

Organics Options:

Opportunities for Local Government Reuse, Recycling, and Composting

Overview

This case study highlights the full range of options available to local governments to decrease, reuse, recycle, and compost organic materials.

Communities that have implemented only some of these programs may find that adding other organics programs could pay off large dividends quickly for greater waste diversion.

In California, the 1999 statewide waste characterization study found that 35.1 percent of the remaining waste stream being landfilled is organic material. This creates a valuable opportunity for greater waste diversion.

Program Characteristics

What Are Organic Materials?

Organic materials include yard trimmings (for example, tree trimmings and grass clippings), discarded food (and food-contaminated paper), wood debris from construction and demolition projects, stumps and large logs, gypsum wallboard, reusable lumber, rebuildable pallets, manures (horse and zoo), and crop residues. Waste prevention and reuse, recycling, and composting programs can dramatically decrease the amount of organic materials being landfilled.

In 1990, more than 90 percent of all these organic materials were disposed in landfills. Other organic materials such as biosolids also contribute to landfills, but they are not the focus of this report.

By 1995 California was diverting about 3 to 5 million tons of organic materials, but the majority of organic materials were still disposed in landfills. A significant increase in organic materials diversion is needed if the 50 percent landfill diversion mandate is to be met on a statewide basis.

In its 1997 strategic plan, the California Integrated Waste Management Board (CIWMB) identified organic materials as a key to meeting waste diversion goals of the Integrated Waste

Management Act (AB 939, Sher, Chapter 1095, Statutes of 1989 as amended [IWMA]).

Most municipalities in California have implemented some form of organics recycling programs. In fact, communities are finding that organics reuse, recycling, and composting programs are diverting from landfills as much waste as the much-heralded curbside recycling programs.

In addition, these materials are high in moisture content and contribute significantly to the generation of methane and leachate from landfills. By diverting these wastes from landfills, communities are decreasing the amount of moisture in landfills. This is critical to the optimal operation of today's landfills and to decreasing landfill impacts on global warming and climate change.

Organic Materials Reduction and Reuse

As in all aspects of solid waste and environmental management programs, the lowest cost option is conservation. Generally, 80 percent of the costs of recycling and solid waste management are in the materials collection. Programs that use materials on-site or do not produce the waste can contribute those savings directly to the household or business participating. For local government organics programs, that means promoting the following:

- Home composting.
- Grasscycling and mower programs.
- Food donations.
- Xeriscaping.

Practices that reduce the amount of green waste yield significant economic and environmental benefits. Direct savings include reduced maintenance, labor, water, and fertilizer cost, and reduced hauling and disposal fees. On-site management of yard trimmings returns valuable high-quality nutrients and organic matter to the

soil. This encourages healthier disease- and pest-resistant plants that improve appearance, prevent erosion, and increase property values.

Home Composting. Composting is a biological process by which plant and other organic materials are decomposed under controlled conditions. Bacteria, fungi, other microorganisms, and worms help break down the material. The finished product is a dark brown, decomposed form of organic matter similar to the organic matter in soil.

Many types of organic materials can be composted—grass clippings, manure, leaves, weeds, corn stalks, pine needles, sawdust, wood ashes, and many other kinds of plant refuse. Branches and twigs should be chipped before composting, or they will decompose very slowly.

Most communities in California promote home composting as part of their educational programs. Many communities provide additional incentives by providing free or discounted home composting bins to residents. San Mateo County provides subsidies to residents to purchase backyard bins and has sold more than 10,000 bins to date. Seattle has reported more than 43 percent of the public is participating in the city's home composting program after eight years of outreach efforts.

Compost bin sales are conducted as one-time events or as a routine service of the community. One-time events are often organized in a parking lot, and bins are sold from the back of a manufacturer's truck at wholesale and subsidized prices.

In Santa Cruz County, 15 percent of all households obtained home composting bins from the hauler or from parking lot sales. Discounted bins are sold to customers at cost if they also want yard trimmings collection services.

In a unique rate incentive, Santa Cruz offers residents a limited service option, which includes a 20-gallon can for weekly garbage service, three stacking bins for recyclables, and no yard trimmings collection. Free home compost bins were distributed instead of providing yard trimmings collection for these customers. Free bins included 2,100 Earth Machine backyard composters and 600 Can-O-Worms worm composters.

Santa Cruz County found that active composting households were much more likely to subscribe to the smallest level of garbage service under this rate incentive. They estimate that these active households averaged 45 pounds of yard trimmings and discarded food recycled per week, or about a ton each year.

In another innovative community program, the City of Glendale provides \$50 rebates on the purchase of home chipper/shredders, a *Consumer Reports* evaluation of reasonably priced chipper/shredders, and information on additional retailer discounts. In addition, the city purchased its own chipper/shredder and offers a free service to residents to bring yard trimmings to a city site for shredding. The shreds are then made available for residents.

Other cities have used a full-size mobile chipper (like those of tree trimming companies) to provide yard trimmings chipping services to residents at their homes. In one case, they offer the option to the resident of leaving the shredded material on the curb for the homeowner to use as mulch, or to take it away.

Grasscycling and Mower Programs. Grass clippings make up a surprisingly large portion of California's waste stream. During peak growing seasons, up to 7 percent of the waste stream is grass clippings, or several million tons each year. Grasscycling offers a simple alternative: just leave clippings on the lawn when mowing.

Grasscycling actually requires less work than raking up clippings and putting them in a bag or at the curb for pickup. Grasscycling is the natural recycling of grass; grass clippings decompose quickly and release valuable nutrients back into the soil. University studies have shown that grasscycling is not harmful to lawns when they are cared for properly. In fact, grasscycling has long been a common practice on large grass areas such as parks, golf courses, and sport fields (locations where clippings collection is not feasible).

The basics of grasscycling are:

- Water and fertilize in moderation.
- Keep mower blades sharp.

- Cut when the grass is dry.
- Cut no more than one-third of grass height at once.

The CIWMB established grasscycling demonstration sites at the State Capitol in cooperation with the building and grounds office of the Department of General Services. The grounds crew was so pleased with the resulting time and money savings that they converted their entire fleet to grasscycling mowers.

The CIWMB and local governments are partnering in many locations to promote grasscycling techniques. The CIWMB has held many workshops around the state, targeting landscapers and other professionals in the field.

In addition, some communities are now partnering with manufacturers of grasscycling mowers. Communities promote the purchase of grasscycling mowers, and the companies provide discount coupons for purchase of grasscycling mowers for the communities to distribute.

Food Donations. Donation of edible food to charities is the highest and best use of this resource. America's Second Harvest is a national network of 200 food banks that distribute donated food through 50,000 charitable agencies to hungry Americans. That network serves all 50 states and Puerto Rico. Their goal is to end hunger in America.

Last year, one billion pounds of food was distributed through the America's Second Harvest network, feeding 26 million hungry Americans. Eight million of these are children (that means one in five people in a soup kitchen line is a child).

Many communities have prepared lists of food donation opportunities in their areas or included those in general lists of recycling opportunities. In some communities, they have also assisted the food donation businesses to improve the services they offer, including purchase of necessary vehicles and equipment.

In San Francisco, the food bank collects and redistributes edible discarded produce and other food. The city helped the food bank with several grants made from 1996 to 1999. These included funds for a refrigerated truck and a partial year's salary for a driver (\$97,100 in 1996), a forklift and pallet jack (\$44,000 in 1997), a sorting conveyor

system (\$55,000 in 1998), and a refrigerated truck and pallet jack (\$62,500 in 1999).

The San Francisco Food Bank collects edible food from wholesalers at the San Francisco Produce Terminal and other wholesalers in the city. Participating businesses benefit from the program by reducing their garbage costs and claiming a tax deduction for donated food.

The food bank collects food in its original packaging, as long as it is mostly edible, and transports it in a refrigerated truck to its warehouse where volunteers separate edible food from inedible food. More than 70 percent of the produce collected is delivered directly to member organizations that feed thousands of people daily in San Francisco.

