

# Preface

## About this manual

### **Integrated campus recycling and waste management guide**

This manual provides state agencies, private and public colleges, and universities with a guide to how different facility types can divert various materials from landfill disposal. It also covers the many facility types within individual campuses, such as administrations, bookstores, student housing, family housing, dining and food vendor areas, laboratories, classrooms, physical plant yards, facilities management yards, and sports complexes. It covers setting up programs, collections, and the processing of different material types such as office pack, corrugated cardboard, white paper, and bottles and cans.

Many other institutions will have similar obstacles and challenges as they implement their waste management programs. The manual will help readers establish the foundations of an effective program; topics covered include:

- background information on waste management programs
- instructions on how to obtain important resources
- how to conduct waste assessments
- how to start a program
- developing and expanding a program
- processing and selling the recyclables as a commodity
- strategies for “buy recycled” initiatives

### **Background**

The impetus for the development of this manual was a piece of legislation passed in California in 1999. Assembly Bill 75 required all state agencies, including the California State University and Community College systems, to meet waste diversion goals of 25 percent by 2002 and 50 percent by 2004.

According to the California Integrated Waste Management Board’s 1995 College and University Status Report, public college campuses account for 51 percent of the waste generated at state agencies. Most universities and colleges have some form of recycling program; however, they are not maximizing their waste diversion efforts. This manual, with its comprehensive scope and “how to” approach, will assist colleges and universities in increasing waste reduction and diversion.

## **Target audience**

The target audience for this manual includes campus administrators, waste and recycling coordinators or managers, and any professional tasked with implementing a recycling and waste management plan for an educational or corporate campus. The California Collegiate Recycling Council (CCRC), the University of California, Davis, the California Integrated Waste Management Board, and several college recycling and waste management professionals combined their expertise to create this manual. It contains critical information for colleges and universities on how to start a waste diversion program, and is intended to serve readers who are “just getting started” in the field. However, it also includes technical information for more developed programs that want to maximize waste diversion efforts and maintain a sustainable recycling program.

## **Acknowledgements**

This manual is the result of a partnership between the California Collegiate Recycling Council (CCRC) and the University of California, Davis (UC Davis). CCRC, a technical council of the California Resource Recovery Association (CRRA), is made up of recycling professionals from both private and public colleges and universities throughout California.

Many people were involved in the production of this document. In addition to the writers listed below, an editorial board reviewed the draft document for content and technical accuracy. Those editors were Barbara Kopicki, Julie Muir, Lin King, Greg Howard, and Alec Cooley. From start to finish, this project has been shepherded through its stages of development by Lin King, Alec Cooley, and Julie Muir.

Recycling professionals from the University of California, California State University, community colleges, private colleges, and private industries assisted in the writing of this manual. They are:

### Alec Cooley, Writer

Alec Cooley is currently on the Board of Directors of CRRA and on the executive committee of the California Collegiate Recycling Council. He has been involved with the recycling and waste reduction field since 1991, when he joined Humboldt State University's (HSU) Campus Recycling Program as a student volunteer. He became a director for both Humboldt's and Fort Lewis College's recycling programs before graduating from HSU in 1995. After working two years as the Collections Manager for the Arcata Community Recycling Center, he returned to HSU as the school's Solid Waste Reduction Manager in 1997. Alec has spoken at several California Resource Recovery Association and National Recycling Coalition Campus Series conferences.

### Christine Flowers, Writer

Christine is a tenured professor of Biology, Environmental Science and Environmental Ethics in Center of Science, Industry and Natural Resources at Shasta College. Christine is also a member of the steering committee for the Western Regional Pollution Prevention Network. She previously taught at Valencia College in Orlando, Florida where she was a Program Director for the Environmental

Technology Program. She received a MEd in Secondary Science Curriculum and an MS. in Biology from University of Central Florida.

Roger Guzowski, Writer

Since February 2000, Roger has served as the Recycling Coordinator for California State University, Sacramento. Prior to joining CSUS, Roger spent seven years as the recycling coordinator for Five Colleges, Incorporated, a consortium of Amherst College, Hampshire College, Mount Holyoke College, Smith College, and UMASS Amherst. In addition, Roger spent two years as a steering committee member for the National Recycling Coalition's College and University Recycling Council (CURC), in which he twice chaired the NRC's Campus Recycling Series.

