is on the carpet for failing to meet its recycling goals, in which case your attorney will, most likely, be in charge), but, as suggested in chapter seven, most state and federal staff have little practical knowledge about recycling but frequently know a little about a lot of things. The right staffers can be extremely helpful if you know what you’re doing and if you take the time to cultivate them but at best they will simply be telling you what your other peers are already accomplishing, matters that you can frequently figure out for yourself.

ADDENDUM A: THE TEN THOUSAND DOLLAR FINE

It’s widely known that the CIWMA allows the CIWMB to levy a fine of not more than $10,000 per day on deficient local public agencies subject to the law. The exact language of the fines section are:

PRC, Section 41813: “After conducting a public hearing pursuant to Section 41812, the board may impose administrative civil penalties of not more than ten thousand dollars ($10,000) per day on any city or county … which fails to submit an adequate plan in accordance with the requirements of this chapter.” Note: the ACP is for an inadequate plan.

Also, PRC, Section 41850: “… if, after holding the public hearing and issuing an order of compliance …, the board finds that the city, county, or regional agency has failed to make a good faith effort to implement its source reduction and recycling element …, the board may impose administrative civil penalties upon the city … up to ten thousand dollars ($10,000) per day until the city, county, or regional agency implements the element.”
In the now seventeen years that the law has been in force, seven LPAs have appeared before the CIWMB for failure to perform; the following is an account of the cases against five of them. [Two are not yet identified.] As you will see, the offending LPA was almost contemptuous of the required submission requirements; to date no one has been fined for failing to meet the goals of the law; all fines have been levied for failure to make timely submissions or “blowing off” the regulatory staff. These summaries were constructed by reading the files of the CIWMB, most in open hearings.

GUADALUPE, Santa Barbara County. City said it would complete its SRRE by July 1, 1997 but didn’t. On January 29, 1998, SRRE is still not submitted and CIWMB imposes $7,200 fine, $5,000 of which will be waived if plan is submitted within 30 days of order being issued. If SRRE not in by March 3, 1998, an additional $617 per day shall be imposed for delays in submission after then. No penalties for Jan.29-March 3 period.

POINT ARENA, Mendocino County. SRRE was due in August, 1994. City said it would have its SRRE in by May 30, 1997 but did not do so. City presents its SRRE at CIWMB’s public hearing in January, 1998 and CIWMB imposes $1,160 administrative civil penalty for SRRE and $580 for NDFE, for a total of $1,740.

SANTA FE SPRINGS, Los Angeles County. City’s SRRE submitted in 1994 projected diversion for year 2000 of only 34%. CIWMB rejects SRRE in January, 1995 and issues Notice of Deficiency [NOD]. City then said it would file adequate SRRE by September 14, 1997 but did not do so. On January 29, 1998, CIWMB assessed a penalty against the City of $43,000 for having failed to submit adequate SRRE and sets date of April 3, 1998 as due date for SRRE package with fine of $3,683 per day thereafter to follow if necessary. Newly-submitted SRRE approved on June 24, 1998.

GARDENA, Los Angeles County. In October, 1999, Board review noted many deficiencies in program implementation and program success; Board staff recommends compliance order and Board did so [CO#1]. In March, 2001, the City of Gardena received an extension for compliance. In January, 2003, diversion rate of 13% in year 2000 led to Compliance Order No. IWMA BR03-02 issued, requiring city to develop action-oriented plan by June 30, 2003. Plan was not submitted until August 18, 2003. In September, 2003, in its ninth compliance order, the CIWMB orders $70,000 fine for late filing of plan. Another penalty will accrue if plan of August, 2003 is not implemented by January 1, 2004. Gardena excluded from Los Angeles Area IWMA in January, 2004.

FORTUNA, Humboldt County. In September, 2002, CIWMB holds that Fortuna [11K population; 70% of MSW is self-hauled to in-town transfer station] has not made a good faith effort to implement its SRRE (Year 2000 recycling rate is 34%) and issues a compliance order. City then agreed to submit workplan by December 31, 2002 and did so. City “missed all but one of the original targeted due dates.” Further failures-to-implement through the spring. On July 19, 2005, Item 25, the Board heard evidence of tardy program implementation, landfilled wastes mis-assigned to Fortuna, lawsuit from waste hauler challenging city’s right to enter into another contract for green waste collections, etc. Board held that Fortuna’s subsequent efforts did not rise to the level of “good faith effort” and assessed a one time penalty of $5,000, and a prospective penalty of $200 per day, starting that day, if by October 31, 2005, Fortuna has not “achieved compliance” in the judgment of the CIWMB Executive Director. If the CIWMB Executive Director holds for Fortuna, then all financial assessments will be suspended.

Chapter eleven: - 2\textsuperscript{nd}. Ed.
RECYCLING, SUSTAINABILITY AND
THE ENVIRONMENTAL MOVEMENT

A. SUSTAINABILITY:

The term sustainability was coined in the late 1980s to describe the commitment of any culture to pursue practices that, while meeting the needs of the culture’s current inhabitants, will not diminish the culture’s ability to meet the needs of future generations ad infinitum. The world is not here to be used up but to sustain us indefinitely. Quoting Chief Seattle, “We borrow the planet from our children.”

One modern writer sees a sustainability program as concerned with five issues, of which only one is recycling-related:
1) resource management (limiting materials use and discards, maximizing recycling/diversion, fewer toxics).
2) Air quality (no off-gassing, indoor air quality, no toxics).
3) Water use (drought resistant plants, minimizing soil runoff, no toxics, etc.).
4) Energy efficiency (ambient heating and cooling, ambient light, etc.).
5) Forgot this.

The Earth Summit in Rio de Janeiro in 1992 was an early focal point, continued at Kyoto in 199x and in Nairobi in 2006.

The most optimistic statement on the relation of sustainability to recycling came from Lisa Bauer, Recycling Coordinator at UC Berkeley, who in 2005 said, “If you understand sustainability, recycling becomes a no-brainer.”

My personal experience is that interest in sustainability tends to weaken the concern for waste reduction and recycling because discarded materials are less “sexy” and attractive than air, water, and energy use questions. I had a brief conversation with Hunter Lovins in the fall of 2006 on this question and she said that the weight of interest within a sustainability program in waste reduction and recycling can be strong or weak and that recycling neither stands nor falls if sustainability becomes the key buzz word.

Some of the key concepts that have developed in the sustainability literature are:
1) The “triple bottom line,” where the leaders pay attention equally to profit, resources, and human needs. [Promulgated by John Elkington, see www.sustainability.com]
2) “Cradle-to-cradle” by William McDonough and Michael Braungart. Designing products so that their end-use and repristination is also planned for.
3) “Ecological footprint” is a concept that we can measure how much land it takes to support our lifestyle and the various resources we consume. Matthias Wackernagel and William Rees published on this in 1996 and believe that the growth in consumption and population means that we have been using up the earth’s resources at a rate faster than they can be replenished since the early 1980s. (Interestingly, Wackernagel has never [apparently] analyzed how increased recycling would change the ecological footprint; the current calculation of the ecological footprint simply reflects the society’s current discards management practices.

The Bioneers movement, known officially as The Collective Heritage Institute, (established in Lamy, NM in 1990) seeks to create “visionary and practical solutions for restoring the earth” and is best known for their regional gatherings (each fall in Marin) and on-line chat rooms.

Well-known writers (to be googled) in this field are Fritz Schumacher, Paul Hawken, S. Schmiedheiny, Amory and Hunter Lovins, Ray Anderson, Brian Nattrass and Mary Altomare, William McDonough, Michael Braungart.

I thank Jeanne Longley of Portland, OR who first got me somewhat up-to-speed on this issue in 2005.

B. THE PLACE OF RECYCLING IN THE ENVIRONMENTAL MOVEMENT.

If you were to thumb through the environmental textbooks of the 1970s you might be surprised to realize how little about recycling is included in those books. Or if you go to the Sierra Club or the Natural Resources Defense Council or the Environmental Defense Fund and
ask them, “How much of your staff resources are devoted to materials conservation and recycling issues?” you might be surprised to learn that, if they answer truthfully, they will say, “1-2%.”

The issues of air and water protection, of wildlife habitat, of endangered species, etc., all seem to take up more space on the larger stage than recycling. At its best, recycling is, to borrow a phrase from my former wife, “applied urban environmentalism,” but it has none of the cachet of saving forests, wildlife and open space. Part of the answer lies in the more critical nature of the other environmental crises. Compared to air and water pollution, compared to hazardous waste disposal, solid waste issues have always taken a back seat because they have, frankly, been less critical. At a time when rivers were catching fire and you couldn’t see the sun on a clear day, air and water pollution were more important. At a time when hazardous wastes were disposed of casually and with great risk to others, recycling was not hot.

Recycling got hot (and you know the popular claim that more people recycle than vote or go to a public library or to professional baseball games, etc.) when curbside was rolled out to middle America. It became a concrete, tangible thing people could do to be environmentally responsible. People liked it because it was simple. And it seemed to work.

But environmentalists weren’t particularly impressed. I think that’s starting to change but we are only beginning to get to the point where people are considering that if you reuse a ton of paper, you are saving 17 trees, and we don’t have the trees anyway. The landfill “crisis,” (which wasn’t really a crisis but merely a time to reassess how far garbage has to travel before it can be buried) has passed and it will be now the coming resources shortfalls (promised for 30 years but that hasn’t really arrived except in the forest products area) and possibly the effect of industrial production on greenhouse gas levels that might elevate recycling’s place in the environmental movement.

The other reason recycling gets little respect is that its leaders are generally fairly timid. Most people who work in recycling are employees first and environmentalists second, they don’t exercise much policy influence in their work environment, and they’re more concerned to keep their jobs than to change the world. It’s very much like affirmative action officers in the civil rights movement; many too many compromises with the way-things-are to be credible among those seeking truth and justice. I mean no insult; it’s simply that working for government and changing the world are two different things.
RECYCLING AND DEEP ECOLOGY

For many recycling practitioners, the very idea that there could be any specific connection between recycling and deeply held feelings, like religion, may seem to be a very strange idea, but, I would argue, there are many points of connection which the recycling professional would be well advised to heed.

1. Certain religions, coming most quickly to mind would be Buddhism and Native American spirituality, hold many ideas of humankind’s responsibility and one-ness with the natural world that would appear to foster anti-wasting attitudes and behaviors.
2. Judaism and Christianity have generally been seen as opposed to a sense of primary oneness with the natural order; this goes back to the historical roots of Judaism with the early Israelites opposed to the Canaanite “nature worship” (fertility gods, gods of the seasons, etc.). God’s command to Adam to name the animals and to care for the earth (Genesis 1:26 and 2:18) become duties but not necessarily joyful or renewing ones. American Protestantism has usually been branded as being pro-exploitation towards the natural world, going back to Tawney and Troeltsch who documented how the Protestant message supported early capitalism and required that material consumption and self-improvement be the cornerstone of religious involvement and commitment.
3. There is nobody in the Roman Catholic Church today who can be said to have a reputation as a pro-nature theologian.
4. Unlike its major involvement with the civil rights movement, leading American denominations have been mostly silent and thoughtless on stewardship of nature questions.
5. Many of the early modern recyclers (post-1970 idealists) were “true-believers” motivated with a religious-type (apostolic-type) fervor to spread their beliefs and gain many other adherents. Existing religious institutions were generally indifferent to their concerns.
6. Contemporary modern Protestantism has a very cursory interest in recycling and usually fails to deal in any meaningful way with the outrageous wealth and personal consumption patterns of American people, including themselves (e.g. America has 3% of the world’s population and consumes 40% of the world’s energy, etc.) The environmental interests that do exist are focussed on “bugs and bunnies” issues (wilderness and habitat preservation) and even their existing religious institutions are woefully indifferent.

Chapter thirteen: - 2nd edition

MEASURING RECYCLING

Note: Starting in the mid-1970s, for about five years I taught an eight-hour class on Numbers
and Statistics in Affirmative Action Programs, mostly an attempt to distill the wisdom of 30 to 40 court decisions where numbers and statistics had been argued by both parties to present or defend against a claim of discrimination. Numbers and statistics in recycling are still much more primitive in their use than in EEO but some useful directions for the beginner might be offered here.

The purpose of numbers and statistics in recycling program management is to provide some control and direction to the program planning and implementation process. The eternal question “What do we get for our money?” will forever rear its head while the people who are being asked to pay (in recycling usually local elected officials and public and private managers) figure out what to do. While soft data (program testimonials, test-drives of new equipment, a neighbor’s success story, etc.) help people feel good about making hard decisions, decision-makers like hard data that documents “this is what it’s gonna cost and this is what we’re gonna get for our money.”

In the recycling field, there are three areas of investigation where numbers and statistics come into use: 1) measuring programs and their success in diverting materials from the solid waste stream; 2) measuring the factors that modify programs to improve their success, and 3) measuring the money earned and expended. While in some ways I can only scratch the surface on these topics, a little insight should be better than none at all. Little of what I say is about the numbers themselves but mostly about how we get into problems with the numbers we have or try to find.

A. MEASURING GARBAGE, RECYCLING AND DISCARDS

The theory of how much garbage and recycling is going on out there is, of course, quite simple: A+B=C. First you measure what people burn or bury (A, garbage, the so-called disposal numbers), then you measure what people recycle (B, the recycling numbers, also in some circles called “diversion” numbers), and from that you calculate what people get rid of (C, what we’ve been calling “discards” although most other people call these the “waste generation” numbers). The sum total of all that we recycle (B) plus what we dispose of in landfills or incinerators (A) equals what we “discard” (C). Since, with very few exceptions, discarded materials do not get dumped in the ocean or sent to the moon, this formula is pretty dependable. As discards are more and more redirected from landfills to recycling, landfill tonnages will drop (A declines) and recycling tonnages will increase (B increases). Very straightforward. Each number can be measured independently and the equation can be checked several ways.

Unfortunately, the problem with this lovely model is, of course, that the real world is never quite so elegantly simple. Hard times emerge when you try to gather the numbers to fill in the formula; there are at least six points where things are harder than they might first appear.