San Francisco's first Kids Cafe is a good example of America's Second Harvest programs targeted at

California Hunger Facts

- 1.3 million Californians were hungry in 1998.
- One in five children in San Francisco is at risk of going hungry.
- 70% of the 2.2 million Californians who receive food stamps are children

Source: America's Second Harvest Web site, 2000.

children in need. The San Francisco Food Bank opened a Kids Cafe in the Bayview Hunters Point Community Center, which serves a neighborhood that has one of the highest rates of childhood poverty in the city. The community center provides children with after-school programming in science and technology, art, dance, ceramics, and academic tutoring. Kids who visit the center can also sign up to be amateur chefs, helping to prepare and serve meals for other kids.

Xeriscaping. Xeriscaping is a landscape practice designed to decrease water use. Xeriscaping also can reduce the amount of waste from growing plants and the amount of time devoted to weeding, pruning, and watering landscaping. Xeriscaping also limits the need for pesticides as it encourages integrated pest management for pest control.

The key to xeriscaping is selecting what to plant. Trees and shrubs that are native to California are often drought-tolerant and slow-growing. These plants will generally produce less waste and require less water. Lists of native plants in your area can be obtained from local master gardeners or most professional nurseries.

Xeriscaping also considers the mature size of plants and ensures that the plants match the location. The use of both winter and summer perennials can give year-round color without the cost and waste of replacing annual plants. Installation of perennial ground covers that do not require replacement every year can be an attractive alternative to turf and result in a reduction of yard trimmings.

To ensure that these plants prosper, the nearby soil needs to be kept free of competing plants, which can be done with composted wood chips, pine needles, fine gravel, or other recycled materials. Mulching provides ideal moist conditions for healthy microorganism and macroorganism populations. The use of compost improves soil structure, texture, and aeration. It also improves moisture regulation and provides slow-release nutrients that feed plants on a constant basis.

Xeriscaping encourages improvements for soil, including lowering its pH. Xeriscaping also allows for shading (which reduces water needs) and planting just before or after the rainy season.

Communities could require xeriscaping to be used in new developments as conditions of local land use permits. Communities could also require xeriscaping practices to be used on all public facilities.

Residential Yard Trimmings

Residential Yard Trimmings Collection. In most communities in California, residential yard trimmings make up 15 to 30 percent of the total residential waste stream. Although some major seasonal fluctuations occur in most areas, this waste stream is produced year-round in most of California. Recognizing the significance of yard trimmings, 294 communities (56 percent of the total in the state) had implemented some type of yard trimmings recycling program. In 1994, another 28 (9 percent) had planned such programs.

Collection programs are typically provided weekly or biweekly to customers to obtain the maximum participation. Unlike curbside recycling materials, residents generate yard trimmings on a sporadic basis when they are able to tend to their gardens, lawns, and pruning. Residents who do not participate every week benefit from having more frequent service when they want it.

Residents are usually asked to set their yard trimmings out in the following containers:

- Cans
- Bags
- Rolling carts
- Unbundled, in the street

The least expensive system often uses existing garbage cans for yard trimmings collection (sometimes with a decal or a sticker to label the can provided by the community).

In Monterey Park, Calif., for example, yard trimmings must be set out in permanent containers marked with a special yard trimmings sticker or tied in bundles under 4 feet in length. Containers must be turned so stickers are visible to drivers.

Stickers can be obtained from the local waste hauler (Athens Services) or in person at city hall public counters. Yard trimmings are usually collected in the early afternoon, after the trucks have finished collecting refuse. Yard trimmings must not be contaminated with refuse or recyclables, or they are collected as trash.

Some communities allow residents to place yard trimmings at the curb in plastic or paper bags. Although plastic bags are a contaminant in processing at composting facilities, these communities have decided the convenience of this approach is worth the cost to separate the plastics. Other communities have experimented with providing biodegradable plastic or paper bags to residents. These approaches are generally more costly and have not been widely adopted.

The majority of the most successful programs are providing rolling carts or collection services unbundled on the street. Rolling carts have become more prevalent through the 1990s for the collection of yard trimmings.

Carts offer the advantage of collection with automated or semi-automated collection equipment. This decreases worker injuries and workers' compensation claims for the haulers. Carts are also attractive to residents who do not have a lot of yard trimmings weekly, because the material is easily contained and rolled to the curb.

Carts have a significant additional attraction for the future. Carts lend themselves to the addition of discarded foods and food-contaminated paper. Carts are the best of all home storage containers for these additional organics to be collected together with yard trimmings. The examples below show how this can help communities increase organics recycling.

In San Jose, unbundled yard trimmings are collected with the "claw" attachment on a loader and placed in the back of a rear-loader packer truck. A major advantage of this approach is that residents do not have to cut yard trimmings into small pieces and don't have to place yard trimmings into containers to recycle them. The results have proven very popular in San Jose, as in other communities that have used this approach.

In the City of Sacramento, the public actually voted two to one in a public referendum in the early 1990s to maintain the yard trimmings collection program there. That program operated for many years using the same collection approach as San Jose. People loved the convenience of the program for their gardening and yard work.

A typical example of yard trimmings collection programs are those provided by the City of Riverside. Unlike most communities in California, Riverside initiated its IWMA programs with its green waste collection program in 1992. The city focused on green waste first, because that was the major material identified in its waste characterization study.

Riverside shifted from twice-a-week collection of trash to once-a-week collection of trash and once-a-week collection of green waste. Green wastes are placed in a green automated collection container. The green waste is delivered and tipped at a \$20-per-ton savings when compared to trash. For the 1998-99 fiscal year, the residential green waste collectors were able to divert 42 percent of the material collected from landfills. This resulted in a savings of \$856,427 in disposal fees.

One of the early concerns about different program designs was ensuring that a quality product could be produced from yard trimmings collected broadly from residents. Experience during the 1990s has shown that all of the above collection programs have been able to produce quality compost feedstock.

The key to obtaining good feedstock is proper enforcement of good preparation requirements and monitoring of yard trimmings as they are collected on the street. In many communities, collectors leave behind improperly prepared material with a note to educate residents on proper preparation for the future.

Processing of residential yard trimmings is often done by local composting facilities or by shredding at landfill sites for alternative daily cover (ADC). Throughout the 1990s, the issue of ADC has been a concern to composters. If landfills accept yard trimmings for tipping fees that are lower than composting facilities in the area, communities are able to save money. However, by accepting yard trimmings for lower tipping fees, landfills make it much less economic for composters to operate.

The counting of ADC as "recycling" was originally adopted by the CIWMB as an interim policy to assist communities until stronger markets could be developed (for example, in the agricultural sector).

Communities could contribute to expanding markets by buying compost and mulch products and by requiring public and private developments to use those products (see "community procurement" on page 13). However, Chapter 978, Statutes of 1996 (AB 1647, Bustamonte), codified the ADC credit into law as an ongoing option for diversion credit under the IWMA.

Christmas Tree Recycling. Most communities collect Christmas trees after the holidays as part of their solid waste services. Most programs offer both curbside and drop-off locations. Drop-off locations are particularly well designed for Christmas trees, because it is often easier to drop off trees than to cut them up into smaller sizes needed to comply with yard trimmings collection programs.

Because most of these trees are uncontaminated (except those flocked or left covered with tinsel), many communities have found that they can recycle these trees into valuable compost and mulch products.

In San Diego, Christmas tree recycling has been operating since 1973, organized by I Love a Clean San Diego. Since 1982, the City of San Diego has supported the effort as well. In 2000, the city had 31 drop-off sites.

Hosts for the drop-off sites included shopping centers, parks, open spaces, vacant lots, community centers, schools, tree nurseries, and city facilities. The city also collected trees through its curbside yard trimmings recycling collection program.

More than 130,000 trees were collected from the drop-off sites and 11,000 from the curbside program, for a total of 141,800 trees. All of the trees were ground into mulch and compost at the city's Miramar "Greenery" as soon as they arrived on-site. Curbside collected trees were put through a trommel before grinding to remove contamination (this was unnecessary for trees dropped off).