Krista Henkels, Writer

Krista has been the Recycling and Waste Management Coordinator for University of California, San Diego since 1994, and has worked in the recycling field since 1990. Krista served as a member of the Board of Directors for the National Recycling Coalition; she previously served on the Board of Directors for the California Resource Recovery Association. Krista is also one of the founding members of the California Collegiate Recycling Council. Krista received a BA in Public Administration from San Diego State University.

Greg Howard, Editor

Greg Howard is Communications Manager for TriNet, a human resources outsourcing firm based in the Bay Area. He is responsible for internal and external marketing projects, media relations, and corporate messaging. Greg has taught writing at universities such as UC Berkeley, Lawrence College, and Bentley College, and has published numerous articles and essays in magazines, journals, and newspapers. Greg received his Ph.D. in English Literature from Tufts University and his BA in English from UC Davis.

Lin King, Project Manager and Writer

For the past seven years, Lin has been the Recycling Manager for the University of California, Davis (UC Davis). Lin has also worked for the State of California, Department of Conservation and the County of Orange Integrated Waste Management Department. He has been the Chair of CCRC for three years and is currently on the Board of Directors of CRRA. Lin received his BS from UC Davis in Environmental Science and his MS from CSU Fullerton in Environmental Policy and Planning; his Master's thesis, *California State University Recycling Programs: Their Progress, Innovations, and Barriers*, is one of the first papers documenting recycling programs at the university and college level in California.

Barbara Kopicki, Writer

Barbara is currently the Manager of the Recycling and Rubbish Exhibit, as well as Chair of the California Collegiate Recycling Council. She assisted in the development and implementation of the Associated Students Recycling Program at CSU, Chico through student government as Commissioner of the Environmental Affairs Council in 1996. After working as a part-time Coordinator for two years, she

was hired full-time in 1998. Barbara has presented information about recycling and composting issues at six college conferences and workshops, as well as spoken at three California Resource Recovery Association conferences.

**Julie Muir, Writer**

Julie is the Community Relations Manager with PSSI and the Stanford Recycling Center. PSSI is an independent hauler that solely services Stanford University. She is on the executive committee of the California Collegiate Recycling Council (CCRC), and has managed Stanford University's recycling program for the last ten years. Julie is responsible, among other duties, for contract management, customer service, material marketing, outreach and education, and environmental compliance.

**Bill Stonecypher, Writer**

Bill has been an environmental program professional for over fifteen years, and current serves as Environmental Programs Specialist for Loyola Marymount University. He has served in the US army and performed summer internships with the L.A. County Department of Public Works in the Hydrology/Water Conservation Division. He has also worked in the California Department of Agriculture as a supervisor in the pest detection unit of the Cooperative Medfly Project.

# Chapter 1. Source Reduction & Reuse Programs

The common phrase, “Reduce! Reuse! Recycle!” refers to the basic hierarchy of waste reduction. “Reduce” (referred to in this manual as “source reduction”) is considered the most important strategy, because it eliminates the problem of waste disposal and conserves natural resources. “Reuse” comes second in the hierarchy; reusing is preferable to recycling because it forestalls the environmental and economic costs of remanufacturing and because, theoretically, it prevents the need to create replacement items using new resources. “Reduce” is prioritized ahead of “reuse,” since reusing an item still requires the resources needed to create the original item—and because disposal costs have only been delayed, not eliminated. Recycling remains an important part of resource and waste management, but it should be considered a secondary option; source reduction and reuse are more important.

Though frequently overshadowed by recycling, source reduction and reuse activities are integral to any waste diversion program. Whereas recycling is often viewed as a tangible practice, similar to any other facilities-run service, source reduction and reuse should be seen in terms of a long-range investment in the university. They can save money by reducing the need for purchasing and disposal activities. Because of the similarities and often overlapping nature of many source reduction and reuse practices, they have been combined for the purposes of this chapter’s discussion.

## Implementing source reduction and reuse initiatives

The first step to implementing source reduction and reuse programs is to analyze different aspects of the campus’s operation, identifying potential sources of preventable waste. This process requires investigating campus-wide sources, as well as training department staff to identify waste. For both tasks, the project coordinator will need to spend time walking around, getting to know campus personnel, and observing their work routine. By meeting with individuals and soliciting their feedback, the coordinator will discover potential reduction opportunities.

Other methods can also help you find and prioritize reduction opportunities. Surveys can be an effective tool for determining potential projects and gauging their popularity. For instance, a survey that asks whether students prefer paper towels or hand dryers may indicate a strong dislike of electric dryers, but reveal a general willingness to use cloth towels. The same survey may also reveal additional data points; for example, electric hand dryers beg the question of handicap accessibility.