1. Estimates Only: Each of the large numbers we can generate is, in fact, a hypothetical construct or simply a good estimate (“guesstimate” is a charming word). Nobody wants to spend the money to measure accurately these three big numbers, so everyone estimates what the big numbers are based on what some smaller numbers are. In going from small numbers to big numbers, lots of errors in assumptions about multipliers and modifiers can be made. These are not errors of mathematics; these are errors of arguing from the specific to the general and the assumptions that underlie that argument.
For instance, the Scrap Tire Management Council tells us that that there are 320 million scrap
tires generated each year in the USA. No one has ever actually counted all those tires; that large
number is an estimate based on lots of other numbers which are recorded: the number of new
tires sold as original equipment, the number of replacement tires sold, the number of car
wrecks, the number of whole tires imported, the number of whole scrap tires exported, and no
doubt many more. Any of these sub-numbers can be erroneous due to oversight, indifference,
false data given out, data withheld, etc. But the 320 million number is the best available number,
and there may or may not be any better (i.e. more accurate) number. Finding better numbers
than what you have may be like looking for missing children; you should never give up hope
but be realistic in your expectations.

2. Disposal: Disposal data is the most apparently reliable of the three sets from the formula but
its estimation is loaded with possible error. For instance, the City of Albany, California is a
predominantly residential city of 10,000 people just north of Berkeley; it is the northernmost
city covered by Waste Management of Alameda County. All of the garbage collected in Albany
in rear-loader trucks and in drop-boxes comes to be weighed at the transfer station in San
Leandro unmixed with any other city’s garbage so those disposal numbers are pretty accurate.
However, the front loader trucks that service Albany are likely also to pick up materials in
Berkeley and other cities as well as Albany so the amount of Albany garbage in any one load
would have to be estimated (this can be done by knowing the cubic yards of bin space picked up
in Albany vs. all other cities in each load, but it would still be an estimate).

When it comes to self-hauled materials (often ignored in early waste analysis work but not any
more), matters get more difficult. The nearest dump to Albany is in Richmond, eight miles away,
and in another county. Even if the Richmond dump accurately collected data on the origin of
self-hauled material, many Albany haulers or people who haul from Albany generators will give
false information since some landfills are restricted to people of a certain area (probably an illegal
requirement but untested in the courts) and they’re afraid they might be denied access. The
Richmond landfill does not weigh small loads of incoming material but charges people by the
yard so it doesn’t know exactly what’s coming from the people who do say they’re from
Albany (which, as we’ve just suggested, may be just a portion of the stuff actually coming from
Albany).

The nearest transfer station to Albany is in Berkeley, only a mile from Albany City Hall and
many self-haulers will go there, although it is more expensive than the Richmond dump. Like the
landfill, Berkeley Transfer Station for many years used volume, not weight, to measure small
loads and many people won’t tell where they’re from. Berkeley has a yard debris diversion
program that is entered through the same gate but charges less per cubic yard; sometimes people
go through the gate with yard debris (which is recycled/diverted) and then dump the material
with the garbage (which is landfilled) instead of in the yard debris pile and that would “mess up”
the numbers. (In the ten years since this sentence was first written, the Berkeley transfer station
staff has gotten much better at making sure people who bring in yard debris put it in the right
place.)

The intention of this long account of garbage details from Albany is to point out how difficult it
might be to get correct what we think are the easiest numbers of the three. This is not to deny
that the best thoughtful estimate may be only 2-5% off the “real” figure, but there’s always
space between the truth and the best estimate.
3. Recycling: With recycling or diversion numbers, things can get even more complicated. Say, for aluminum cans, it’s widely assumed that national data is relatively correct. Why, because almost all of the aluminum cans go back to 15 or 20 mills in this country and are bought and weighed. But, what about all the cans that end up in local smelters making swags and are not in the aluminum can loop? What about the can stock that gets messed up in the bottling plants; is that material kept separate from the other returned material for calculating diversion percentages? Will people bring aluminum cans from Mexico to get higher prices at California recycling centers where a government fee now of about $1.55 per pound is added to the buyback price? Or what about newspaper that gets recycled locally into animal bedding; that material doesn’t go through the big paper mills. So, for national figures, lots of miscounting is possible.

When it comes to local counting, it can get even worse. TRI-CED, a buyback program in Union City, California, is a major aluminum can buyer in their section of Alameda County. People from at least three other cities sell cans there; can we expect TRI-CED to keep track of how many cans come from which city? I don’t think so, and they don’t. (They may say they do, but they probably don’t; in my city the buybacks don’t even bother to ask.)

Measuring Curbside Program Participation: An area where many old-timers in recycling cut their teeth was in estimating curbside program participation. It was known from the beginning that not everybody who used the program used it every week, so various techniques were used to estimate what the overall participation rates were. For a while there was the popular “double it” multiplier (i.e., 30% of the houses had set-outs on audit day equals 60% participation rate), but when participation rates calculated in this fashion exceeded 100%, we all knew the multiplier was suspect. Auditors have written down addresses, put paint spots on the curb over a four-week test, etc.

4. Waste characterization audits: In 1996, the Alameda County Waste Management Authority and Recycling Board spent $300,000 hiring a consulting firm to collect state-of-the-art disposal data. They tabulated data at all the right places from all the right sources and on many different materials. They can tell you how many pounds of aluminum cans are in the trash of each city in the county.

But, and this is the disclaimer, “In order to complement the manual sorting of MSW, the waste composition of relatively homogeneous or bulky loads of roll-off and self-haul was estimated using a visual procedure. Subsampling and hand sorting the waste from many of these loads was not feasible because of the bulky nature of the waste.” (page 2-4). This is not to say that the WCA data is wrong; it’s just that at some point they ran out of money to count everything and had to make some guesses.

That is true now and will always be true. It’s just that some guesses are better than others, and anybody using data needs to be prepared for the proof of its limitations.

5. Discards: As to data on generating discards, this calculation involves determining the total weight of materials leaving a unit of society (household, business site, etc.), whether this material goes out for recycling or as solid waste. It’s interesting to note that except for a few experiments (the Queens College, NYC professor (Barry Commoner) who did the eastern Long Island study in the Hamptons in the late 1980s, the Dartmouth College study in the early 1990s), no one has ever tried to do this on a large, field-data first, scale. Macro generation data
has always been a construct from disposal and recycling data.

An alternative method to calculate discard data was established by Franklin Associates in Kansas that comes closest to estimating national generation data by looking at annual American finished goods production data and determining the useful life of these products and then concluding when these items would be discarded (on the reasonable assumption that not everything can be stashed in a closet forever). These projections, while very theoretical, have usually proven to be supported by the more empirical work.

2 Rate and Date Laws: Starting in 1982, the various states began adopting laws that called on the LPAs to adopt plans and programs that would reduce solid waste by a certain rate by a certain date (typically 25% by the year 1995 and 40% by the year 2000, but there’s a great variety among the states). At some point there will be a history of litigation as states try to enforce these laws against recalcitrant or underperforming LPAs, but it hasn’t happened yet. To my knowledge, with the exception of the New York City case, there is no court in the country that has either found a LPA to be out of compliance or has ordered sanctions under these laws. Nor have I even read that any state agency has filed charges against an LPA under these laws. It appears increasingly that the rate and date laws are designed to catch the public’s attention but it’s also increasingly clear that neither the states nor the public interest law firms (who may or may not have the right to file claims under the various state laws) are very interested in prosecuting these cases.

The analogy to the federal EEO contract compliance enforcement issues comes to mind here. From 1961 until 1983 (when I last tracked this issue), the Office of Federal Contracts Compliance Programs [OFCCP] had the right to suspend or disbar federal contractors who failed to meet goals and timetables for workforce integration. In fact, while several (under 30) federal contractors were debarred for lying, throwing investigators out of their office, or refusing to submit records, none were suspended or debarred for a failure simply to meet goals and timetables. There, as here, the intricacies of the factual situation and the difficulty of making a case based on statistics alone creates a very difficult factual burden for the moving party.

B. FACTORS AFFECTING RECYCLING RATES

The second major area using numbers and statistics in recycling program administration involves measuring the factors that directly affect program success. While the relationship between the inputs to and outputs of human behavior are frequently a mystery, the development of both statistics and the social sciences in the last century have given modern experts lots of ways to test and analyze why people do things, and what factors will make them do more of a certain good thing.

In mathematics this is done with variable factor analysis, which is simply adding a lot of known equations and attempting to solve for unknown factors that will apportion significance to those unknown factors. This work is really in its infancy in recycling but two recent studies will be cited here to give the reader a sense of what can be done.

1 For many years in many Maine towns most people had paid for garbage service as a flat fee included in their property tax bill. In an attempt to get people to use less garbage and more recycling services, many towns switched to pay-by-the-bag garbage service where homeowners were required to place any material to go in their home garbage collections containers in
specially-marked bags that they had purchased for a fee that included the collection service. A public policy center at the University of Maine studied some of the towns that had implemented this pay-as-you-throw system and compared those towns’ residential waste tonnages and the program management costs with towns that had continued using the conventional system. Pay-as-you-throw towns had 452 pounds of garbage per person per annum less than the flat rate towns and also had lower operating costs. Towns with mandatory recycling programs also exhibited lowered waste disposal volumes similar to the pay-as-you-throw towns, but the study did not measure the comparative cost of these two sets. [This study is entitled ESTIMATED IMPACT OF CHARGING MAINE HOUSEHOLDS BY THE BAG FOR WASTE DISPOSAL, and is available from the Margaret Chase Smith Center for Public Policy at the University of Maine, 5715 Coburn Hall, Orono, ME 04469; 207/581-1646. Summary in World Waste, April, 1996, pp.9-10.]

Lisa Skumatz, a self-employed economist whose firm, Skumatz Economic Research Associates, Inc., is based in Seattle, has for years argued the importance of pay-as-you-throw systems to raise the public’s consciousness of waste disposal and to decrease reliance on the solid waste disposal system. In July, 1996 she published NATIONWIDE DIVERSION RATE STUDY / QUANTITATIVE EFFECTS OF PROGRAM CHOICES ON RECYCLING AND GREEN WASTE DIVERSION: BEYOND CASE STUDIES. In this study she had asked a large number of communities (over 500) to complete a detailed questionnaire that would collect information both on what recycling and solid waste program options were in place and what the diversion figures were for each community. By adding up all this experience, she was able to quantify the relative significance of various factors in affecting recycling rates. Among her conclusions is the finding that diversion success is enhanced in smaller communities, in higher income communities, and where the cost of garbage service varies by the amount of material set out (so called variable rates).

Policy analysts and economists have been doing these types of studies for years in the energy field, studying especially demand-side management (DSM; how you get people to use less energy but it seems that we’re just getting going with this type of work in the recycling arena; I hope there can be more of it.

C. MAKING AND LOSING MONEY IN RECYCLING

In the seventh grade I worked on a Boy Scout merit badge that required I keep track of any money I spent for three months. It was a major challenge to my helter-skelter young existence but it began a life-long habit of keeping track of my income and expense. This nitty-gritty has always been a counterweight to the other part of me that likes to dream the big dream, think the big thought, and get myself out of any silly old bookkeeping rut.

Figuring income and expenses is a vital part of any recycling venture, for, while one of the truisms in do-good work like recycling is that you can always keep going at least until you run out of money, other, less altruistic, persons want to make money from the get-go. In some ways all budgets are simply advanced versions of how you planned to spend your allowance but with (maybe) a few wrinkles.
When I got out of seminary, budgets were the last thing on my mind but over the years (17 years doing my own books, several non-profit treasurerships, etc.) I’ve learned a little bit. The comments that follow will not guarantee your success as a recycling businessperson, or even save you from failure, but they will alert you to some of the mistakes that others who’ve gone before (my friends and myself) have wished that we could have avoided.

**New Ventures:** “Everybody wants you to succeed but not at their expense.” That truism was my biggest learning in my first couch and mattress dismantling plant; in some ways it’s a simple restatement of what I learned as a non-profit manager years before, “Just because others applaud your walking off the gang-plank doesn’t mean they’re going to follow you.” It probably takes a hundred new ideas to find one that can make money. I’ve found that most successful people have lots of things they’d love to do but don’t because they don’t know how to make money at it. Almost everybody who’s been less than IPO-successful thinks that starting a new business was too hard and if they knew then what they know now would have never started it, but they’re usually still running it. Fortunately the entrepreneurial instinct is never dead and our children or their friends will move in where we have feared to tread. “When in doubt, don’t,” my father said to me, but I often did nonetheless. Edison said, “Success is 2% inspiration and 98% perspiration,” and he was right.

The biggest problems I have seen people get into in new ventures comes from 1) overly optimistic projections about how many goodies there were in a mixed recyclables stream (one start-up owner worked from his own three year old data and failed to recognize that new immigrants in pick-up trucks were now picking up OCC free of charge in an area where before it had all gone into the trash which he had built a plant to pick through), 2) erroneous projections of how many tons per hour of material could go through the sorting operation (the designer said we could do 200 tons per shift on this conveyor; if you ran the conveyor at top speed for all eight hours you could not have gotten more than 100 tons on the belt), 3) erroneous projections of how much material could be diverted from a conveyor belt picking system (this time the designer said twelve people could pick the belt 50% clean; it never got better than 35% with 18 people), 4) far-away buyers who get gun shy when you send them highly-contaminated materials (how many times we started and stopped film plastics recycling in the late 80s because the Chinese blew hot and cold on our buyer’s materials), 5) erroneous projections about how many pick-ups a truck can make in a day (you’d think you should be able to do 16 but it never got better than 12), 6) hiring people with far fewer problem-solving skills than themselves and expecting that new person to be as productive doing a job as they themselves had been (I would find some way to complete the sale/delivery/pick-up, but my man (an excellent driver and a nice man) would often seem to get lost or confused and fail to get the job done), and 7) inadequate planning and pre-project execution. (Once our firm agreed to pick up couches and mattresses in a city where we had no pre-arranged place to leave our trucks overnight; when the program manager got frightened by police ticketing him for parking in the wrong place one night, we ended up driving back to our home base every night for ten days and paying all that extra mileage and employee time that ate up 30% of our profit.)