The trees not only enhance the smell of the mulch, but they also slightly increase the acidity. This makes the mulch very useful to residents in the area with alkaline soils, which are commonly found in San Diego. Mulch is distributed free to residents.

The City of San Diego diverted 84 percent of all Christmas trees from landfilling, disposing only of the flocked and tinsel trees. This was determined by actual tree counts, a curbside participation study, and tonnages from the Miramar Landfill. A conversion factor of 17 pounds per tree was used to convert tonnage data to the number of trees recycled.

The operational costs incurred for this program are part of the normal yard trimmings collection budget for residents. The only additional costs incurred are in advertising, including 70,000 flyers, 700 posters, production of a movie theater slide, and new signs and banners for drop-off sites.

In addition, the program included a media kickoff event, and coordinators produced 30-second video public service announcements (PSAs) for all TV

stations in San Diego. They also provided radio interviews and radio PSAs. News releases went to church and business newsletters and to other media promoting Christmas tree recycling and how to have a no-waste holiday. Program staff operated a Christmas Tree Hotline that received 6,112 calls.

Commercial Yard Trimmings

Many developments with large landscaped areas are developing their own composting programs on-site. These include parks, golf courses, corporate campuses, colleges and universities, and large multifamily residential developments.

In areas where adequate space is available, chipping and mulching or windrow composting may be done on-site. In other areas that are more densely developed, new commercial on-site composting systems are being used (see examples below under commercial discarded food).

In many areas, independent landscapers are still responsible for maintaining the properties and collecting the yard trimmings. Landscapers take their materials to competitive composting facilities wherever they are available.

In San Jose, the Villages Golf and Country Club has been operating an outstanding yard trimmings composting program for many years. They collect grass clippings, weeds, and tree prunings from routine landscape maintenance activities. They grind these materials into particles 1 to 1½ inches in size. They compost these materials in windrows, which take 90 to 120 days for a final product. This reduces the volume of incoming materials by 65 to 70 percent.

The Villages facility uses the end product as a soil conditioner, fertilizer, and a suppressor of soil-borne diseases (by increasing the biological activity in the soil). Compost is used as a top dressing for lawns, dug into garden beds for vegetables and flowers, spread as mulch around bushes and shrubs, backfilled in planting holes, and spread between rows of plants.

Discarded Foods

Discarded food and food-contaminated paper (sometimes referred to as "soiled" paper) constitutes 10 to 15 percent of the residential waste stream of many communities. Food waste is the single largest waste stream remaining after the

community has implemented basic curbside, yard trimmings, and construction and demolition (C&D) debris recycling programs.

There is no one strategy for diverting discarded foods to beneficial uses. Food can be donated to charities, converted into animal feed, rendered into soap or other products, and composted. Clearly the donation of edible food to charities is the highest and best use of this resource. If food is disposed of as waste, it can be collected and recycled in a number of ways.

One of the major considerations at present in California is the availability of processing systems to handle different types of discarded foods. Most composting facilities that were established primarily to accept yard trimmings are not permitted or designed to accept all discarded foods. Some of those facilities may be able to accept produce wastes, but not meat and grease. Communities should contact their local enforcement agencies to identify the permit status of composting facilities in their area.

Four basic types of composting approaches are in use in California:

- Passive static pile composting.
- Turned windrow pile composting.
- In-vessel composting.
- Vermicomposting.

Static piles are suited for small operations but usually cannot accommodate meat or grease. Aerated windrows can handle meat and grease with frequent turning and careful temperature and moisture control, although this is not advisable in many circumstances. In-vessel composters are enclosed temperature- and moisture-controlled systems. They come in a variety of sizes and have some type of mechanical mixing or aerating system.

In-vessel composting can process larger quantities in a relatively small area more quickly than windrow composting and can accommodate animal products. Vermicomposting uses worms (usually red worms) to break down organic material into a higher biologically active compost (worm castings). It cannot accommodate animal products or grease.

Residential Discarded Food Collection. Much of the progress in the collection of separated discarded food has been in the Netherlands, Germany, Switzerland, and other European countries to date. In the Netherlands, virtually all municipal governments provide source-separated collection of all residential organics. Both yard and discarded foods are generally collected on at least a biweekly basis.

The European experience has been motivated, in part, by the absence of garbage disposals in most residences and by the adoption of aggressive national environmental policies.

A national environmental policy adopted in the Netherlands in 1994 requires that all municipalities collect residential organics separately. Those materials are banned from landfills. The Netherlands has also adopted a goal of achieving 75 percent waste diversion from landfills and incinerators.

In residential programs that already have a weekly yard trimmings pickup by rolling carts, adding food can increase diversion without adding significantly to costs. The key to this is whether the current composting facility can accept discarded foods. Additional start-up costs may be incurred for kitchen pails and outreach. Additional costs may be incurred for adding cart service. These may be offset by savings in collection efficiencies and avoided disposal costs.

One of the major issues for instituting discarded food collection programs is the type of storage containers to be used, both in the kitchen and outside the house. Discarded food is generally stored in the kitchen in a temporary storage container. This may be a special container provided to residents by the recycling program, a plate, a used coffee can, or a used 1-gallon plastic ice cream container with a lid that residents provide themselves.

The storage container is usually stored in a convenient place, such as a countertop, under the sink, or in the refrigerator (to reduce the generation of odors). Residents are generally asked to empty their plate or container into their yard trimmings cart and to close the lid of that cart. Residents are encouraged to empty their container in the cart frequently and then place their plate or container in their dishwasher immediately.

This keeps counters clear of food debris and smells, and it also minimizes the potential for pests.

Residents are asked to place food-contaminated paper into these same bags and place them in the yard trimmings bin as well. By combining both discarded food and contaminated paper together, the paper will absorb the moisture from the discarded food. Acceptable materials might include:

- Fruit and vegetable peelings and scraps.
- Meat and fish bones and scraps.
- Egg shells, cheese, and dairy.
- Grains or breads.
- Used paper towels, napkins, and tissues.
- All food leftovers.
- Food-contaminated cardboard packaging.

Plastic-coated or wax-coated papers or bags (for example, milk cartons, juice boxes, ice cream cartons, frozen food containers, food takeout containers, margarine, butter, or candy wrappers).

Based on programs around the world and pilots in North America, programs that collect discarded food in this way should be able to obtain a weekly setout rate of 30 to 50 percent.

Those participating will generally provide 80 percent of their discarded food and food-contaminated paper. The result of adding this material to a yard trimmings program should therefore yield diversion of another 3 to 6 percent of the total residential waste stream once the program is operating.

The City of Dixon, Calif., added discarded food (initially fruits and vegetables only) to its yard trimmings program in April 1997. The program serves 4,000 households on a weekly basis and provides a white plastic pail with handle and lid to residents on request only. These are generally given out at speaking engagements. Participants have had no problems with pests.

As noted with Riverside, Dixon had no curbside recycling when this program began. The city decided to collect yard trimmings first. Dixon was able to move forward with this innovative program due to the leadership of the B&J Landfill (a Norcal

Waste Systems company). B&J installed one of the first “Ag-Bag” in-vessel composting systems in the state as a demonstration project under the registration tier of their compost permit.

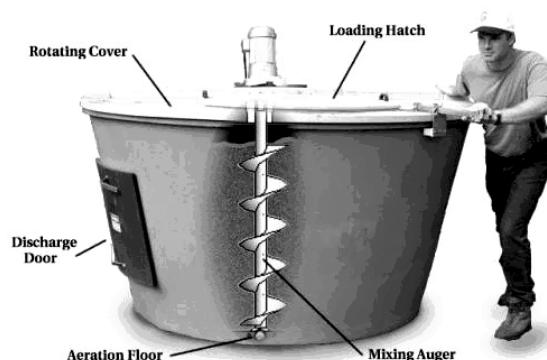
B&J applied for and received a composting permit to provide ongoing service, not only for produce, but also for all discarded foods (including meat and grease). Because of its leadership, this facility was able to expand its operations to accept discarded foods from its sister Norcal company in San Francisco. That program is described in detail in CIWMB Publication #310-02-001, “Food Waste Recovery: A Model for Local Government Recycling and Waste Reduction.”