What I have never seen anybody dumb enough to do yet is 1) rely on somebody else’s numbers to tell them what’s in the waste stream (publicly paid-for waste characterization studies should never be relied on as your sole field data); 2) figure that price alone will get you in the market (people who bring stuff to a specific buyback center are peculiar customers; they are very
sensitive to suspected theft [i.e., you’re cheating them at the scale] but don’t seem to mind being yelled at or otherwise personally demeaned. [add others]

**Established Ventures:** Many persons new to recycling have the chance to take over or operate for owners an on-going business. Anybody with experience in retail operations can understand the basic costs (goods purchased, labor, plant and equipment), income (sale of prepared goods), and margins (what it takes to keep the owners happy). “Keep the place clean and be nice to the customers” was my best advice when I started running a center in 1983 and I haven’t heard anything any wiser in the meantime. The other wisdom I wish I had understood better was the cyclical nature of markets and how prices go up and down and you can’t do anything about it. One friend who left a college recycling program to become the assistant manager of a large buyback and baling operation realized that the reason he got the job was that nobody on the floor could write a report (injury, accidents, etc.) or make a speech (orientation, safety, visitors) except him; the workers were great at their jobs but not “manager” potential.

**Chapter fourteen: - 2nd. edition**

**DUTIES OF THE RECYCLING COORDINATOR IN A LOCAL PUBLIC AGENCY**

In the course of interviewing several hundred recycling coordinators [RC] in the last twenty years, most of them working for local public agencies [LPA], I have been able to draw up something of a job description for that person. This listing of job activities is not intended to be prescriptive, but it seems that all of these things need to get done in each local government that plays a role in recycling programs and activities; if the coordinator is not in fact responsible, then the tasks will not get done or will get done by somebody else for whom these tasks may, or may not, be in their job description.

The most important thing for the RC to recognize is that, with few exceptions, you don’t move the materials yourself, but that you move the people and the paper around the stuff. Fortunately there are enough people doing the job now so we can see what the job entails, but in the early days there was a lot of misunderstanding.

1. **Curbside Collection Contract:** Most local governments first got involved in recycling when they started a curbside collection program; a few of the more progressive communities had other programs before a curbside program, but for many LPAs, this was the first real introduction to recycling. And most cities understood fairly quickly that a certain amount of the curbside work needed to be done by the LPA, not just the hauler. Most of the LPA job descriptions for RCs in the early days stressed the curbside support work, mostly listening to citizen complaints about service and trying to straighten out misunderstandings between the various written descriptions of the program and what the hauler was actually doing.

   One of the major varieties of this part of the job is the amount of detail the boss wants on the dissatisfaction with service. If the boss is mad at the hauler, she may want a lot of detail, building a case for selecting a new hauler the next time. If the boss thinks that nothing can be done to improve service, then she may want very little data. Personally I recommend that the RC spend a lot of time out on the routes to see the difficulties that the driver faces in completing his or her route in a safe, timely, and efficient fashion. Route monitoring (or at least observing) builds a database of experience which can be invaluable at later times. The RC may also gather data and provide support to the hauler when an adverse personnel action is necessary against a driver or if the hauler submits false data on such topics as how long it takes to do a route or what tonnage comes off certain routes. As I was told early in my working career by a merchant seaman, “When the captain’s on the bridge, everybody else
does their job a little bit better.” Your eyes and ears out in the field give you first hand and highly reliable data about what’s really going on out there.

Not to belabor this point, but in 15 years I have yet to find a RC who has cross-checked the claimed tonnages coming out of a curbside program with the actual sales and shipment records of the hauler. Are they cheating or lying? By their own admission, of course not, but the LPA has no independent data that the numbers claimed match up to the amounts shipped. I think this kind of audit work is valuable and keeps everybody on their toes.

2. Boundary Role Person: Most LPAs don’t know very much about recycling and to most city managers, recycling is just another something the LPA has to do. Part of the RC’s job is to bring reliable information back to the LPA so that senior staff can make proper estimates of how the LPA’s own programs and policies need to change to keep up with the changes in the external world. Just like every army has scouts at the outlying areas to keep track of the enemy and his movements, every LPA has boundary role persons who track what’s going on outside the LPA’s own turf but which will create a need for change and response now or in the near future. The ability of the RC to provide timely and wise counsel to upper management who already have (in their own opinion) too much to think about is the beginning of building a high trust-level between the RC and her/his superiors. For the RC to keep her/his ears to the ground and eyes open to know how the regulatory world is changing is a critical function of the RC.

3. Public Education: In some LPAs where the relation between the hauler and the LPA is intense, long-standing, etc., pub ed may be done by the hauler alone, but in most LPAs, the agency itself does this work. In curbside start-ups and change-overs this has become the main role of the RC but as programs mature and the public learns what it is supposed to do, the importance of this role declines. It’s my belief that very little of what the LPA or the RC actually does changes the behaviours of the committed non-recycler but I could be wrong; too many LPAs and RCs think churning out some leaflets and brochures is the key but I’m not convinced. Having spent twelve years recruiting speakers for a conference on recycling innovations, I have had so far only one occasion where a program official (not actually an RC either) from an LPA has come forward with viable statistics that one specific pub ed program had a measurable effect on curbside participation. [Lest you wonder, when the City of Berkeley began for the second time (about 2002) its cash award of $250 to any household that had no recyclables in the trash can (city staff selected through self-nominations one household per week for inspection), the amount of tin cans in the curbside bins increased by 20%. The Berkeley curbside program is heavily scavenged each operating day but there is no cash market in the area for used tin cans so the program operator monitored tin can inflow as a way to determine the effect of the “cash-for-clean-trash” campaign. A reasonable conclusion I would think.]

My own perception is that the people who recycle think they know what they need to know and the people who don’t are interested; this makes for a difficult public education campaign. It’s like selling a product that everyone’s already made up their mind about. Whether selling the role of recycling in greenhouse gas emissions or in creating jobs or anything else will make a difference (see Chapter 6), I have no idea.

4. Education at the Schools: This area of responsibility is a very different kettle of fish from public education and is one that is now (2007) coming into its own. Early attempts to get the schools to take up a recycling curriculum were met with cries of “No, we have too much to do” and in 2003 the legislature got around to telling the schools that recycling has to get fitted into the curriculum. It’s fairly common now for RCs to have an elementary school presentation down pat and there have been some attempts to involve upper grades children in the recycling message; I was intrigued by some films made by high school students in 2006 with themselves as the stars that encouraged their peers to “toss it in the can.” Many high schools apparently have ecology clubs but not much has gotten back to me about how these clubs are involved in recycling. When the long process of developing mandated curricula is complete (the elementary one is in final rewrites), this area will get a fresh burst of light. Whether the school boards replace the LPA as the movers and shakers on this area remains to be seen.

5. Internal Waste Reduction and Recycling Programs: In addition to managing the general public’s activities in recycling, the LPA is itself a procurer and discarer of materials. Some LPAs have wonderful diversion programs, others aren’t doing anything of merit. There are a hundred different things an LPA can do, from banning styrofoam in all LPA lunch rooms to bins on each desk for office paper to removing all toxic cleaners in LPA office buildings to putting only drought-resistant plants in street medians, etc. I have never seen a list of anything anyone has ever thought to do in this area; it would be very long.

6. Increasing Diversion at Commercial and Institutional Sites: While it’s generally agreed that the RC will not visit individual homes to encourage and plan for increased recycling, most LPAs have some type of program to target the commercial sector (in USA this term covers institutional, industrial and commercial ventures). Quite
often the larger generators are visited first, the RC performs a waste characterization study, and advises the account what materials can be diverted from the waste stream. My impression is that most follow-up is pretty spotty, and that very few people do this work very well. It’s certainly important but, like stopping smoking, it will ultimately be done one person, one account, at a time.

7. Implement Mandates: In the last ten years, mostly since 2000, the California legislature and some LPAs have enacted a wide variety of statutes and ordinances that require implementation.

   In the summer of 2006 the City of Oakland prohibited restaurants from using styrofoam containers for take-out or in-house use; staff will have to visit all these establishments, explain the rules, suggest alternatives, etc.

   The state collects fees on tires and motor oil; these laws require that certain things be done; should the LPA staff go out in the field and gather data on compliance?

   Under the Department of Conservation rules, the convenience zone recyclers should be open 30 hours per week with a required number of hours on weekends. How should the LPA be involved in complaints that are brought to its attention? Should they be simply passed to the DoC or should the LPA itself become involved?

   This is perhaps the most rapidly growing area of activity for the RC. This work has the capacity to absorb a lot of time and to have a very uncertain payback.

8. Regulatory Compliance: While the role of the RC under Task 7 is somewhat variable and negotiable, there are mandated reports, particularly to the CIWMB, that must be prepared. The SRRE, the annual reports, aggregating data from numerous sources, back-checking and cross-checking the data, requesting a new base year, applying adjustment factors to generation data, etc.

9. Bringing in Outside Funds: The amount of money available from the state for local programs has increased considerably in recent years. The oil and tire programs both have local grants; the Department of Conservation gives flat and variable grants to LPAs, etc.

Two final words of advice:
1. The best RCs are people who have significant small program management experience. Whether you think of yourself as a “boss” or not, you are a boss; you are the only one who really knows what the best use of your time and talent is. Some people have a knack for this, and many people don’t. I would rather take a good safety officer and ask them to be the RC than to bet on some wide-eyed, bushy-tailed environmentalist. Whatever the big picture, recycling work involves paying attention to a lot of not particularly interesting details, and a lot of people don’t do this very well.

2. As an RC, you will get a tremendous amount of information that you can use to help and hinder other people, to bless them or curse them, if you will. How you use that information is a very large part of determining your effectiveness. What I think I’ve learned in forty years of small program administration is that you need to be very thoughtful about what you tell and who you tell it to. When you withhold from larger circulation information about someone you have observed, that that person would not like to be widely known, you gain power over that person but you also have enabled him to trust you. You saved him from an embarrassing moment. How you manage all this information in the long run is the key to your effectiveness.

I’m occasionally asked what happened to the old timers in the recycling movement. Thy’ve gone off to different places. Some are top-level bureaucrats (but not many). Some drifted off to other environmental work. Some dropped out and run a store in rural Arizona or Vermont. Some went into the private sector, some as entrepreneurs, others teaching the recycling world to garbage companies, paper and metal companies, etc. Some are dead. A fair number have become consultants. There’s a lovely film called “The Recyclergy” that xxx made in 2005 that interviews on-screen some of the old-timers; I’m in the film myself.

Chapter fifteen: - 2nd edition
NICHE RECYCLING SPACES

If recycling is an equal opportunity event, then there are several types of locations where recycling programs are supposed to work but the general “rap” is that these “markets” are fraught with difficulty. My sense is that we are just now beginning to understand what makes specific programs work in these specific environments.

A. MULTI-UNIT RESIDENTIAL BUILDINGS:

In my 24 years in the recycling business and having attended many too many conferences, I have yet to hear a presentation by anyone who thinks they’re doing a good job recycling in multi-unit buildings. I remember hearing Joe Garbarino from the Marin Sanitary Service saying about 1985 that they had left multi-unit buildings out of their early curbside program because the people there just wouldn’t do it; he knew without trying. San Jose began its curbside program in 1987 in single family homes and began multi-unit building as a pilot in 1990 with full service everywhere for multi-units in 1994. Although in Marin there were subsequently enough complaints about paying for services they weren’t getting, and the general LPA policy that all housing units should be offered the service, LPAs with some reluctance got into providing recyclables collection services at multi-unit buildings but, to my knowledge, rarely feel good about it. I print below ten recent journal articles on multi-unit collections; if you read them, then we will all know that we haven’t skinned this cat yet.

That being said, we do know of a few things that are true.

1. Kitchens in multi-units are small and what might work in a single-family house won’t work there.

2. The outside containers for recyclable materials have to be as available and identifiable as the solid waste containers.

3. Somebody on-site has to care. John Wagers was a friend who owned a 36 unit apartment building in North Oakland. In your lease you agreed to abide by the building’s recycling system (which he spelled out). He then went through the trash to make sure you did what you said you’d do. 36 one bedroom units used two yards of garbage per week. It worked.

Recent Articles on Multi-Units .


First of four articles. Two Ph.D.s at the University of Arkansas speculate how the on-site manager, the owner, the residents, the LPA and the hauler could affect the discard diversion system. Just running their mind.

Before leaving this topic, it should be noted that not every LPA draws the line between single family and multi-family buildings at the same point. In Oakland, any building with six or fewer units is considered a single unit structure; in other cities it’s a different number. The distinction matters because in the garbage contract the smaller buildings are required to pay for the equivalent of single family minimum garbage service times the number of units, irrespective of the actual amount of trash generated whereas larger buildings treated as a “multi-unit” building would only be required to purchase as much garbage service as they actually need.

B. SHORT-TERM EVENTS, also known as VENUE RECYCLING: (Sporting events, street festivals, concerts, etc.)

In about 1992, the last year of the Festival at the Lake in Oakland, my friend Steven Tiffin was site manager and we worked up a little experiment where I stationed myself near some food vendors and encouraged people to bring their old plates of food to me for disposal. I got the food and rottable paper in some garbage cans and took them home for composting. There were enough street people working the event to take care of the CRV materials.

I think it was the 1996 Olympics where recycling was first tried in a short-term venue.
In 2003, the state enacted AB xxxxx, for the first time recognizing that short-term events have recycling needs. There are no goals or objectives in the law but it was a start.

The City of Toronto has for many years had a three part stainless steel container street-side with three compartments and entry portals: paper, beverage containers, and trash. I have not seen this rig in any American city. I think it’s superior to the locally-favored retrofit of litter cans with a containers small bin on top of the litter can. Not cheap, though. (Photos available on request).

In July, 2006, I had the pleasure of assisting my friend Pat Scanlon at the Lowell,[Massachusetts] Folk Festival. All of the food vendors at the festival had agreed in their contracts to keep all of their compostable materials (mostly food prep) out of the general trash. In one area with 6-8 food vendors, the volunteer collections staff gathered all of the post-consumer food service related items and brought them to a mini-MRF. There staff sorted out the beverage containers and other contaminants and pushed the all-organic residue into a rear loader truck for a trip to the compost yard. (Photos available on request.) All of the food vendor cardboard is also collected separately.

In the summer and fall of 2006, I made a tour of a number of county fairs in California as well as the State Fair and decided that: 1) a three bin collection system looked OK and could work [paper, containers, trash], 2) the receptacles for containers and papers had to be as attractive and convenient as the trash can [the proportion of beverage containers in the trash can was a direct function of how far it was from the trash can to the nearest containers’ receptacle]. If the containers’ receptacle was right next to the trash can, there were almost no containers in the trash can; if the containers’ receptacle was as little as three feet away, you began to see beverage containers in the trash can; if the containers’ receptacle was more than 15 feet away from the trash can, you would find a significant number of beverage containers in the trash can. 3) It is not necessary (as certain sales departments would claim) that the receptacles for beverage containers must be transparent or capable of being seen into. 4) The most attractive collection containers I saw were at the Greater Toronto Convention Center where they had three Slim Jim containers, placed parallel (long sides together) in a metal rack. Each Slim Jim was a different color and had a different aperture on the top: a slot for papers, a round hole for containers, and a wide rectangular opening for trash. Very clean, very tidy. 5) Trying to collect compostable debris at a street festival is very iffy; I saw it tried on several venues in the Bay Area in the summer of 2006 with a lot of disorder and not much success. 6) Particularly at street festivals, where merchants would be left with another day of inconvenience if the streets and sidewalks aren’t cleaned up, the garbage collection forces are lurking in the background, waiting for the recyclers to finish their little programs and then they sweep in like an army to get the street ready for tomorrow. 7) The San Diego County Fair at the Del Mar Fairgrounds probably has the best current (2006) program in California; in some places you’d be ashamed to call what they’re doing a program.

C. THE POORER PARTS OF TOWN:

People who cut their teeth in recycling on curbside programs forget that these materials have value and for people with more time than money, it is a worth-while venture to collect salable items and turn them into cash for food, rent, whatever. In Oakland, where I live, we have estimated that between 800 and 1500 people earn some or all of their income from selling cans, bottles, newspaper, cardboard, reusable pallets, scrap metal, and xxxx to the 15 or so buy-back businesses in Oakland. A small portion of this material is litter, most of it comes from recycling bins, garbage cans, and commercial trash. Curbside proponents complain that these “scavengers” (an historic name used by several garbage companies but apparently in disrepute now) steal from the curbside set-outs but in many cases these self-employed collectors were bringing in these materials to buyback centers long before the city had a curbside program. (In 1990 I sat on a committee in Oakland that planned the introduction of curbside to the city. We found data to show that in 1988, after the bottle bill was enacted in California and redemption centers were still paying only a penny per unit but before the curbside was started, that over $5 million of redemption money had been paid out in that one year in Oakland. The unstructured army of street-side scavengers was already at work. When curbside came in, it merely created a government-backed competition.

In September, 2005, I spent twelve days in Beijing at a conference. I was struck by the number of people out hustling materials out of trash cans; Beijing has no visible trash-sorting systems but thousands of people (in a metropolitan area of 12 million) make their money finding cans, bottles, papers, etc. in the public litter receptacles. Throughout the city, probably every 3-4 blocks, there is an open market establishment, centered around a 16-18 foot flatbed truck with a simple scale next to it. A person is operating this business and buying cans, bottles, newspaper and cardboard from the collectors. Although when you look in the street-side litter cans you see all these salvageable materials, when you go to the transfer stations (and there are mini-transfer stations in every area,
probably a service area of less than a quarter-mile square), there are no recoverable materials in the trash; what’s left is organics, and fairly clean stuff at that. The better-off collectors work with pedi-trucks (similar to a rickshaw but with a large flat table in the back or a open top steel wire box between the two rear wheels that might hold 2/3 cubic yard of materials) but most of the collectors are on foot. I was told that few older people in China have a “retirement” income and that all do what they can to help their families. I will always feel that we need more systems like this in cities like Oakland, not less.

I would be remiss to fail to note that many of the people in Oakland among the street-side scavengers do have drug and alcohol problems. But my sense has been that the physical burdens of their work burns off the booze and also keeps them in shape. When I ran a neighborhood recycling center in the middle-1980s, some of the men I now see pushing carts worked for me to earn their welfare check. Many found the dehumanizing aspects of the regulated system very unpleasant and are happy to be out from under the need to kiss up to get their $300 per month check. With street-side scavengers earning $20 to 40 per day, they’re making it and on their own terms. Not what we bourgeoisie might consider a way to live, but they do the best they can under the circumstances. I hope someday someone better equipped than myself can organize this rag-tag army into a fleet of recyclers in a city like Oakland.

A FEW WORDS ON COMMERCIAL ESTABLISHMENTS: There has been little uniformity across the country about how various non-residential properties should be classified. Some LPAs lump all non-residential properties together as “commercial,” other distinguish between industrial, commercial and institutional (which could include schools and colleges (with or without residence buildings), hospitals, government buildings (sometimes commercial, sometimes institutional). Neither the state nor the federal government has any rules here so each LPA is pretty much on its own. Someday there will be standard protocols about how to categorize the wide universe of people and institutions discarding materials, but for now we have only the various experiences of multiple analysts.

STRIP COMMERCIAL: These are your small stores, organized on commercial streets or in small shopping centers. These were the last group of generators to receive LPAs’ attention although many of them have been recycling for years. The College Avenue area of Oakland near the Rockridge BART station has over 25 bars and restaurants in a eight/tenths of a mile strip; not one of those facilities currently puts glass or OCC in the garbage and yet all of the material is collected by private collectors, not the local official waste hauler nor the residential curbside recyclables hauler. In the mid-1990s, LPAs began to look at how they could bring SourceSep recycling services to strip commercial accounts. Some pilot programs looked at separately routed collection programs but it seemed cheapest just to treat these small quantity generators as a residential account. (Do not be surprised that some small office spaces have no garbage service and either take their discards home for disposal or use a near-by street litter can [not legal but still done] for disposal.) The City of Palo Alto did some interesting work under John McCabe [now with the City of Oakland] in trying to understand how strip commercial businesses could cooperate in using a mixed recyclables bin.

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**Chapter sixteen: - 2nd edition**

**EQUIPMENT FOR MOVING MATERIALS (COLLECTING AND AGGREGATING)**

There’s no way that a few pages of prose can introduce the entire world of recycling equipment, but many newcomers to the field are at a distinct disadvantage because they know so little about the equipment used to contain, collect, and aggregate recyclables, and we should try to provide some information here. A side value to this section is also to provide safety tips to persons not normally familiar with heavy equipment.

**CONTAINMENT:** For many years, the most common containment device in recycling
programs was the single-family-home curbside bin, usually made (partly) with recycled plastic. Bins varied in size from 12 to 20 gallons and also in the amount of information printed on them and whether the information highlighted the city of the program or the waste hauler. Bins had no wheels and no lids; some had elastic cord across the corners to help hold down newspaper on a windy day. Older model programs (Santaosa, 1983; San Jose, 1986) offered three stackable bins per household but that system never attracted a wide following. Bins replaced the first generation containment devices which were usually five gallon plastic buckets or, in a few cases, burlap bags. In the early part of the 21st century the bins themselves were replaced with wheeled carts [often referred to by a brand name, Toter], usually holding all of the recyclables (excluding compostables) for collection.

In multi-unit buildings and at small commercial sites, materials are collected on-site usually in the wheeled carts which always have wheels, hinged lids and are made of molded plastic.

In large office buildings, materials are frequently collected in a steel frame cart with hard wheels and canvas sidewalls; this is called a laundry basket laundry cart and will usually hold 70 to 90 gallons of material. This type container is used mostly for white office paper and sometimes cardboard.

Where recyclable materials are picked up by a front loader truck, the materials are usually collected at the site in a front loader bin, varying in size from one to seven cubic yards. A front loader bin will have one slot on each side where the forks from the truck grasp the bin; these slots are called pockets. Although common for garbage collections, it’s very unusual to use steel bins with a loader truck for recycling.

When materials are stored in large steel boxes that are pulled onto a truck for haul-a-way, those boxes are known as drop boxes roll-off boxes (these boxes are sometimes known as roll-off containers). A steel container that is pulled up onto a truck is always a box and never a bin; bins are always emptied into the truck and left at the site. Drop boxes can be (no steel top) or closed (sliding steel panels on the top). Most roll-off boxes are side-hinged in the back so the two doors will swing open sideways; a few are top hinged to allow, when emptying, material to slide out the bottom (like a dump truck’s back gate), and some, mostly in construction materials boxes, have one large, side-hinged door.

When the generator uses a compactor to pack the material into the steel box, (common with industrial size cardboard or mixed loads), if the compactor is fixed on the ground it is called a stationary compactor.

If the compactor is a single unit with the box it stuffs, it is called a mobile compactor (mobile compactors are commonly used in garbage sites where the wasted materials are very heavy (restaurants) or potentially dangerous (hospitals). The steel box attached to the compactor is called a compactor box and usually has a solid steel roof (the only way in and out of the box is through the back).

When the generator offers containment equipment for recyclables at an individual worker’s worksite, they usually offer a small cardboard box or a plastic tray to hold office or mixed paper. Material aggregated in a work area (like the floor of an office building) will go in a steel or plastic container about the size of a 32-gallon garbage can but usually with distinguishing shapes or markings to distinguish it from the trash container.
In California, communities with yard debris collection programs have offered their residents wheeled carts for this material although many landscapers and yard clean-up staff are expected to haul off the yard debris after the job is done. For years Sacramento has told its residents simply to put the yard debris in the streets and an ingenious combination of a small loader and a specially fitted rear-loader garbage truck make the rounds and remove the material.

**COLLECTION:** The most common vehicle in recyclables collection work is the curbside truck, now usually a three axle truck that will hold up to about 28,000 pounds of material. (Federal highway rules limit a two-axle truck to a total weight of 38,000 pounds; a three axle truck can go to 51,000 pounds). Almost all curbside trucks today are equipped with a hand-activated, air-pressure, emergency parking brake used as the truck makes its 350-450 stops per day.

The industry system to classify trucks is based on gross vehicle weight (GVW) of the truck. The largest on-road truck would be Class 8 (over 33,000 pounds, usually three axle tractors, cement trucks, etc.) Class Seven vehicles are 26,001 to 33,000 and are two axle tractors and some smaller three axles, most garbage trucks, most gasoline tankers); Class Six trucks (19,501 to 26,000 pounds) would be larger stake-side and box trucks, school bus, etc. Classes Five, Four, and Three range from 10,001 to 19,000 pounds and include almost everything bigger than a pick-up truck (step-vans, smaller box trucks, etc.)

**FIRST GENERATION TRUCK:** The original curbside truck was a Class Six vehicle loaded with four or five removable bins that would be removed by forklift when the loaded truck returned to the aggregation yard. Many were converted from former beer delivery trucks. The maximum volume on these trucks was about 15 cubic yards.

**SECOND GENERATION TRUCK:** By 1987 the state-of-the-art model truck had two large hoppers mounted on a Class Seven vehicle chassis that could be emptied by hydraulic tippers on the truck; the maximum volume of these trucks was about 24 cubic yards. The driver threw materials into each bin, usually fibres in the back and containers in the front. The driver could typically get the two hoppers each about two-thirds full before further loading became difficult. After the third generation trucks were introduced, these second-generation trucks were retrofitted to add hydraulic lifters for detachable carts that let the driver load the truck hoppers up over the top; this addition allowed these trucks to service multi-unit buildings where carts contained the recyclables and also permitted the hoppers to be topped off before the truck had to return to the aggregation center. At the aggregation center the rear hopper would be emptied to the back and the front hopper to the side.

**THIRD GENERATION TRUCK:** About 1990 the LaBrie model was introduced that offered a side hopper that ran the length of the side of the truck into which the driver could tip the materials from the curbside bins and then cycle the side hopper up the side of the truck to dump over-the-top of the large hopper into the appropriate separate section within the hopper; most trucks had 32-34 cubic yards of carrying capacity. In the hopper, hanging steel panels kept each material separate inside the truck and, when the truck returned to its yard and dumped its load, each panel was released after the loads further back had been dropped into the right piles. For multi-units service, various rigs were attached to the side rack to allow carts to be attached and lifted up for emptying into the side hopper.
FOURTH GENERATION TRUCK: The commonly seen truck of the fourth generation is the modern, wheeled-cart emptying side loader, some are known as automatic (driver never leaves the cab); others are semi-automatic (the driver leaves the cab, walks to the cart, rolls the cart to the truck-side, and pushed a button which cycles the grabber to go around the cart, lifting it up and then tipping it over inside the front back of the truck. The grabber returns the cart to the ground and detaches; the driver moves the cart back out of the way). One of the more innovative rigs has been a front loader truck that carries an open-top two yard bin in its forks at all times; the driver exists the cab and hooks the wheeled cart to the bin; a tipper attached to the bin flips the cart into the bin and returns the cart to the ground. The driver replaces the cart off the street and cycles the front bin up over the top bask into the holding area as needed. This modified front-loader rig offers a slightly larger holding chamber (i.e. more stuff, longer routes), but is heavier and a little harder to manage. (Front-loader trucks are distinguished by the forks that go to the front of the truck and that “spear” a front loader bin in the pockets and then lift the bin high in the air to unload the bin into the opening atop the truck. On a typical garbage collection route, a front loader truck can hold about 30 bins worth of materials. Most front-loader trucks have an internal push blade that will compact the materials inside the hopper. A front-loader truck is usually a Class Seven vehicle.) One innovative modification for front loader trucks is to divide the hopper in the truck along the long axis of the truck so that two parallel hoppers extend the length of the truck. The truck then picks up bins with partitions separating two kinds of material (fibres and containers typically) and dumps them into the divided hopper.

Safety Tip: Stand well clear of a front loader truck as it cycle up a bin. Welds give way, material comes tumbling down or is blown off the top of the truck, etc.