Commercial Discarded Food Collection

On-Site Composting. During the past several years, new in-vessel and enclosed composting systems have been developed for use in many commercial applications. These systems enable businesses and institutions to compost on-site. This saves collection costs, which are typically 80 percent of the costs of solid waste management.

These systems reportedly cost between \$30 to \$50 per ton to operate, a cost that is competitive with most landfill tipping fees in California. The capital costs for these systems can be easily amortized by businesses that calculate the substantial avoided collection and disposal costs.

The Earth Tub from Green Mountain Technologies (shown below) is an example of one type of available system. The Earth Tub is a fully enclosed composting vessel featuring power mixing, compost aeration, temperature control, and biofiltration of all process air. This self-contained unit is ideal for small-scale composting at schools, universities, restaurants, hospitals and supermarkets.



The Earth Tub's capacity is about 150 pounds/day, and the auger will shred and mix a ton or more of compost in 10 to 15 minutes. During active composting, the Earth Tub should be mixed at least two times per week. The volume reduction is typically 70 percent or higher. Compost produced is often used as a thin mulch around facility grounds, or bagged and distributed to customers and employees. The compost can be cured for 20 to 40 days for further stabilization.

Maintaining aerobic conditions and controlling temperature are essential for composting and odor control. The aeration system draws air through the compost and forces the exhaust air through our biofiltration air purification system to remove odors. Liquids are collected and disposed to a sanitary sewer or holding tank.

For larger applications handling 1 to 150 tons per day of organics, Green Mountain Technologies offers its CompTainer composting vessel. Materials are loaded into a compost mixer, blended, and loaded into the CompTainer.

The CompTainer has a stainless steel aeration floor to evenly distribute pressurized air while capturing leachate. Once full, the operator closes the CompTainer, attaches the aeration lines and inserts the temperature probes.

The CompTainer regulates sterilization during 10 to 24 days of active composting. The CompTainer can be picked up by a standard rolloff truck and dumped at a product storage area or at its final application. The compost may be screened to recover bulking agent and to refine the compost product.

Although composting products are available, they are just beginning to be used in different California applications. One of the constraints appears to be the lack of technically knowledgeable people at businesses to oversee such operations.

This presents a business opportunity that may be filled in the future by service companies willing to finance, place, and maintain such units at interested companies. Communities could assist in funding the startup of such service companies or help promote the in-vessel equipment directly to appropriate businesses.

Vermicomposting. Vermicomposting refers to the controlled degradation of organic materials primarily by worms. It is the deliberate attempt to grow and maintain a large population of worms that distinguishes vermicomposting from other conventional thermophilic (heat-producing) composting. Composting worms are capable of ingesting one-fourth to two times their body weight in food each day, depending on variations in temperature, pH, and environmental conditions.

In vermicomposting, worms obtain their nutrition from microorganisms consuming decaying organic matter. As worms multiply, they can consume more material. Their population grows and stabilizes according to the availability of food.

Worm feeding also increases the surface area of the material being treated, thus increasing microbial growth. As this process continues, complex changes occur. The process eventually produces a finely structured material known as worm castings, or vermicompost. Worm castings are suitable as both a plant growth medium and an agricultural soil amendment.

Worm boxes. Worm boxes have become popular as one method for safely composting food scraps at home, schools, and offices.

Popularized by books such as *Worms Eat My Garbage* and *The Worm Book*, home vermicomposting is now practiced in more than a million homes throughout North America. Some communities subsidize the purchase of home worm bins as another option for home composting.

Worm bins come in all shapes and sizes, such as the 100 percent plastic "Worm Barn" and the wooden "Worm Cabana" available from Yelm Worms.



Worm Cabana made by Yelm Worms

Larger worm bins are now being manufactured for use in commercial and institutional settings, including cafeterias, restaurants, campuses, and nurseries.



Worm Wigwam made by Yelm Worms

The Worm Wigwam from Yelm Worms, measuring 5 by 6 feet, is a large-scale continuous-flow worm bin. It is designed to handle at least 75 pounds of food and bedding every day. Completely covered and verminproof, this system efficiently composts discarded foods and mechanically harvests worm castings.

Produce Collection. Source-separated produce from groceries and food processors is increasingly collected around California. One of the largest examples of produce collection is the system pioneered by Community Recycling and Resource Recovery.

Community Recycling serves more than 1,000 grocery stores throughout the state, including all the Safeway supermarkets. Crew members mix the discarded foods with yard trimmings at the company's composting site near Bakersfield. More details on these systems are available in CIWMB Publication #310-02-001, "[Food Waste Recovery: A Model for Local Government Recycling and Waste Reduction.](#)"

Animal Feed. Inedible food can be used directly to feed animals or blended and processed to produce animal feed. This method can produce a large amount of waste diversion in a comprehensive program. San Francisco diverts more than 21,000 tons per year from the waste stream through animal feed (including rendering).

Four rendering companies serving San Francisco collect food service grease and meat for rendering products. Dext Feed from Stockton collects discarded bread, flour, and other dried bakery products and makes animal feed products.

A dairy farmer from Sonoma County picks up the inedible or spoiled produce from the San

Francisco Food Bank free of charge. He blends the organics into his dairy and heifer feed (using up to 10 percent produce in his mix). He also sells the material to other farmers in the area. More than 400 tons per year of inedible produce has been productively used for dairy and cattle feed.

Composting Facilities

Locating and Attracting Composting Facilities.

Siting composting facilities was one of the great challenges of the past decade. Many composting facilities have been sited close to existing landfills. To attract landscapers and others with green waste to use their facilities, the composters charge a tipping fee that is less than the rate charged at the landfill.

During the past decade, some facilities have experienced problems with organics processing operations (particularly "chip and grind" facilities). These facilities operated without the proper local land use and solid waste facility permits. Some of these facilities received odor and fire complaints that eventually led to site closures, site cleanup, and remediation requirements. This demonstrates the importance to communities of working with qualified and permitted facility operators.

Many communities today solicit private composting operators via requests for proposals for composting services (which may or may not include collection of the materials). Or they may solicit indirectly through a yard trimmings recycling collection company.

Communities should be particularly concerned about the following when selecting a composting facility:

- Background and experience of the service provider.
- Technical knowledge of composting processes.
- Marketing experience in sale or use of products.
- Status of permits and enforcement track record.
- Financial capabilities to accomplish proposed activities.

In soliciting for composting facilities, communities typically request some compost

products be provided free of charge. The products are requested for community use in parks and landscaping or for public promotion of the composting and recycling program.

San Jose requested a portion of the compost for city use in experiments to document the value of compost for different purposes to help expand the marketplace.

In addition to yard trimmings, many communities are including wood wastes as part of the scope of these proposals. Other materials and services that could be included in such solicitations, depending on community needs and costs, could be:

- Wood debris from construction and demolition.
- Firewood for sale (especially from stumps and large logs, using “log splitters.”)
- Gypsum wallboard composting.
- Lumber salvaging.
- Pallet rebuilding.
- Manures (horse and zoo).

Communities could encourage composting and reuse and recycling companies to jointly supply these services. This would encourage creative partnerships, a greater diversity of services, and competitive prices.

Selling Compost Products

Markets for compost products have changed dramatically during the past decade. In 2000, the CIWMB concluded that another 9 million tons of organic materials needed to be recycled under anticipated scenarios for meeting IWMA goals. To accomplish that, new markets needed to be developed, particularly in the agricultural, landscaping, and horticultural industries.

Impacts of Electricity Deregulation. California’s composting industry was partly built in the late 1980s on facilities selling biomass fuels produced from yard and wood wastes for electricity production. Biomass plants had been built throughout the state in response to government incentives adopted in the late 1970s and early 1980s to make California less dependent on foreign oil for its energy needs.