ROLL-OFF TRUCKS: The simplest difference between a rear and a front loader truck on the one hand and a roll-off truck (also known as a “drop box” or “box” truck) on the other, is that the roll-off truck use a winch and cable to pull the roll-off box or compactor box up onto the truck; the box rests on the back of the truck, whereas a rear or front-loader always leaves the containment bin on the ground where they found it. A recent modification to the roll-off truck is a new system that relies on a large steel hook to grab the box and pull it on the truck (winches lose power, cables break, etc.). The rails on which the roll-off box sits move from horizontal to a 60 degree incline to aid in loading a box; there is the long hydraulic cylinder that tips the rails.

Safety Tip: Stand well clear of a roll-off truck when picking up a box, dropping it or unloading the box. Cables break, winches lose power, material slides out of a box unevenly so that one side is much heavier and the box somersaults off the rails; your writer has also been hit in the head by a piece of plywood that took flight as it slid off the back of an open 30 yard box.

AGGREGATION: When material is dumped out of the collection trucks, how it is moved around depends on the nature of the material, the operating system that the aggregator chooses to work with, the equipment available to buy for the funds available to spend, etc. There is probably no ideal system, just some that work better than others. In the paper industry aggregating facilities are called “packing plants;” in the metal industry it would be called a “scrap yard.” Commonly in the recycling field these facilities are called “MRFs”, pronounced “Murfs” (standing for “materials recovery facility).

The biggest problem in these facilities is to keep the glass out of the paper products. Most often
this is accomplished by separating the areas where the two materials are handled and by using different stationary and moving equipment to handle them.

In designing aggregation facilities one needs to plan for a place to leave the newly arrived but unprocessed material, a place to sort, clean, and bundle the materials, and a place to leave the separated materials before having enough of the material to make a truckload to send on to the processor. You can almost never have too much space although unnecessary space tends to fill up like an extra closet.

Six pieces of equipment are most commonly found in an aggregation facility:

**Loaders:**

There are two types of loaders working here:

- **Tired front loader (also known as “front-end loader”):** This could best be described as a small bulldozer on wheels. It has a push blade in the front (generally flat, not very curved) for pushing materials around on the ground, with some ability to lift the blade to push materials up on top of piles of previously placed material. Front loaders are sized by the horsepower of their engines, usually 40-200 horsepower; some have gasoline, some diesel engines.

- **Bucket loader:** Another version of the front loader machine is the bucket loader; in this case the plow has a concave face that can hold and lift 1-5 cubic yards of material; used mostly for loading glass, metals, and plastics. Because these machines do more lifting and less pushing, their horsepower is greater, usually 60-300; these are always diesel engines. (A skid-steerer, like a Bobcat, can be used in place of both of these machines but are not very popular in the industry.) A baler is a hollow steel box into which materials are loaded, a hydraulic cylinder (known as a “” and rated by its diameter in inches) pushes one or more steel plates (“platen”) down on the material, then steel or plastic straps are wrapped and tied around the material. The bound material is then ejected or removed from the baler and held in storage for shipment to a processing facility. All paper and plastic materials are baled before shipment. Depending on the facility and the systems they work in, tin and aluminum cans may also be baled; glass is never baled.

**Balers:** Balers come in all types and sizes. The most common baler is known as a downstroke and is the type found in grocery stores to bale cardboard boxes. A single cylinder (usually 6-8” in diameter) is mounted above the chamber and pushes the platen down into the chamber. This type baler can also be used in small recycling centers to bale newspaper, cardboard, aluminum cans, and plastic soda bottles. The next larger baler is called a horizontal baler (also known as the one-ram, often 8-10” diameter), where the material is loaded from the top, the ram pushes the platen horizontally, and the material is pushed up against the bale just previously formed. Largest of the types is a two-ram baler, where one ram (usually 10-12” in diameter) pushes the material up against a solid steel wall, then a second ram (4-6” diameter) pushes the plug of material out the side of the chamber where it is strapped automatically as it leaves the baler chamber. Two-ram balers create a more compact bale and are said to make an “export bale.”

To suggest the different capacities of these balers, it is valuable to look at the typical cardboard bale made by the three different sizes of balers: a downstroke bale of OCC is usually 60 cubic feet and weighs 400 pounds; a horizontal bale is 50 cubic feet and weighs
1100 pounds, and a two ram bale would be 75 cubic feet and weigh 1800-2100 pounds. Balers range in price from $7-8 thousand for a simple downstroke to $350,000 for a large two ram; a state-of-the art baling operation with appropriately sized conveyors can cost $600,000-$800,000 for equipment alone.

**Conveyors:** Conveyors have two major purposes in recycling facilities. One is to provide a steady stream of materials into a baler (usually horizontal or two-ram) (spoken of as an infeed conveyor or a take-away conveyor) or to spread out a large pile of material so that people working alongside the conveyor can toss off various materials at various spots on the conveyor (called a sorting conveyor). Where the conveyor can have heavy materials dropped directly on the conveyor, a steel plate conveyor may be called for; sorting conveyors are simple rubber belt conveyors like in a grocery store check-out line, only sturdier, a little wider and much longer.

**Forklift:** This machine is like a small truck; depending on the engine, it can run on gasoline, electricity or propane. It has two blades (“forks”) in the front that can lift bales and pallets; it is generally the workhorse of the finished goods area. Auxiliary parts like a snowplow blade can allow a forklift to substitute for a tired front loader but inefficiently so. Forklifts are usually rated in their lifting capacity, one speaks of a “3,000 pound forklift.” A decent used machine would be $4,000 with a first class new machine priced at $20,000. A forklift with a rotating head allows the forks to pivot on an axis to rotate bins of stored material for dumping into a baler infeed.

**Scales:** While most noticeable at a buyback center, scales are used throughout the recycling industry to weigh and thus value the materials moving from place to place. Scales in the industry generally come in three sizes.

- **Bench scales** are smaller scales, usually with a weigh pan slightly larger than one-foot square. They can be used in smaller buybacks and to weigh samples, small loads, etc. They rarely weigh loads greater than 100 pounds and can weigh by the ounce or 0.1-pound. A **platform scale** usually has a weigh pan of 4’ x 4’ and sits on or in the floor; this scale will usually weigh loads up to 3,500-5,000 pounds in one pound increments and is ideal for weighing bales, bins, etc. A **truck scale** is usually 10 feet wide and 40-70 feet long and is designed to weigh straight trucks up to tractor-trailers, up to 85,000 pounds in ten-pound increments. Some scales, particularly used in aluminum can buyback centers, operate off load cells in a hanging basket, so the employee runs all the cans up a conveyor and the cans drop into a hanging basket which has a remote read-out. After the transaction is complete, the bottom of the basket opens and the cans flow on to the next stage of processing.

**Bunkers:** We should not leave this discussion without mentioning bunkers. This is an intermediate storage area that will hold loose material before the material is baled or loaded into steel containers for shipment to market. It is an area on concrete or asphalt, surrounded on three sides by concrete block, steel or baled material walls that enable loaders to drive in and out and drop off or pick up loose material.

A person who understands all this equipment, how to maintain and repair it, is a valuable employee. Many office-bound recycling program managers fail to appreciate the skill involved in organizing and operating this equipment. There are many operational issues that continually need to be resolved in successful program operation, but to discuss them is beyond the scope of this book.
Chapter Seventeen of this book will describe more in detail the equipment used in centralized separation facilities.

Chapter seventeen: - 2nd edition
THE TECHNOLOGIES OF CENTRALIZED SEPARATION,

usually known as “residue,” have gone off to the dump. Under California law, these facilities require solid waste permits and are known colloquially as “dirty MRFs.” [pronounced “murfs”]. There are several hundred such facilities now operating in the United States and the reader may find a description of some of the operating features valuable. As I have not been close to this business since the fall of 1993, some of my information may not be current, but it’s the best I can do.

So-called waste material from a variety of sources and arriving in a variety of vehicles enters the facility and is dumped on a “tipping floor.” The floor is almost always concrete (asphalt is too light-duty), usually inside (to protect materials from wind and rain and to improve appearances), and usually too small for the volumes of material to be processed (in a typical waste service area, about 75% of all waste materials is dumped between 8 and 11 a.m., while a dirty MRF may operate 16 hours per day; short-term storage of unsorted materials is frequently underplanned for).

The material is pushed around on the tipping floor by a front loader-type vehicle and various items are removed on the floor; these items would usually be oversized items (furniture, tires, etc.), visibly-identifiable hazardous materials (cans of insecticide, etc.), and things known to jam up the machinery (this will vary from place to place; magnetically-operated apparatus works well to take tin cans out of a mixed containers pile but in a stream that includes steel strapping tape this apparatus can make a total mess as the steel tape drags all kinds of other things along with it to the magnet). The people working on the tipping floor tend to be the most energetic workers in the plant and are also alert to getting run over by the front loader. The next sorting begins with material placed on some type of a conveying system that moves the material forward into a “picking area” where the salvagable goodies are to be removed. This initial conveying phase has been done many different ways; in Marysville, CA, a two-yard bucket loader dumped loads of mixed waste materials on an elevated shaker panel that spread out the load and allowed workers to remove the “overs.” The material then falls off the shaker pan onto a lifting conveyor. In the modified Folsom, CA plant, the initial conveying is below-grade, with a three-foot wide conveyor. Some facilities use a three to six foot deep pit with a “live floor”
Once the material is on a moving conveyor, the next goal is to separate the big stuff from the small stuff. In the Oakland plant where I worked in 1989, until you removed the cardboard and the wood from the incoming loads, you couldn’t really see what else was on the belt; so that needed to be done first. “Finger screens,” as they’re called, are constantly-moving, steel “fingers” that shake and allow smaller pieces to drop through (most often cans and bottles) and hold up the larger pieces (most often wood and paper products). In the modified Folsom plant there was a shaker screen that allowed all the one-inch minus pieces to drop through and that material was removed from further processing (this was usually soils, small bits of wet foodstuffs, etc.). In Marysville the separated materials leave the finger screens and go onto two separate lines for picking.

On the picking portion of the conveyor, workers are stationed at various points along the conveyor belt and instructed to remove certain materials. They are provided with chutes next to the conveyor so they can pick a piece of material off the conveyor and move it into and down the chute where it will drop to a intermediate holding chamber down below. Chutes will typically be designated for cardboard, wood, newspaper, mixed waste paper, aluminum cans, the three different colors of glass, etc.

The largest design limitation of this type of a picking belt is that the worker can only be encouraged to remove from the belt materials for which he (or she) has a convenient drop point, and the original design usually indicates that each worker would be responsible only for one material. What usually happens in practice, however, is that the designated material for a particular work station is present either in super-abundance or not there at all and so the station-fixed worker has too much or nothing at all to do. The creative adaptation to the poor design is that workers use the walkway surrounding their work station to place smaller containment vessels (5 to 20 gallon containers) where they will place valuable items like white paper or aluminum cans no matter where those materials are found on the belt. Then, when those smaller containers are full, they will be dumped down the appropriate chute for intermediate storage.

The number of people working on the picking belt will vary by the design of the belt. At Folsom we had 18 workers, but they were inmates paid less than a dollar an hour. In Oakland, we had 12-18, depending on where management saw the break-even point. With an infinite belt and an infinite number of pickers, you could, of course, eventually pick the belt clean, but adding on more belts or more pickers becomes, at some point, cost-effective. A major management effort in operating this type of a facility is to calculate the value of adding additional picker labor costs balanced against the increased revenues and reduced residue disposal costs to be achieved through that labor.

This type of picking is called a “positive sort,” where workers are acting to remove designated materials from a conveyor belt. The other kind of sort is called a “negative sort” where the picker’s intention is to remove contaminants from a flow of materials that are going to a baler, a shredder, a composting machine, etc.

**Fixed Station Sorting:**

In the summer of 1990, while doing contract work for the City of San Jose, I saw for the first
time how a linen supply company sorted mixed materials. Workers there emptied bags of soiled linen onto fixed workstations (tables roughly three foot by five foot; there were eight separate tables in this plant). At each workstation there was one worker, sorting out all items of the same type (e.g., pink dinner napkins, yellow hand towels, 6 foot white table cloths, etc.), and placing the pile of all-one-type of material on a conveyor that ran at one end of their tables. The conveyor carried the materials thirty yards to another worker who was surrounded by seventy or eighty 150-gallon canvas bags on dollies, each holding a different item of the “to-be-washed” inventory. This “take-off” worker walks up and down alongside the conveyor, removing piles of all-one-type material and dropping those little piles into the proper “to-be-washed” bag. The large bags then hold the separated materials until the bag is full or until a whatever-they-got-sorted quantity of a particular finished good is needed for washing, drying, folding and replenishing stocks ready for shipment as finished goods.

The virtue of this arrangement is that the sorting worker works through the material at her own pace, not that of the moving conveyor, and yet the power of the conveyor is still being used to help sort the materials. Someday (he says hopefully) I will find the money to build this type of system for sorting discards.

Learning More about Centralized Separations Technology:
The best way to learn about these types of operations is to work in one or at least tour as many such facilities as possible. Facility owners vary in their pride of design or efficiency and some are more willing than others to let you in for a tour. Biocycle Resource Recycling magazines seem to have the best descriptions of sorting operations, but nothing beats hanging out in a place for a while. Most of these operations have performed well below early expectations (one facility promised 400 tons per day on a conveyor belt system that has never run more than 50 tons per shift), but, by various jack-leg engineering feats, the operations have improved over time.

Question: What are the flat-round separators, cited in BIOCYCLE, Nov. 1996, p.64.

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THE CALIFORNIA BOTTLE BILL:

There is a tendency for recycling newcomers to find the California bottle bill in its multiple
complexities rather difficult to understand but it’s really fairly simple once you get the background.

Oregon was the first state in the USA to have a modern bottle bill in 1971. For fourteen years bottle bills were introduced in to the California legislature or as an initiative (1982) but they always lost. By 1986 the good guys were ready to cut some deals to get a bill off the table and they had the experience of 7 or 8 other states where bills had been adopted but various problems emerged. Such as:

1) Bottle bills are not recycling laws, they are anti-litter laws. Under a traditional bottle bill law, yes the grocer had to take his bottles back and you had to get your money, but he didn’t have to recycle the glass or the aluminum. By the late 1980s, as recycling had grown in popularity, that was a problem.

2) Grocers were getting rich on the unredeemed deposit money. The grocer kept the nickel when you took the bottle out of the store; if you didn’t bring the bottle back, he got to keep the nickel. Since he didn’t want to take the bottles back in the first place, and was sometimes quite grumpy about it, everybody thought that seemed a little unfair.

3) Prop 13 in 1977 had limited local governments’ revenue from property taxes and the state was in a hard place for money.

4) Even after they had complied with the law in other states, the grocers still hated taking the bottles in the store

The key features of the California bottle bill solved all these problems in the following way:

1) The containers must not only be redeemed but recycled.

2) The unredeemed deposit money stays with the state.

3) The unredeemed deposit money can be used for good works, not personal profit.

4) The grocers didn’t have to take the cans and bottles in the stores.

The best way to see what we do here is with a diagram:

Insert Drawing A.

Follow the money.
Chapter nineteen: - 2nd edition

DISSING THE COMPETITION: Landfills & Incinerators

No introduction to recycling would be complete without throwing a little mud at the competition. Wiser heads than mine have done the hard work here and I would simply repeat some of the better known arguments.

INCIKERATORS:

Because there are only three solid waste incinerators in California and none within a hundred miles of where I live, I tend to know very little about them. What we do know is this:

1) Incinerators are not a “final solution” for solid waste; in exchange for reducing the volume of solid waste by 70-80%, they produce steam and electricity which is sold to local users. They also put fumes in the air through their smokestacks and can concentrate some toxins in their ash.

2) Despite federal rules attempting to define all incinerator ash as non-hazardous wastes, the Supreme Court held that all incinerator ash needs to be tested to determine if it is in fact hazardous. This requirement subjects incinerator operating costs to greatly escalated charges for ash disposal and can make what was a break-even facility now lose money.

3) At the current prices for electricity, incinerators cannot break even unless their tipping fee is at least $xx per ton. If all this money is to be raised from charges at the gate, then incinerators in the western United States will lose material to nearby, lower-priced landfills.

4) Waste incinerators rarely operate at the projected operating levels of efficiency. Either the burned materials do not create electricity as efficiently as intended or there is less waste being delivered to the plant than projected.

5) There is a continuing controversy about the pollutants carried in incinerator smoke. A Massachusetts study indicated that half of the mercury (a very toxic metal) in the state’s waterways came from incinerator smoke settling into the water.

6) The incomplete combustion of chlorine-rich materials creates dioxins and furans in the smokestack which settle out of the smoke and onto the land; these are major carcinogens.
7) A Chicago schoolboy tested the soil downwind from an incinerator and found lead levels in soil higher than upwind from the incinerator; good science by a young person.

8) EPA air emission limits for stationary sources can be met only by restricting volume of materials burned, reducing operating margins.

The result of all this negative press is that there have been no new incinerators built in the United States in five years and there are none foreseen in the near future. Much of the negative press on incinerators is reported in Paul and xxx Connett’s WASTE NOT newsletter, available at xxxxx, Plattsburgh, NY 11xxx.

**LANDFILLS:**

The modern sanitary landfill is a creation of fifty years of engineering experience designing better systems to enclose and contain unwanted and decaying so-called waste materials. Spurred on by some small disasters in the late 1960s and early 1970s where landfills leaked sour liquids into nearby groundwater and caused people’s well water to be so contaminated that it smelled or caught fire and where landfills leaked methane gas to blow up in the basements of neighboring homes, the modern regulated landfill (the so-called Subtitle D landfill) is an engineering marvel that is designed to 1) leak no gas or leachate into the surrounding groundwater, 2) allow no methane (a major greenhouse gas) to escape into the atmosphere, and 3) manage all surface litter to end windswept trash.

In the 1984 amendments to the Resource Conservation and Recovery Act, s. 4010 directed EPA to issue MSW landfill regulations; these became 42 CFR Part 258, known as Subtitle D, effective October 9, 1993.

Because the modern landfill is so much better than an old-style landfill, and because recent public policy has been relatively effective in keeping hazardous materials out of Class C sanitary landfills, it’s hard to get much interest in the current system’s shortcomings. A few examples might suffice:

1) For years there have been requirements that monitoring wells should be drilled around the perimeter of a landfill to monitor drifting leachate. When the impermeable membrane concept was added to the bottom of the modern sanitary landfill, it meant that leachate plumes could leave the landfill site in a much more narrowly directed outflow. But the space between test wells was not changed and leaks would now be more likely to go undetected. (G. Fred Lee is the source for this point.)

2) Methane recovery systems are notoriously inefficient and will capture only 25-60% of the methane generated in a landfill. If greenwaste is used as alternative daily cover, each ton of green waste rotting in an anaerobic landfill will create 70 pounds of methane, only 25-60% of which will be combusted.

So, for all these reasons, we think that recycling is the better disposal method than incinerators or landfills. Our goal is to leave what we found in the ground, but once you take it out of the ground, keep it in the loop as long as possible.
Chapter twenty: - 2nd edition
LOOKING INTO THE FUTURE: ENDING GARBAGE AS WE KNOW IT

When true-blue recyclers get together, one of their favorite topics is how to get rid of garbage service. What we’ve all learned is that the cost of recycling is the major impediment to further program advances and if we could get our hands on the garbage trucking money (roughly 80% of all garbage fees pay for the cost of containing and collecting the garbage and delivering it to a disposal site; less than 20% of the cost of garbage is paid to disposal site operators), then we could do a lot more recycling.

The major attempt to make that concept practical today is in determining how household discards should be sorted to maximize diversion and to minimize expense. Various models have been suggested; the most popular seems to be a three-bin truck with separate containment areas for 1) wet garbage, 2) dry materials, and 3) yard debris. The truck would collect everything in one drive-by and then compost both organics and pick through the dry materials for recyclables. Others have suggested a two bin truck: one for “wet” materials (food wastes and yard debris together with soiled paper, etc.) and one for “dry” (typically packaging and odd lots).

To date there have been only a few large-scale experiments with these systems (the Canadian experiments are best known) but there continues growing interest in this issue.

APPENDICES

A. Abbreviations, Acronyms, etc.
CFR - Code of Federal Regulations
CIWMA – the California Integrated Waste Management Act of 1989, as amended, found at Public Resources Code, s. 41000 and following.
CIWMB: the California Integrated Waste Management Agency which enforce the CIWMA.
ITR - Introduction to Recycling (this book)
LPA - local public agency: this is a term that would cover a county, a city, a special district, or some other government entity. The CIWMA applies to LPAs with garbage franchising
APPENDIX B. Words and Phrases:

Every day, each one of us spends a certain amount of time making decisions about what should be done with things. What to eat, what to wear, whether to open or close the window, etc. Most of the decisions are made so repeatedly and most often so effortlessly that they occupy little of our serious attention.

The overall purpose of this book to examine in detail how, when we decide to get rid of things, we can keep those materials in circulation and not “ruin” or “destroy” them. To talk about the environmentally sound way to get rid of things involves in many cases learning a new language, or at least looking at the words we use to describe our acts in a fresh way, and this first chapter tries to do that.

1 THE ACT OF DISCARDING OR DISPOSING: A basic concept here is that at some time in our life we will get rid of every thing we have. If we think it has value, we may sell it or give it to our children or to someone less fortunate for their use. If we think it has no value, we may let it pile up in a closet or a back yard or pay someone to take it away. There seems to be no single term for this act: it can be the verb “to dispose” or “to discard.” The important point is to recognize the intention of the property owner to get rid of it; we are not storing, saving, putting away, or in any way holding onto this thing; we are getting rid of it.

2 NAMING THE STUFF WE GET RID OF: For a little more than a generation now, these things we have been getting rid of have been called “wastes.” Since “to waste” is really a verb and the term “wastes” used as a noun is a fairly recent invention, we need to explore the background of this term.

Throughout the nineteenth and early 20th centuries in America, a variety of terms were used to describe materials that people 1) no longer wanted to own, 2) were unable or unwilling to sell or give away to willing takers, and 3) felt would become a nuisance if not removed from their properties promptly. In most cases people were prepared to pay for this material’s removal. Terms such as “garbage,” “trash,” “wet garbage,” “rubbish,” “junk,” and “refuse” were common in everyday discussions and appeared in various municipal ordinances to describe this material.

Most often these terms were used with some blurred lines of distinction and have never been used with truly precise definition. The term “trash” is almost always applied to unwanted...
materials that will not start to decay unless wetted down and is used to refer to the least putrefying material, with “garbage” being “wetter” (or more full of putrescent materials) with “wet garbage” being the most moist and the most likely to start rotting on its own. The term “rubbish” is sometimes thought to be restricted to construction and demolition materials but that is uncertain; it’s great fun to ask someone to explain the difference between “trash” and “rubbish.” The term “junk” frequently connotes merely disorderly piles of zero value materials, with no suggestion of putrescence, etc. The term “refuse” appears to be nothing more than an early umbrella term, very much like the more recently introduced term “solid waste.”

The development of big, broad terms to replace long lists of particular ones would not be unique to our field. In the equal employment field, at one point when the list of what were impermissible bases of discrimination got lengthy and included race, color, ancestry, religion, national origin, plus later sex, physical disability, mental disability, age, etc., the short-hand term “affected classes” was introduced to cover all those items without plowing through the list every time they needed to be mentioned. In the same way, I believe, the term “solid waste” was invented in the late 1950s and early 1960s to replace the use of all of these diverse garbage-refuse-trash-wet garbage-junk-rubbish terms listed above. At some point in the 1960s the distinction between hazardous wastes and solid waste became important and there might be an argument that the term “solid waste” gained currency initially as a clarification of what is a non-hazardous waste.

The term “solid waste” gained great currency after the 1965 federal law on “solid waste” and now has such general acceptance that it is almost universally used. But, and this is my point here, the term doesn’t really mean anything; it’s a catch-all phrase that covers over a lot of dissimilarities between unwanted materials.

3. A MODEST SUGGESTION FOR RENAMING UNWANTED MATERIALS: The language I like to use is that we speak of the things we get rid of as “discards;” in some ways this is as unfortunate a term as “wastes” since it is a new noun derived from a verb and is of recent origin. But it tries to say that, from our human perspective, there are things that we want to get rid of (i.e., “discards”); whether or not they become wastes will depend on what we (both as persons and as a society) do with them, not with whether we get rid of them. A discard may be either recycled and kept in the materials conservation loop, or “wasted” and disposed of in a landfill or incinerator.

This analysis is indebted to the work of Dan Knapp and Mary Lou Van Deventer in their TOTAL RECYCLING study but makes some changes in their preferred language. A brief statement of their language is found in....

2 A DIFFERENT UNDERSTANDING OF RECYCLING: As recycling has developed in the last twenty-five years, it was first looked at as something you did with so-called solid waste rather than bury the material in landfills or burn it in incinerators; see in general the 1972 California Solid Waste Management Act and subsequent early amendments. In an era when garbage incinerators were marketed as the technology to reduce America’s slowly growing concern with the increasing volumes of “solid waste,” recycling as a technology was still considered very experimental. There had been markets for used metal and used paper for years, but very few people had the vision of a sustainable society where everything that humans made would be remade into something else that was useful and that didn’t need to be thought of as a “waste.” There had been a few experiments where large numbers of the public had separated their “wastes” (steel food can salvage programs during World War II were an early model), but
there was no confidence that it could be done on a large scale, so it was somewhat natural to think that recycling was something that people did with “wastes”.

One of the few detailed treatments available of the solid waste definitional problem is found in J.T. Smith II’s “The Solid Waste Definitional Dilemma,” 9 Natural Resources and Environment (Fall, 1994), 3-5, 41. He wrestles mostly with federal questions of when a solid waste is a recyclable and uses terms like “secondary,” “post-consumer,” and “spent” but has no answers.

In recent years (roughly 1987 and after), recycling has more often been looked at as an alternative method of handling discarded materials so that they do not become solid waste. (I have argued this point elsewhere in an analysis of the changes in how the term “recycling” was defined during the 1989 amendments to the California solid waste law; see Appendix A.) This issue is important for recyclers because if garbage haulers own the solid waste, as is so often established in municipal ordinances, then they would also own the recyclables, see Chapter Seven below.

The relationship between recyclables and so-called solid waste can also be illuminated by reference to the developing terminology for an automobile. Cars were originally called “horseless carriages” because the most significant difference between an early car and a horse-drawn carriage was that the former didn’t get pulled by a horse. In the same way, recycled materials were early on seen as “unwasted wastes.” But in the same way that people became comfortable with a self-propelled vehicle and could call it something else (“auto-mobile” or “motor car” were, I think, the early popular phrases), so recyclable materials need no longer be defined by their relationship with so-called wastes and can now rather be understood as materials moving in the materials conservation loop.

This willingness to look at recyclables as something other than wastes has been furthered by the actual growth of recycling activities and the gradually developing norm that if humans make something, then they should be able to unmake and recycle it. As the pendulum has shifted towards more and more recycling, there has been a major shift in how people talk about recycling. In the old days, recycling was a few things that we kept out of the solid waste; increasingly people are seeing so-called “solid waste” as the few things people didn’t want to or don’t know how to recycle. This is a sea change of public perception and opinion and, of course, is not completely accepted yet, but all the trends are in this direction.

I would liken this change in perception to the changes we have seen in talking about death and disease in the last century. In the nineteenth century, people died of what were called, for lack of a better term, “natural causes,” meaning usually that they were old enough to die and nobody really cared to find out why they died. When I ask people what’s in a garbage can, they usually say “garbage” but until it went into the can, it was a banana peel, a piece of paper, a gum wrapper, etc. I believe the term “garbage” is used in the same way the 19th century used the term “natural causes,” it’s some sort of a generic term that covers a lot of particulars that nobody really cares about. In the same way that today we get very specific about how people die, I believe we will become increasingly specific about what it is that we throw away, and “curing” that material, finding another home for it other than a landfill, is the next step.

Just as anatomy is the first class in medical school, studying discards in detail is the first class for a recycler.
It would be wrong to leave this discussion of the “solid waste” term without repeating the old saw, “there are no solid wastes, only wasted solids.” or, elsewhere, “wasting is a verb, not a noun; it’s just what people do with things they don’t want any more.”