Biomass plants in the early 1990s bought wood chips from \$20 to \$40 per bone-dry ton. This enabled many composting facilities to amortize their investments in processing equipment and to accept yard and wood wastes at low enough costs to compete with landfills in their areas.

By the mid-1990s, proposals were seriously circulating to deregulate the electricity generating industry in California. The proposals impacted the composting industry particularly hard.

The prices electric companies had paid for electricity produced from biomass-fueled generating plants were dropped dramatically. This was due to anticipation of legislation authorizing electric deregulation (Chapter 854, Statutes of 1996 [Brulte, AB 1890]). The average prices paid for biomass wood wastes dropped to \$0 to \$10 per bone-dry ton today (although some facilities may get up to \$20 per bone-dry ton for high quality material.)

As a result of this pressure, composters were forced to raise their tipping fees to obtain more revenue from the processing of materials and to diversify their markets. Although the diversification of markets proved beneficial in the long run, the higher tipping fees required for composters exacerbated the problems with ADC noted above.

Agricultural Markets. The CIWMB recognized the need to diversify composting markets in partnership with California’s agriculture industry. Since 1994, the CIWMB has been actively involved in funding demonstration projects that field-test the uses of compost and mulch in various situations.

The CIWMB has funded field projects that monitor the effects of compost on crop and soil productivity. Other CIWMB projects have examined the use of compost as a soil erosion prevention tool. In addition, the CIWMB has developed regional partnerships with various growers and communities to promote the use of compost and mulch through field days and demonstrations. Through all these efforts, compost has been shown to have a wide range of beneficial uses in both agriculture and pollution control activities.

Agricultural demonstrations have been completed in:

- Fresno County.
- Monterey Bay region.
- San Jose region.
- Stanislaus County.
- Tulare County.
- Southern California.

Compost and mulch are also currently being examined for their erosion control properties. The CIWMB contracted with the California Department of Transportation (CalTrans) to conduct research on the use of mulch to control erosion on highway rights-of-way. Vineyards also have been interested in using mulch as a cost-effective alternative to straw and cover crops for hillside erosion control.

Growing operations continue to expand onto hillsides, and many jurisdictions are beginning to require mitigation measures for such erosion control. The CIWMB has funded two hillside vineyard erosion control projects in Napa and Sonoma Counties, as well as research on the use of mulch in controlling erosion in citrus orchards in Ventura County.

Other potential markets for compost and mulch include:

- Horticulture.
- Wetland restoration.
- Bio-remediation of air and wastewater streams.
- Mine reclamation.

The CIWMB is funding two new projects with the University of California-Davis this year to explore innovative uses of compost and mulch by end users. Specifically, UC Davis will be evaluating the use of compost to control phylloxera in vineyards and the use of compost on cover crops for vegetable production.

CCQC. The California Compost Quality Council (CCQC) is a unique alliance of compost producers, scientists, farmers, landscape contractors, and recycling advocates formed to administer compost quality guidelines in

California. The CCQC operates an independent verification program through which compost producers can assure consumers that quality claims have been verified.

Compost producers who meet the criteria established by CCQC can display the CCQC registration seal (above) on their products. This is intended to provide farmers, nurseries, landscapers, groundskeepers, and others in green industries with extra confidence in the quality and consistency of the compost products they use. Reliable product information allows compost users to compare different products and determine what is best for their specific application.

Registered operations must meet several minimum requirements:

- Producers are in compliance with State composting regulations.
- Compost meets State standards in terms of pathogen reduction and trace element concentrations.
- Producers have an active quality control program.
- Producers allow CCQC inspectors on-site.

Participating CCQC compost producers must disclose information on important product and process parameters. Independent parties verify the information disclosed, including:

- Organic matter content.
- Salinity.
- Feedstock materials (including additives or amendments).
- Screen size or maximum particle size.
- Bulk density.
- Moisture content at time of transport.
- PH.

The many different parameters of a compost dictate how and where that material can best be used.

There are currently 15 facilities registered with CCQC:

- Sonoma Compost Company, Petaluma.
- Napa Garbage, Napa.

- Grover Landscape Services, Inc., Manteca.
- Cold Canyon Compost, San Luis Obispo.
- City of LA-Griffith Park, Los Angeles.
- New Era Farm Service, Visalia.
- Community Recycling and Resource Recovery, Bakersfield.
- Nortech Compost, Roseville.
- Z-Best Compost, San Jose.
- Napa Valley Farm and Garden Products, St. Helena.
- Sun-Land Garden Products, Monterey.
- Newby Island Landfill (BFI), San Jose.
- California Biomass, Thermal.
- B&J Compost Facility, Vacaville.
- Zanker Road Compost, San Jose.

In addition, CCQC has set a goal of having 20 registered producers in the near future. The existing registered facilities above represent as much as half of all compost produced in California. Annual fees for facility registration are based upon compost production.

CCQC maintains a database of compost producers (www.ccqc.org/) in the state to help interested buyers locate suppliers of quality compost. CCQC coordinates with a network of soil scientists and laboratory professionals who are able to answer technical questions regarding compost characteristics, applications, and related issues. CCQC also assists with referrals to others who use compost in particular applications.

Buying Compost Products

State and local agencies need to buy compost and mulch products to help create the new and expanded markets necessary for achieving IWMA goals. Agencies that use recycled organic materials in landscapes will also find that it enhances soil fertility and water-holding capacity, slows evaporation losses, increases plant drought tolerance, conserves water, and suppresses the spread of wild fires. Using compost and mulch products will reduce fertilizer and water usage, which in turn reduces toxic runoff that can lead to surface and groundwater pollution.

As a public service to residents, landscapers, and State and local agencies, CIWMB maintains a listing of compost and mulch producers. To be included on the list, producers must meet the following criteria:

- Products must be available in bulk and are listed only in counties where materials are produced or stored.
- All products produced must comply with the CIWMB composting facility regulations, PRC Title 14: Chapter 3.1. The regulations can be found on the CIWMB Web site at www.ciwmb.ca.gov/Regulations/Title14/1chaptoc.htm.

Mulching and vermicomposting, which are considered “excluded activities” in the composting regulations, may also be listed if they are in compliance with applicable State minimum standards. In addition, composting businesses may be listed with “permit pending” status if appropriate permitting paperwork has been submitted to local agencies and verified with the local enforcement agency by CIWMB staff.

The CIWMB is also developing the following:

- Fact sheets on how to develop specifications for compost and mulch procurement.
- Fact sheets for compost and mulch application rates for end uses in landscaping, nurseries, horticulture, and turf grass production and maintenance.
- Case studies that document successful local government and State agency compost and mulch programs.
- An updated recycled-content products database (recently completed).
- Workshops and educational materials designed to help increase the supply of quality compost in California and promote markets for compost and mulch.

Community Procurement Programs. Some communities are specifying the use of compost and mulch products in publicly funded construction and maintenance projects, including streets, highways, mass transit facilities, parks, public buildings, housing, erosion control, and environmental restoration projects.

The CIWMB is actively working to ensure that State agencies do their part to help the community in which they are located to meet its diversion mandate. Through the State Agency Buy Recycled Campaign, the CIWMB is working to increase the amount of recycled-content materials that State agencies purchase, including compost and mulch.

Permit Conditions For New Developments. One of the most powerful and familiar tools for local governments is the placing of conditions on local land use permits. Planning departments can include recycling and recycled-content requirements in conditional use permits.

In Los Angeles, approval of the Playa Vista development of 5.1 million square feet of commercial space and 13,000 residential units included special conditions for:

- Recycling C&D debris.
- Use of recycled-content products.
- Ongoing recycling programs.

More than 84,000 tons of C&D material was recycled (including 9,000 tons of green waste), recovering 92 percent of all materials generated. Many other recycling efforts are underway. Based on the success of this project, the Los Angeles City Council has passed a motion to develop similar sustainable development guidelines for all future city building projects and private sector developments.