5. A VERB FOR THE DISCARDS: When we discard discards and intend them for recycling, what is it we are doing with the materials? If you read the laws, they’re not clear on this. Dan Knapp and Mary Lou VanDeventer like the verb “dispose,” arguing that when we dispose of an estate, we are not sending it to the dump; the term “dispose” has an ancient meaning of arranging for the orderly giving away of materials.

For myself, I like the verb “set aside,” and to speak of setting aside materials for recycling. We dispose of materials as “disposed of as solid waste” or “set aside materials for recycling.” The problem with the term, of course, is that it’s new, it has no support in the law, but it does make sense, it gives weight to the generator to decide what happens to the material.

2 THE TERM “INTEGRATED WASTE MANAGEMENT” IS UNSUITABLE: It naturally follows from my problems with the term “solid waste” that the term “integrated waste management” also leads our thinking in the wrong direction. I have never seen an analysis of how the IWM term originated; my own guess is that it was invented by people who definitely liked the concept of solid waste at a time when they realized that, conceptually, they had to find a place for recycling in the panoply of things they do (mostly bury and burn). “Integrated” waste management is a polite way to open the solid waste system up to recycling without relinquishing control of it; the critical nature of this claim will be discussed below in Chapter Two.

The only arena where I am familiar with the concept of the integrated management of something being propounded is with pests (ants, roaches, bugs, lice, etc.). With integrated pest management, it’s very clear that somebody’s gonna kill a lotta bugs. Integrated pest management was a bug-killing strategy that relied on more than chemicals to do the job (sterile males and predatory insects were two common alternative strategies), but there’s nothing in IPM that says any bug will live again to fight another day. By analogy, “integrated waste management” is gonna get rid of a lot of wastes, it just has some more strategies than landfills and incinerators.

A later attempt to make IWM even more recycling-friendly was the introduction of the term “the integrated waste management hierarchy.” As commonly understood in our time, there are five things to do with “wastes:” source reduction, recycling, composting, landfilling and incineration. By saying that some things-to-do are better than others, (the first items listed are given preference), there is a hierarchy of activities. To me, even the hierarchy is a compromise with the devil because it 1) values landfilling and incineration as an option for some materials, and 2) still sees recyclables as wastes. To understand how these terms became popular in our time requires some careful historical work, far beyond the scope of this modest book.

The core concept of this book, the concept of “zero waste” or “total recycling,” is antithetical to the concept of IWM and must always be understood as such. In our mind a person has only one of three realistic choices in the management of discarded materials: bury it, burn it, or recycle (in the largest meaning of the word) it. There can be no peace between these destinations: it’s like Kauai and Maui competing as the destination of your one-week Hawaiian holiday. One wag suggested that “integrated waste management” is like filter-tip cigarettes, a concept which recognizes the evil of smoking but tries to make a halfway truce with an
untenable foe. Or as another person said, “I don’t want to integrate waste; I want to end it.”

SOME THOUGHTS ON MATERIALS

In the beginning there was stuff. Particles, atoms, molecules. Elements, compounds and mixtures. These things came together and formed our planet earth. It was rock and water, and there was no life, and there were no wastes.

Eventually there was life on earth, and creatures were born, took in stuff (water, carbon dioxide, oxygen, simple sugars, etc.; we call it eating), grew, and died. There was a cycle, of birth, living, dying and decay. This went on for millions of years, and there was waste, but there was also a stasis - a balance. Things built up and things broke down; the “Lion King” movie called this the circle of life.

We have been taught to believe that the earth is a closed system; while we receive radiant energy from the sun, we receive no new atoms or molecules. (The recent theory that our oceans come from centuries of melting comets would challenge this closed system theory in a very interesting way.)

To reach the balance and to continue the life cycle on the earth requires that three basic cycles be maintained: the oxygen-carbon dioxide cycle (plants give off oxygen; animals give off carbon dioxide); the water cycle (evaporation, transport, condensation, water running through the earth to the sea), and the materials cycle (birth, growth, death, and decay).

American children know the first two cycles by second grade; the third cycle doesn’t get as much attention or interest - is this a cause or effect of our problem with materials?

It’s difficult to write about how simple plants and animals affect stuff; if we were to remove all traces of human impact on this planet, we would still see evidence of creatures using materials and leaving behind by-products of their natural processes: clearly coral reefs are the old shells of the coral animal; birds build nests; monkeys stick straws into anthills to get the ants to climb on the straw - the monkey then pulls out the straw and has a snack of ants. Higher creatures die and leave their carcasses to decay. But all of these activities take place within the three cycles mentioned above and could presumably go on for time without end.

The recent history of the human race shows that we now live differently. While for several million years humans lived much like monkeys with no long-term impact on the planet, then, about ten thousand years ago, something started to happen to homo sapiens. As human brainpower and ingenuity has increased, so our ability to do things with stuff has increased. In the Book of Genesis, the wandering Israelites built stone towers to commemorate religious events. It’s been only a step from there to the medieval cathedral and the modern secular “skyscraper.” Humans learned to fire clay about 3000 BC and it’s a small step from there to the fifteen or so dishes per person in each American home. From 3000 BC on, humans learned to make copper, then bronze, then iron and it’s a small step from there to automobiles, airplanes, tin cans, file cabinets, etc. Glass first appears about 2500 BC and another small step to beer bottles, windowpanes, and TV picture tubes. Humans learned to fashion/shape wood with stone then metal tools and yet another small step to wood frame houses and furniture.

What many people fail to realize is that for most of recorded human history, going back as far as the ancient Near East, the materials and products that human ingenuity has extracted and created have been managed with great care. When they were broken or came to the end of their
useful life, they were recycled, taken back to the blacksmith or the glass blower to be reformed into new products, burned in the fireplace for heat, food fed to chickens and pigs, etc.

An article on recycling in the National Geographic said that you find no metal or glass in colonial American trash pits; lots of ceramics (a broken pot could not be reused), but no glass or metal.

Human beings are not by nature waste-ful. People were poor; they had very little. As late as 1940, my grandmother bought baking flour in 50 pound cloth bags; the bag had a printed pattern on the cloth and she made shirts, blouses and dresses from the material. Abraham Lincoln had no paper as a boy and scratched on a slate with a nail whose marks he could wipe off.

These examples are simply to remind the reader that human society’s concern with large quantities of unwanted stuff is a very, very modern concern. Before the Industrial Revolution, and in this country probably not until after the Civil War, was the “supply of discards” (Dan and Mary Lou’s term for what the world calls “wastes”) large enough or onerous enough to attract public attention.

There are at least five factors that have increased the supply of discards in recent years.

1. Population Explosion/ lots more people:
2. Rising Standard of Living/ more people have more money to acquire more goods:
3. Rapid Pace of Technological Change/ new products available for purchase:
4. Planned Product Obsolescence/ market economy thrives on new gimmicks:
5. Packaging/ science of marketing, shelf life, product protection, etc. :

For whatever reasons and by whatever means, the modern industrial economy has created a straight-line resource consumption model that looks like this:

(Figure One) extracted raw materials > manufacturing > assembly > wholesale > retail > consumer > discards > “wastes.”

Recyclers contrast this with a materials conservation cycle that is essentially an adaptation of the materials cycle that has been in place since the world began. This is the loop that people speak of when they speak of “closing the loop.” It looks like this:

(Figure Two)

extracted raw materials > manufacturing > assembly > wholesale > retail > consumer > discards > collection > aggregation > processing > used materials > manufacturing ...

As the next chapter of this book is an explication of this diagram, you may consult it often in the ensuing discussion.

APPENDIX C: KNOWLEDGE BASE IN RECYCLING:
Whether or not you recognize it, and whether or not you like it, if you’re reading this book, you’re an information worker. In the rapidly growing and changing field of recycling, you will constantly need to gather, process and store information. These resources should help you. Source reduction notwithstanding, get all the freebies you can (SCF = single copies free); most government documents are free.

This list was first developed about 1992 and has been modified over the years as resources change. It is probably about 85% accurate at this point and about half as long as it should be (lots of omitted items).

A. Data Bases

1. THE SOLID WASTE INFORMATION CLEARINGHOUSE (SWICH) is operated by the Solid Waste Association of North America. An on-line database of journals, reports, studies, proceedings, curricula, etc. Also an electronic bulletin board. 360-page annual catalogue is $40. Started in 1990. At 301/585-0297 or 1/800/677-9424.

B. Definitions


2. Camp Dresser McKee (CDM) has a small booklet called THE SOLID WASTE LEXICON with 450 terms defined. 29 pp. Free from corporate offices in Cambridge, Mass. Call 617/621-8181.

C. Books

1. Knapp, Daniel and VanDeventer, Mary Lou. TOTAL RECYCLING: PRACTICAL WAYS TO APPROACH THE IDEAL. Los Angeles, CA: University of California Press, forthcoming. Originally scheduled for 1989 publication, the authors continue to rework the text. It will probably be the recyclers' favorite textbook.


D. Policy Statements

1. NATIONAL POLICY ON RECYCLING (1986): Adopted by the National Recycling Coalition, this two-page document calls for changes in transportation charges and tax policy to build-up recycling. Calls for improved technology transfer, a national database, a federal policy
on environmental quality, a private sector preference, and enhanced public education about recycling.

2 RECYCLING AGENDA FOR THE 1990s (1991): Drafted first at the 1989 CRRA conference in Arcata and adopted in Sacramento in 1991, this document seeks to encourage recycling by listing all the many public policy initiatives that will move recycling forward: garbage rate changes, higher landfill fees, product disposal charges, avoided collection costs to fund recycling, marketing cooperatives, subsidies for using recovered feedstocks, procurement, improved public information, and broadening educational offerings at all levels of schooling.


E. Research Publications

[The technical literature (as distinct from popular literature) is the recycling field is very limited. Most of the writing is “do it!” literature (exhortation-type stuff) or “this is how we do it” literature with program operators proudly reporting their success. Both the physical and the social scientists have, to a large degree, neglected recycling as a field of inquiry.

1 National Solid Waste Management Association publishes occasional papers summarizing current activities in the waste field. Usually survey information.

F. Magazines:

1 RESOURCE RECYCLING. (Resource Recycling, Inc., Portland, OR; 503/227-1319) Started in 1982, this is the old, community-based, “hippie” recyclers’ magazine. Has moved uptown with the movement. Steve Apotheker’s writing is a plus and Jerry Powell as founding editor keeps going.
2 BIOCYCLE. (JG Press, Emmaus, PA) Founded about 1960 as the JOURNAL OF COMPOST SCIENCE, this magazine was transformed in the early 1980s into BIOCYCLE. Strong interest in compost and other organic issues; for a while had broader waste reduction interests but appears to be moving back to its roots.
3 WORLD WASTES (Communication Channel, Inc., Atlanta, GA; 404/955-2500) This privately-owned small magazine, once known as SOLID WASTES MANAGEMENT, is aimed at the small waste hauling firm and supported solely by advertising. Tends to reprint press releases with fairly surface treatment of issues but does have information not found elsewhere.
4 WASTE AGE (Environmental Industry Associations, Washington, D.C.; 202/244-4700) The private garbage haulers’ association, the National Solid Waste Management Association, has produced this magazine since about 1960. In 1995, NSWMA was restructured into the EIA which includes hazardous waste issues as well. About 1989 the editors realized that recycling was serious business for waste haulers and now print excellent articles. Chaz Miller does good statistical pieces.
5. MSW MANAGEMENT (Forester Communications, Santa Barbara, CA; 805/681-1300) Started in March, 1991 and aimed at the “municipal solid waste official.” About half the articles are on recycling and composting. Lorie Nevares has detailed “Washington Watch” section. John Trotti, the editor, tries to keep it interesting.

G. Newspapers (subscription fee):

1. RECYCLING TIMES (EIA, Cicero, IL) Started about 1991 by NSWMA staff to bring market prices for materials to local public and hauler staff. Broad but not deep reporting, mostly press releases. Has regional markets news on prices, demand, etc.
2. WASTE NEWS (Crain Communications, Detroit, MI; 800/678-9595) Started in 1995, this glossy weekly relies on a string of local writers and contains all the news that fits; lots of data on illegal activities getting caught, buying and selling waste companies, etc. Some, but not much, on recycling; what it has is frequently not available elsewhere.
3. REFUSE NEWS (Refuse News, San Dimas, CA). Started in 1967, this has functioned as the newspaper of the Greater Los Angeles Solid Waste Haulers’ Association. Lots of attention to GLASWMA dinners and golf tournaments but the closest thing there is to a California wastes newspaper. Monthly, $18/yr.

H. Catalogues (to be added)

I. Subscription Newsletters (to be added)

1. RESOURCE RECOVERY REPORT. (RRR, Washington, D.C.) Frank McManus started this newsletter in 1976 to report on waste-to-energy happenings. Still has that focus but much more besides. Good tone; monthly @ $250/year.
2. INTEGRATED WASTE MANAGEMENT (McGraw-Hill, Inc. This bi-weekly newsletter was formerly called WASTE-TO-ªENERGY REPORT. $695/yr.
3. SOLID WASTE REPORT. (Business Publishers, Inc., Silver Springs, Maryland.) This Washington-oriented newsletter reports recent federal happenings with lots of interest in hazardous materials issues. Not important for the recycler.
5. BOTTLE/CAN RECYCLING UPDATE (Resource Recycling, Portland, OR) Started in early 1990. Monthly @ $75/yr.
6. MUNICIPAL SOLID WASTE NEWS. (Solid Waste Association of North America [SWANA]. SWANA was known as the Government Refuse Collection and Disposal Association [GRCDA] from the 1940s until 1991. Newsletter, started in 1978, is free to members monthly. Unlike NSWMA, SWANA does not publish a glossy monthly magazine.
8. CONTAINER AND PACKAGING RECYCLING UPDATE. (Container Recycling Institute, 710 “G” Street, SE; Washington, DC 20006; 202/543-9449). CRI started pushing for a national bottle bill in 1991 and publishes this 8-12 page newsletter quarterly.

J. Free Newsletters (distributed for promotional considerations; all have information not
available any other way).

1. REUSABLE NEWS (Office of Solid Waste at US/EPA). Quarterly.
2. THE RECYCLING MAGNET (Steel Recycling Institute, Pittsburgh, PA; 800/876-7274), Quarterly.

K. Internet Sites


L. California-based Resources:

1. California Recycling Review, California Department of Conservation, Division of Recycling. Quarterly, since 1993. (8 pp./issue). SCF at 800/RECYCLE. Jim Hill is the editor. A pastiche of items related to beverage container recycling: markets, processing, etc. Generally well written and better than you would expect for a government publication.


Appendix D. How This Book Came to Be Written:

In 1972, at age 34, after a long career as a student (Yonkers, NY public schools, Princeton AB, Brown MA and a divinity degree at Union Theological Seminary, New York), a year of college teaching (Virginia Union University, 1961-62), and seven years in the Episcopal parish ministry, I found myself definitely unprepared for my new job as staff director of the State of Rhode Island’s Commission for Human Rights. This small state agency was overseen by five part-time Commissioners appointed by the Governor; two (the first females in this 25-year old agency’s history) were new appointees who pushed for my appointment because of my openness to them, my energy and my intelligence; I also had no ties to the existing but somewhat (from the ladies’ perspective) lacklustre staff.
The process of figuring out what my job really was became the most challenging assignment of my life, and it was incredibly fun. It was my first time as a supervisor and as a manager. Although I had the commissioners overseeing my work, I was left very much alone to “figure things out” and plot the agency’s direction. Today we call it small program management but then it was just trying to figure out what all the buzz words were, where to put my time, what to support, what to ignore, what to keep an eye on, what my work product should be, etc. In the course of ten years in that field I became something of a minor expert, did a lot of teaching for adults (220 days of public seminars), some writing, and, as a friend once said, made myself useful.

In 1983, at age 45, I made another career switch, this time to recycling. For six years I put my head down and ran a small donation and buyback program in north Oakland, CA (Berkeley overflow, some call it), and I might be there yet if the world (mostly newspaper prices) hadn’t changed. For five years (1989-1994) I pursued a variety of short-term (not intentionally) assignments involving mostly waste audits and proposal writing that brought home some bacon. From 1994 for a few years I undertook to become the world’s expert on home furnishings dismantling and salvage (about one percent of the so-called “waste” stream; in USA 20 million mattresses and ten million couches go to the dump needlessly every year).

At various times in my recycling career I have been struck by the similarities between recycling and equal employment opportunity. Discrimination and garbage are ways of life for many people but the “greater good” (expressed in laws and public opinion) says these activities should be curtailed or ended. My job for twenty-five years now has been to enforce the sentiment, to turn dreams of the “right thing” into practical realities. And I’ve learned some things along the way that I shared in this book.

In 1991 some friends started asking me to teach about recycling. I did some guest spots in the certificate programs at UC Berkeley and San Francisco State Extension (now both discontinued), a few lectures in the undergraduate, usually non-credit, courses (like UC Berkeley’s “The Joy of Garbage,”) and, later, co-leading the UC Berkeley Extension’s four day offering on “Principles of Integrated Waste Management” (not my choice of a title).

Since 1995 I have been teaching a course, variously 3-12 hours in length, with the same title as this little book. In mid-1997, I decided to seek a wider audience for this material and wrote down what I was teaching.

This is not a book for lay people; it has too much esoteric detail for a lay audience. It is aimed, like my course, at the newly-appointed professional or technical worker in our field, one trying to get their bearings. I would hope you’ll find this information useful. I have long believed there is nothing as practical as a good idea (Kurt’s phrase, an early student of group process) and when you’re trying to get your feet on the floor in a new field, there’s nothing like getting to listen to people who have already figured out a lot of the things you’re struggling to understand. Unfortunately, in contemporary America, these leadership people are frequently “out of reach,” usually busy with their own work, many are poor teachers, and the novice practitioner, like yourself, my presumed reader, is left to reinvent your own wheel. May this collected information shorten your time from caring about our field to being good at it. My achievement here is not in saying anything new, but in writing down what a lot of people have found out so far. I am also fearful of what my Old Testament professor said about Toynbee that every reader
found him an expert in each field but his own, but that’s the risk you take.

There are some major omissions in this book. I have a rudimentary understanding of economics, public contracts, laying out collection routes, composting, and motors and engines (these areas come most immediately to mind; I’m sure there are others that might be relevant).

It’s also true to say that no one can ever be an expert in this field because it is so vast; the saying that “the more we know, the more we know what we don’t know” is certainly true here. One of the great challenges in life is to know when you know enough to move forward and when you should stay put; unfortunately it’s more often our foolhardy or conservative personalities that tell us what to do more than our knowledge of the lay of the land and what the real opportunities are.

This book is a basic introductory text; if you’ve been in the field for a year or so, most of what I’ve written down is stuff you should have picked up along the way by now, but this should be helpful for those just starting out or interested in our field.

Finally, no introduction would be complete without acknowledging those who have gone before, my teachers: Chuck Papke (now dead) was a wonderful sharer of details, his phone numbers, and his experiences; Richard Gertman had a few good insights along the way; and Dan Knapp and Mary Lou VanDeventer, whose textbook TOTAL RECYCLING has been in final rewrites since 1989, were always gold mines of information as was Neil Seldman at ILSR. Dan Belknap didn’t know much about recycling but helped me keep my head above water in Oakland politics. Portia Sinnott was a good friend along the way. For them all, I give thanks; Chuck and Richard both should have written more, and Dan and Mary Lou should have written less and published more. I am particularly grateful to my friends ... who have read earlier versions of this material and offered valuable suggestions and corrections. At times the tone of the book is more like a transcribed lecture than a book; if that seems a little tedious to some, I apologize - I can be tedious. I have followed the current practice of calling anyone who owns materials that they wish to get rid of (either as recyclables or as so-called wastes) the generator. In some ways I am unhappy with the term but it will do for now. In speaking of local governments, I often refer to a city but could mean a county or special district (water, sewer, etc.) as well. When a whole paragraph has a double indentation, it should be treated as a footnote. I have inserted occasional signed notes where I hope that further studies can be developed.

**Appendix E: 2nd ed.**

**WEIGHTS AND MEASURES**

The newcomer to recycling programs may feel a little adrift in the large number of weight and volume figures found in the industry, but after a while it becomes comprehensible. Fortunately, America’s brief affair with metrics is mostly over so it’s simply pounds and feet that need to be mastered.

Most containers for material are rated in size by gallons or cubic yard capacity (202 gallons =
One cubic yard. Trucks are rated usually by the length of the cargo containment area (e.g., 14 foot box truck, 40 foot sea container, etc.), but curbside trucks are usually rated by their cubic yard carrying capacity (e.g., 22 yards, 28 yards, 33 yards; “cubic” is always intended but often not stated in this instance).

Landfills are rated in cubic yards (e.g., 15-20 million cubic yards total capacity would be a small landfill; 200 million cubic yards would be a very large or mega-fill), although many are described by the number of tons permitted to enter in a single day (e.g., 300 tons per day [TPD] would be a small landfill; 7,000 TPD capacity is a big one).

Large tractor-trailer combinations are limited by law to 81,000 pounds gross vehicle weight (GVW) which normally yields a payload of about 50,000 pounds or twenty-five tons. A million tons of garbage, at 25 tons per sea container, would stretch 303 miles (one million tons = 40,000 sea containers @ 40 feet each long = 303 miles of containers [no space between each box]).

Curbside programs are usually described in average tons of material collected per month (TPM) or tons per year (TPY). Most commodities are spoken of by tons (e.g., a paper plant can process 400 TPD or make 100,000 TPY of finished goods; the plastics industry usually talks in pounds (50 million pounds capacity is only 25,000 tons). A long ton is 2,240 pounds and is sometimes used in weighing metals but rarely used for anything else. A 2,000 pound ton is sometimes called a short ton but most often just a ton.

Sea containers used to come in only two sizes: 20 footer (20 feet long x 8’ high x 8’ wide) and 40 footer (40’ long x 8’ high x 8’ wide). Hi-cube containers were the first change (40’long x 9.5’ high x 8’ wide); then 45, 48 and 53 feet long and some now are 8.5 feet wide. There are now at least twelve different sizes of sea containers.

“Tare weight” (or “light weight”) refers to the unloaded weight of a truck or sea container; “loaded” or “full” is when the truck or container is loaded or full.

You’ll be a rookie until you know all of the right words, but don’t let it bother you.

APPENDIX F: TRAINING RECYCLING PROFESSIONALS:

It’s my impression that very little has been done on the issue of how do you train people to be professional recyclers. In the early 90s in California there was a great interest on the part of universities to train professional recyclers, but when the rules never developed that would require (a la hazardous waste matters) eight or 40 hours of training and required in-service training, eventually the students went away and the programs closed up.

The issue of professional certification has been raised episodically in the industry; SWANA now offers a professional certificate in recycling but I have never been impressed with the information or leadership of such certified people. They’re not worse than the rest of us, just no better. The California state recycling association is currently (2007) on a certification push but in my opinion it will go nowhere useful. It seems impossible to certify that anyone has learned anything; you can certify that they sat in class but generally certification programs are written, like much adult education, at a level that everyone can pass and few are challenged.
A few of the things I have done as exercises in my now-three day training program in recycling (average attendance 12-20) that might give you some ideas about training folks in your area.

1. I handed to each student a copy of a brochure that encouraged people to stop smoking; all students got the same brochure. I asked each student to read through the brochure and develop ideas of what he/she would put in an “anti-garbage, do-more-recycling” brochure. Students worked alone for five minutes, then discussed among themselves for ten minutes and one person presented to the entire class the best ideas of her/his small group.

2. Our association produced a film in 2004 known as “Point of Return: The Role of Oakland in the Pacific Rim” which highlights some recycling businesses in Oakland and raises questions about exporting all our scrap to Asia and finding land in Oakland (rapidly being gentrified) for “dirty” (or low margin) businesses to operate. We watch the 17 minute film, then I distribute a script of the film to each student and the assignment which is to cut three minutes from the film so that it will fit into an airtime slot. The students work in small groups and identify which portions of the film seem least important to them. Each small group presents to the larger group. As differences emerge, it becomes clear that the film has multiple messages and it’s valuable to see how different messages can all be in play.

3.

APPENDIX G: CLASSROOM TALK ON RECYCLING MATERIALS:

Back in the mid-1980s, a friend at my church, a second grade teacher in San Leandro, asked me to talk to her students about recycling. I got there a little early and walked about the room while she had them working on something else. On one wall was a crude diagram with poster paints of the water cycle: streams coming down off the mountain and flowing into the sea, evaporation taking water up from the ocean, clouds drifting over the mountains and dropping down rain. On another wall was an equally simple drawing in poster paints of the oxygen-carbon dioxide cycle: on the left was a boy and a bunny rabbit breathing out carbon dioxide and on the right was a tree (with red fruit as I remember) breathing out oxygen; the word respiration and the other big word were written in big letters. No other similar posters in the room.

When it go to be my time to go on, I asked the kids where was the materials cycle; I reminded them of the water cycle and the air cycle but asked where the solids cycle was. After a few more questions they finally got the point that I was talking about creatures, that creatures are born, they flourish, they die, they rot, and their materials come back in some other form. When 5 years old, my middle daughter exclaimed, “There could be a piece of a dinosaur right here in my leg.”

I expect if I visited that grade school today that the materials cycle would be up on the wall. Several years ago the legislature said, “Hey, this is important,” and the curriculum writers and the textbook publishers are working feverishly now to get us all ready for this.

This is the script of a talk I give about the materials cycle; its a big fluffy topic, but it is the foundation of everything that we do in recycling.

We begin with humankind itself:
Here we are, one person:

Actually there’s a lot of us, about six and a half billion at last count.

But let’s just talk about one person right now:

What do we really need:

First, we need air. How long can we live without air? (a couple of minutes)

Second, we need liquids, water, beer, soda, something. How long can we live without liquids (a couple of days)

Third, we need food. How long can we live without food. (a couple of weeks; record is 56 days [I think]).

What else do we need? Clothing, shelter.

Anything else? Some people say we need stuff. Does everybody have a pencil, or a ruler, or a stapler, Do you have paper to write on? That’s all stuff.

In fact, people today, living in our kind of world, think they need a lot of stuff.
Let’s think about Abraham Lincoln, everybody knows who he is. When was he born [1809]. When did he die [1865].

When he was a boy, did Abraham Lincoln have air, and water and food? [Answers come back yes.]

Did Abraham Lincoln have clothing? What kind of clothing did he have? [Home-spun; made at home.]

Did Abraham Lincoln have shelter? What kind of shelter did he have? [Log cabin]. Did they buy this house from somebody else? [No, they made it themselves.]


Why didn’t he have any of these things? [He was poor, he lived far out in the woods, they hadn’t been invented yet.]

As a boy, did Abraham Lincoln go to Disneyland? [No.] Why? [Because it hadn’t been built yet.]

The most amazing thing about Abraham Lincoln is that he had nothing made in a factory. Everybody know what a factory is?

This factory makes underpants. Everybody wears underpants today, right? Does anybody wear homemade underpants? Probably not, in fact we wear or eat or have almost no stuff that we make ourselves. Everything comes from a factory.

Do we go to the different factories to get what we want? [No.]
How do we get the things we want? [mail order, in the store, over the internet, etc.]

So we have stores and we have factories, what else do we have? Do things go right from the factory to the store? [No, sometimes they wait in a warehouse.]

So, what do we call all this together: factories and warehouses and stores? [It’s called the economy.]

Where do factories get the stuff that they make things out of? [fields, forests, mines, woods, etc. On top of the ground or from under the ground.]

Do you know what we call this stuff, as it occurs in nature? [Raw materials, or natural resources.]

Why will stores give us things? [Because we give them money.]

What do they do with the money? [They give it to the warehouses, and the factories and the raw materials suppliers.]

Where do we get our money? [From working in a store, or a warehouse, or a factory.]

Once we get all these things, what do we do then? [We enjoy them, we use them up.]
And then? Do you have now all of the clothes you’ve had in your whole life? Where’s the milk carton from last week; do you still have that at home?  [We get rid of things.]

This is the end of the Second Edition ____________________________