Other communities could follow this lead. In addition to the recycling of green waste, communities could require public and private developers to use compost and mulch products as part of the conditions for approval of those projects.

In addition, communities could advocate that projects built with State and federal funding within their community use the maximum amount of recycled products, including compost and mulch. This could have a major impact in stimulating the use of locally generated compost and mulch products.

Case Study: San Jose

San Jose has been a national leader in recycling programs since the mid-1980s. Its yard trimmings recycling program began with a composting plan

in 1987 that evaluated options and made recommendations on how to proceed. The composting plan recommended implementing the type of yard trimmings collection system then used by the cities of Sacramento, Davis, and Modesto. San Jose adopted that recommendation. San Jose uses a wheel loader with a claw bucket, which grabs material left in a pile at the curb and deposits it into a rear-loader packer truck.

In evaluating its options, the 1991 San Jose source reduction and recycling element (SRRE) noted that collection of loose yard trimmings:

- Requires no debagging.
- Does not cause collection crew strain from lifting heavy objects.
- Facilitates inspection of contaminants.
- Is easy for the generator to use.
- Maximizes collection of large volumes of materials.
- Provides residents with unlimited recycling of yard trimmings.

A loose-in-the-street collection system was believed to be the quickest and most cost-effective method of pickup for an area the size of San Jose. The city felt that a containerized program slows down collection, thereby increasing the costs.

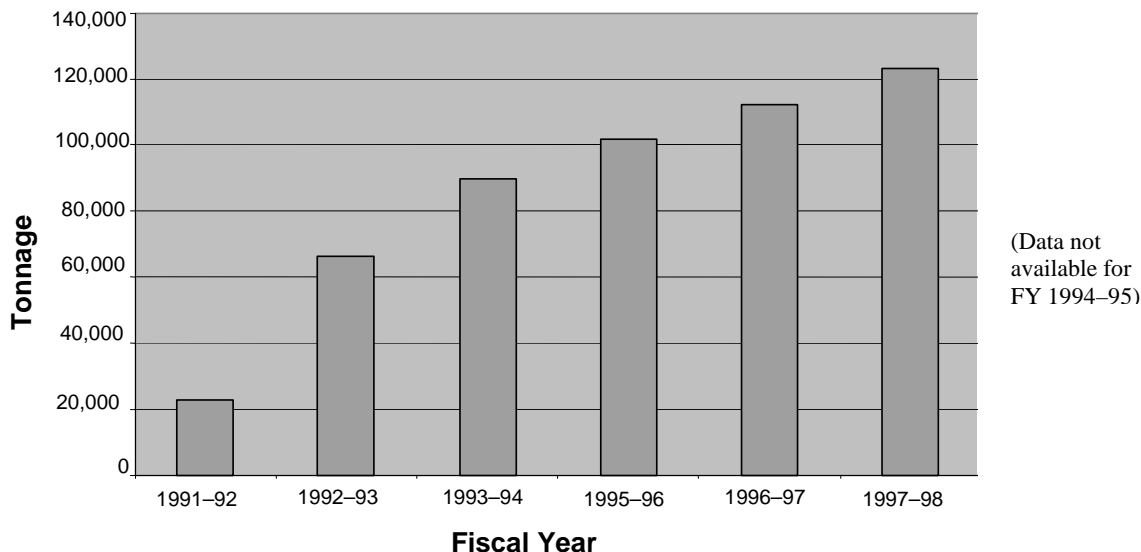
The SRRE recognized that collection of loose materials might:

- Be more labor-intensive.
- Be more costly.
- Require parking regulations.
- Result in residue left on the street.

The city concluded that the program could be designed to address most of these concerns. In particular, the city brought back monthly street sweeping service to San Jose that had been stopped in response to the passage of Proposition 13 passed in 1977.

The city decided that any residue left from the yard trimmings collection program could be easily captured in the street sweeping program. According to analysis from the city's streets and traffic department, monthly sweeping captures 90

San Jose Yard Trimmings Collected in Fiscal Years 1992–98



percent of the material that would be captured with weekly sweeping.

The SRRE noted that alternative containerized collection systems would be advantageous because no significant behavior change is required of residents, and standard existing waste collection vehicles could collect the yard trimmings.

However, the city expressed the following concerns about containerized collection systems:

- Debagging may be necessary.
- Collection crews may need to lift heavy bags or other containers.
- Use of bags or cans is difficult for prunings.
- Use of bags creates more waste.
- Potential contaminants are hidden from view, reducing the quality of the end product.

The SRRE recognized that the inclusion of discarded foods in the residential curbside collection program would require a containerized collection system. However, the city had focused on yard trimmings as its prime target for composting, so the discarded foods considerations were not a major consideration.

The SRRE indicated that co-composting of discarded foods from the commercial sector with yard trimmings would not introduce serious complications and would result in a high-quality compost.

Two of the major considerations in adopting the loose program were convenience and participation, and the market implication of its design. From its highly successful curbside experience, San Jose learned that a program more convenient to use would result in a higher participation rate.

Former Deputy Mayor Shirley Lewis often said, “Curbside made it convenient for people to do what they knew was right.” That same philosophy was applied to yard trimmings collection.

San Jose felt requiring residents to bag or place their trimmings in containers would limit the amount of yard trimmings that would be set out for recycling. The city felt that loose in-the-street collection would provide the most convenient system of picking up yard trimmings. This method would also encourage unlimited quantities of yard trimmings to be recycled.

San Jose tried to be particularly careful in designing its recycling programs to make sure that high-quality compost markets could be developed. At the time, other containerized systems were reporting a large amount of contamination (more than 10 to 20 percent in their programs, whereas the loose system was reporting 3 to 5 percent (now less than 1 percent).

Loose yard trimmings were also expected to have a lower contamination rate because drivers could see the materials in the pile on the street.

The city council had adopted a market development strategy in 1987 that weighed heavily in favor of the approach that would have the least contamination and the best markets. As a result, the city chose to proceed with the loose in-the-street approach.

Pilot programs were operated by the city from 1989 to 1991 to test the merits of this approach and to encourage the development of the composting infrastructure in the area. Phase 1 of the citywide program expansion began September 4, 1991, and was completed by September 1, 1992.

In the SRRE, the city noted that approximately 27 percent of its municipal solid waste consisted of compostable materials. This makes compost a prime target for waste reduction programs. The disposed waste analysis for 1990 indicated that discarded food accounted for 152,500 tons, yard trimmings for 118,000 tons, and wood waste for 6,300 tons of the total waste landfilled. The waste analysis also noted that other materials such as mixed paper are also potentially compostable.

The amount of compostable materials generated by the residential sector in 1990 was 131,800 tons. The commercial sector generated 166,000 tons. In 1991, the city estimated the volume of yard trimmings to be approximately 79 percent prunings, 18 percent leaves, and 3 percent grass, further justifying its collection method.

However, San Jose recognized that these analyses were being made during a drought and that grass would likely increase to a much greater percentage. In a 1998 waste composition study, San Jose determined that yard trimmings represent about 35 percent of the city's residential waste stream.

Promotion of the yard trimmings program was expanded as part of the startup of the city's new "Recycle Plus!" integrated garbage and recycling system in July 1993. This resulted in a major increase in yard trimmings collected.

In addition to the promotion of the new yard trimmings program, the city changed its rate structure from unlimited garbage collection with a flat fee to unlimited recycling collection and a linear pay-as-you-throw residential rate structure. As a result, yard trimmings recycled in FY 1993

increased by more than 30,000 tons in one year (a 45 percent increase).

Yard trimmings are now the largest part of the city's diversion programs. Compared to the 40,000 tons estimated in the 1991 SRRE, San Jose is now collecting more than 130,000 tons per year through this extremely successful program. The city is now serving 181,000 single-family households with this program.

Yard trimmings are also collected from city facilities (for example, parks and community gardens) and multifamily dwellings (MFDs). An estimated one-third of the MFDs use this program. Where loose collection is not feasible, residents place their yard trimmings in burlap tarps or cans. The haulers provide the tarps; residents must provide their own cans (and label them with a yard trimmings sticker.) Tarps and cans are manually emptied into the truck.

Materials accepted in the yard trimmings program are grass clippings, leaves, small prunings, and clean green holiday trees. Ashes, concrete, dirt, discarded foods, fruit, garbage, lumber, pet wastes, processed wood, rocks, sod, flocked holiday trees, vegetables, and pumpkins are not acceptable.

Drivers leave notices whenever a pile cannot be collected explaining why the pile was left and how to properly participate. The contamination rate of collected yard trimmings has stayed below one percent.

San Jose collects approximately 83 pounds of yard trimmings per month for each participant with loose collection. This is significantly better than the 54 pounds per month collected in the adjacent town of Milpitas, which has containerized collection.

Residents are instructed to place their piles loose in the street. If they live on a busy or narrow street, they are asked to call the city for special instructions on how to use the tarp or can program. The city requests that piles be no larger than 5 feet wide and 5 feet high. Residents can place as many 5-foot piles as they can fit in front of their property.

Branches larger than 5 feet long or 6 inches in diameter are not accepted for collection. Piles are to be set 12 inches from the curb and 5 feet away from garbage carts and parked cars. Piles are not

to be placed in bike lanes, next to a red curb, or in front of recycling bins.

Piles are to be set out before 6 a.m. on collection day, but not more than 24 hours before then. Trimmings set out too early can block parking and other curbside activities. Cyclists, pedestrians, and motorists are also safer without the obstacle presented by yard trimmings. Wind and other activities can also scatter yard trimmings, turning them into an eyesore and a storm drain pollutant.

San Jose contracts with two companies—GreenWaste Recovery and Browning-Ferris Industries (BFI)—to provide weekly year-round curbside pickup of yard trimmings. The city contracts separately with two composting sites, Zanker Road Resource Management and BFI, for processing. By using multiple contracts, San Jose had more control over contractor performance. The city could also count on skilled contractors to substitute for the regular contractor when necessary.

Yard trimmings are recycled into high-quality soil amendments, compost, biomass fuel, mulch, animal bedding, or wood chips. After being processed, 1,800 tons per year are used for city parks and community gardens.

The contractors sell the processed amendments to farmers for use on agricultural lands surrounding San Jose and to local nurseries for sale to the public. About 100 tons per year are given away to the public at outreach events to help promote and support the program.

San Jose policy requires that yard trimmings be processed into the highest and best use of materials. For example, San Jose does not allow the use of yard trimmings as alternative daily cover (ADC) in its processing contracts.

San Jose has also been very active with its agriculture in partnership program. It received one of the first grants from the CIWMB in 1994 to start the program, which it continued to fund in 1997 and beyond.

Trials have been carried out at farms and research sites to determine the benefits of San Jose's compost products and to determine the best potential applications. The CIWMB helps present research findings to farmers through workshops,

newsletters, and the Agricultural Cooperative Extension Service.

San Jose's program also includes the promotion of home composting and xeriscape landscaping as part of its general composting program. They encourage residents to obtain information on how to build a bin, how to sign up for a free compost class, and to seek advice on other general composting questions. Residents can contact the Santa Clara County home composting education program through the master composters Rotline.

During and after composting classes, the City of San Jose will provide compost bins to San Jose residents at bargain prices. Subsidies for the bins are provided through the Recycle Plus! program. Discounts are only available to residents with San Jose identification or a Recycle Plus! bill and photo identification.

The City of San Jose sells the following bins to San Jose residents:

- Smith and Hawken Biostack: \$43.
- Home Composter: \$25.
- Wriggly Wranch: \$50.
- 14-gallon worm bin: \$10.

The program also promotes grasscycling and encourages people to call the master composter Rotline for grasscycling information.

San Jose is soliciting proposals for its next Recycle Plus! program. Some of the new directions the city will be exploring in the future include more work in the following areas:

- Discarded food composting.
- Compost research.
- Vermicomposting.
- Outreach.
- Expanded focus to include landscaping.
- Partnerships.
- Web site.

San Jose Costs, Economics, and Benefits

Loose collection costs San Jose \$3.54 per household per month. Due to cart costs and decreased route efficiencies, the city estimates that the cost would rise to about \$5 per household per

month with containerized collection. Purchasing 96-gallon containers for residents would cost the city \$11 million, averaging \$1.50 per household per month for cart purchase and maintenance.

San Jose uses 17 loaders and 17 packer trucks to collect yard trimmings. They estimate that they would need to add 50 vehicles for containerized collection. The city has determined that the claw and a front loader can collect from 2,200 homes in a day, while two automated trucks can collect only 1,200 carts in a day.

San Jose also has discontinued a separate leaf removal program used to keep storm drains clear during the fall. The current yard trimmings program is more effective at clearing leaves, resulting in fewer storm drains being blocked. That amounts to a program savings of \$300,000 per year.

Local Government Challenges and Opportunities

Communities have many options to reuse, recycle, and compost organic materials. Communities that have implemented some of these programs may find that adding other organics materials could be a key to increasing waste diversion from their community.

In many communities, organics recycling programs are surpassing the tonnages recycled by curbside recycling programs to become the largest waste diversion program in the community.

Some of the greatest savings come from reducing the production of yard trimmings, or using them on-site in a closed loop system. Other significant diversion will increasingly result from composting residential and commercial discarded foods.

Adding discarded foods and food-contaminated paper to residential yard trimmings collection programs may be one of the fastest growing trends during the next several years.

Unlike residential curbside and yard trimmings collection programs, waste prevention and commercial programs require different approaches. Communities do not have to arrange the services. Instead, they need to help develop the public and private infrastructure and promote those initiatives with potential users.

Some tools that communities can use to help develop the food recovery infrastructure include:

- Linking commercial discarded food generators with haulers and end users.
- Providing grants or contracts to service providers to purchase equipment and develop new services.
- Providing technical assistance to discarded food generators to help them design and implement programs.

Tips for Replication

- Identify organics programs that have not been implemented in your community.
- Identify the largest remaining organics recyclables remaining in your waste stream and where they are generated (residential and/or commercial).
- Identify compost processing facilities and service providers in your area.
- Help expand existing organics services in the area, either through direct funding or working together with county and regional programs.
- Match businesses that generate materials with service providers.

References

CIWMB Publications

Many CIWMB publications are available on the Board's Web site at:
www.ciwmb.ca.gov/Publications/.

To order hard copy publications, call 1-800-CA-Waste (California only) or (916) 341-6306, or write:

California Integrated Waste Management Board
Public Affairs Office,
Publications Clearinghouse (MS-6)
1001 I Street
P.O. Box 4025 (mailing address)
Sacramento, CA 95812-4025

“Choosing a Compost Bin for Your Community”
(Publication #442-95-008)

“Compost Demonstration Project on Use of Yard Trimmings Products: Agriculture in Partnership with San Jose” (Publication #422-96-048)

“Compost Demonstration Project, Fresno County: A Comparative Analysis of Soil Amendments Used in Peach Production” (Publication #442-96-048)

“Compost Demonstration Project, Monterey Bay Region: Demonstrating New Opportunities for Growers” (Publication #442-96-050)

“Compost Demonstration Project, Placer County: Use of Compost and Co-Compost as a Primary Erosion Control Material” (Publication #443-99-018)

“Compost Demonstration Project, Stanislaus County: Green Material Compost Use on Ornamental Nursery Plants and Field Crops” (Publication #442-96-053)

“Compost Demonstration Project, Tulare County: Green Material Compost in Field Crop Production” (Publication #422-96-052)

“Compost: Matching Performance Needs With Product Characteristics” (Publication #443-00-005)

“Grasscycle! Make the Most of Your Lawn. Make the Most of Your Time” (Publication #443-99-011)

“Keeping Green: A Landscaper’s Guide to Reducing Yard Waste” (Publication #442-95-045)

“Market Research into the Use of Organic Soil Amendments by Agriculture in California” (available in hard copy only)

“Nonyard Wood Waste Report” (Publication #500-94-045)

“Nonyard Wood Waste Report: Annual Update for 1995” (Publication #443-95-026)

“Resource Conservation District Projects Using Mulch and Compost From Cities” (Publication #422-97-043)

“Results of Northern California Compost Demonstrations” (Publication #422-97-029)

“San Jose Area Growers Reap Benefits With Compost and Mulch From Yard Trimmings” (Publication #421-98-009)

“Santa Barbara Preliminary Compost Market Assessment” (available in hard copy only)

“Southern California Mulch and Compost Demonstrations Expanded” (Publication #422-97-042)

“Stop Runaway Soil—Use Mulch! An Erosion Control Guide for Citrus Growers” (Publication #443-99-021)

“Urban Compost Makes Soil Sense” (Publication #422-95-070)

“Vineyards Benefit From Compost and Mulch” (Publication #443-99-005)

“Wood Waste: How to Keep Wood Waste Out of Landfills” (Publication #500-94-017)

“Worms and Waste Management in California” (Publication #442-95-044)

“Xeriscaping for Waste Prevention” (Publication #442-96-033)

Other Publications

Michele Young, “Going Bulk for Yard Trimmings Collection,” *BioCycle*, December 1999, 419 State Avenue, Emmaus, PA 18049. (610) 967-4135, biocycle@jgpress.com.

Compost Science & Utilization, JG Press, Inc., ISSN 1065-657X, 419 State Avenue, Emmaus, PA 18049. (610) 967-4135, biocycle@jgpress.com.

Resource Recycling, North America’s Recycling and Composting Journal, Resource Recycling, Inc., 1206 N.W. 21st Avenue, Portland, OR 97209-1609. (503) 227-1319, resrecycle@aol.com.

MSW Management, Forester Communications Inc., 5638 Hollister Avenue, #301, Santa Barbara, CA 93117. (805) 681-1300, publisher@forester.net.

Source Reduction and Recycling Element, City of San Jose, August 1991, San Jose Environmental Services Department, 777 North First Street, Suite 450, San Jose, CA 95111.

Brenda Platt and Kelly Lease, “Cutting the Waste Stream in Half: Community Record-Setters Show How,” U.S. EPA, publication #530-R-99-013, prepared by the Institute for Local Self-Reliance.

Dennis Williams, San Diego Environmental Services Department, Christmas Tree Recycling Excellence Award Application, Solid Waste Association of North America, 1999. (619) 492-5010, dfw@sdcity.sannet.gov.

Roger T. Haug, *The Practical Handbook of Compost Engineering*, Lewis Publishers, CRC Press, Inc., 2000 Corporate Blvd. N.W., Boca Raton, FL 33431. 1-800-272-7737.

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Eliot Epstein, *The Science of Composting*, Technomic Publishing Company, 851 New Holland Avenue, Box 3535, Lancaster, PA 17604. 1-800-233-9936.

Luis F. Diaz et al., *Composting and Recycling Municipal Solid Waste*, Lewis Publishers, CRC Press Inc., 2000 Corporate Blvd. N.W., Boca Raton, FL 33431. 1-800-272-7737.

Web Sites:

Worm and worm bin suppliers in California
www.ciwmb.ca.gov/Organics/Worms/WrmSupply.htm

Composting resource page,
<http://oldgrowth.org/compost/>

Cornell Composting,
www.cfe.cornell.edu/compost/Composting_homepage.html

Yelm Worm Farm, www.yelmworms.com/

EnviroCare, www.envirocare.com/

Contacts

CIWMB

Office of Local Assistance, (916) 341-6199. Also see www.ciwmb.ca.gov/OLA/Contacts.htm.

To contact the CIWMB for more information on past compost or mulch demonstration projects, visit www.ciwmb.ca.gov/Organics/ or call (916) 341-6620.

Other Contacts

Jim Jensen, Yelm Earthworms and Castings Farm c/o The Dirt Dept., 1477 Elliott Ave. W., Seattle, WA 98119. 1-877-339-6767, yelmworms@aol.com or www.yelmworms.com/.

Mary Applehof, Flowerfield Enterprises/Flower Press, 10332 Shaver Road, Kalamazoo, MI 49024. (616) 327-0108, Mary@wormwoman.com or www.wormwoman.com/

Worm Growers in California

(from Envirocare)

Rabbit Barn, Turlock, (209) 632-1123.

Cosmo's Red Worms, San Francisco, (415) 759-7874.

Avalon Farms, Newcastle, 1-800-808-3136.

Happy Yo, Studio City, (209) 738-9301.

Ecoway, Santa Ynez, 1-800-770-7778.

Pacific Industries, Fremont, (510) 795-0760.

Hefner's Fishing Products, Vallejo, (707) 462-4334.

Happy D Ranch, Visalia, (209) 738-9301.

Oasis Worm Farm, Littlerock, (805) 944-6199.

Morning Mist, Davis, (707) 448-6836.

Foley Farms, Coarsegold, (209) 642-6264.

Broads Worm Farm, Nuevo, (909) 926-9076.

Patzer Worms, Northridge, (818) 718-8599.

Green Mountain Technologies, 3822 Latona Ave, NE, Seattle, Washington 98105. (206) 634-2625, pat@gmt-organic.com or www.gmt-organic.com/products.html.

Jim McNelly, NaturTech Composting Systems, 44 28th Ave. North, Suite J, Saint Cloud, MN 56303-4259. (320) 253-6255, compost@cloudnet.com or www.composter.com.

Wright Environmental Management Inc., 9050 Yonge Street, Suite 300, Richmond Hill, Ontario, Canada L4C 9S6. (905) 881-3950, fax: (905) 881-2334, www.wrightenvironmental.com/.

David Johansen, Enviro Care Of America, P.O. Box 19724, South Lake Tahoe, CA 96151. 1-800-889-7238, david@envirocare.net or www.envirocare.net/index.htm.

America's Second Harvest food bank network, www.secondharvest.org/foodbanks/foodbanks.html.

California Food Banks

Cathedral City, FIND, Inc., (760) 328-3663.

Chico, Butte County Gleaners, (530) 899-3758.

Concord, Food Bank—Contra Costa and Solano, (925) 676-7543.

Fresno, Community Food Bank, (559) 237-3663.

Los Angeles Regional Food Bank, (323) 234-3030, www.lafightshunger.org/.

Manteca, San Joaquin Food Bank, (209) 833-3663.

North Highlands, Senior Gleaners, (916) 971-1530, www.seniorgleaners.org/.

Oakland, Alameda County Community Food Bank, (510) 834-3663, www.accfb.org/.

Orange, Second Harvest Food Bank of Orange County, (714) 771-1343, www.feedoc.org/.

Oxnard, Food Share, (805) 983-7100.

Riverside, Second Harvest Food Bank of Riverside and San Bernardino Counties, (909) 359-4757.

Roseville, Community Resources Council, (916) 783-0481.

Salinas, Food Bank for Monterey County, (831) 758-1523, www.food4hungry.org/.

San Diego Food Bank, (619) 523-8811, www.sandiegofoodbank.org/.

San Francisco Food Bank, (415) 282-1900, www.sffoodbank.org/.

San Jose, Second Harvest Food Bank of Santa Clara and San Mateo, (408) 266-8866, www.secondharvestsjca.org/.

Santa Barbara, Food Bank of Santa Barbara Co., (805) 967-5741.

Santa Rosa, Redwood Empire Food Bank, (707) 523-7900, www.refb.org/.

Visalia, FoodLink for Tulare County, (559) 651-3663.

Watsonville, Second Harvest Food Bank of Santa Cruz and San Benito Co., (831) 722-7110, www.thefoodbank.org/.

Credits and Disclaimer

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The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web site at www.ciwmb.ca.gov.