Analyzing procurement records is another method for identifying source reduction or reuse options. Studying campus purchasing practices can help identify materials that are over-ordered, and provide important information about long-term purchasing trends. Finally, waste characterization studies may enable you to see potential source reduction materials in the waste stream. Informal walk-through surveys are particularly effective at identifying waste at its point of origin.

Once potential source reduction initiatives have been identified, work with decision-makers to suggest the operational changes or alternative purchasing practices. You can start by talking to the director and staff of the department in charge of procurements. Their position allows them to influence the purchasing decisions of the rest of the university. By training such individuals to identify wasteful purchasing practices, you can help them promote your program's goals. For instance, when a purchase request arrives for a new copier, the staff can suggest a model with a double-sided copying capacity.

In addition to educating people about source reduction and reuse practices, you will need to help implement formal policies and procedures. Working with the solid waste reduction committee and appropriate decision makers, you can develop policies and procedures that outline specific steps and indicate who is responsible for following them. For example, a policy could require vendors to deliver goods and supplies in reusable shipping containers whenever possible, and to take back any pallets used to deliver the shipments. Or kitchen staff may be instructed to separate compostable food scraps into special containers during food preparation.

Remember—when proposing source reduction policies, cost savings are more likely to sway decision makers than environmental concerns. Though the resource conservation argument may be more compelling to student activists or even the program coordinator, administrators and department directors are more likely to appreciate the fiscal impact.

As with recycling, it is important to follow up periodically and monitor the success of source reduction and reuse programs. In some cases, policies or previous educational efforts may need to be reinforced. It's also possible that unforeseen problems will need to be addressed and eliminated before the effort can be carried forward.

## Potential source reduction initiatives

### Office/ classroom

- *Paper reduction.* Paper comprises one of the largest portions of the waste streams on most campuses. Therefore, it provides one of the greatest opportunities for source reduction. Promote the purchasing of copiers and printers with the capability to print on both sides of the paper; make sure that “double-sided printing” is their default setting. Encourage professors to print double-sided syllabi and class handouts—or even better, ask them to use e-mail and powerpoint displays instead of handouts. Have them encourage students to submit papers and reports double sided or electronically. Promote the use of clean, one-sided paper as scratch paper. Work with printing offices to cut and glue one-sided paper into note pads. Establish a policy whereby all printing or

copying orders placed through printing offices automatically default to double sided on recycled paper unless otherwise designated. Route memos or post a single copy on public area bulletin boards, instead of sending copies to everyone.

Picture #1, Caption: *Notepads made from clean one-sided paper.*

Picture #2, Caption: *Clearly labeled trays can be placed next to printers and copiers collect unwanted one-sided paper for reuse.*

- *Junk mail reduction.* The U.S. Postal Service delivers over 87 billion pieces of junk mail each year, the vast majority of which ends up in the landfill. At colleges and universities, junk mail becomes more than a mere nuisance when you consider the sheer volume of catalogs and brochures addressed to hundreds, if not thousands, of employees. In addition to generating a significant amount of waste that serves no useful purpose, unwanted junk mail can also pose a contamination threat to the paper recycling process. Well-intentioned staff and faculty may try to recycle junk mail that includes non-recyclable items such as CDs, plastic credit cards, or non-recyclable paper.

There are several measures that can be taken to reduce the influx of junk mail. One step is to contact the senders and request that your campus be removed from their lists. This can be done by either calling company 800 numbers or by sending postcards. In both cases, catalog companies often require a customer code or number, which will be printed next to the address on the cover.

With thousands of employees on a typical campus, the effort to reduce large amounts of junk mail requires education and persistence. One method is to pre-print and distribute campus postcards. These postcards would contain a message asking to be removed from a mailing list, leaving a space where faculty and students can insert the appropriate names and addresses. This way, individuals can remove themselves from junk mail lists without even going to the trouble of writing a letter.

Another approach is to have staff and faculty forward their undesired mail to a central point, where someone can be assigned the task of contacting the companies or organizations for the entire campus or office. This job can be done with the use of inexpensive or free sources of labor. For example, you can use work-study students, collection staff on worker's compensation who can perform light-duty work, or local individuals who need to log community service hours.

A final step is to educate staff and faculty about ways to avoid mailing lists in the first place. When corresponding with companies or making purchases, they can specify that they do not want to be included on mailing lists or have their names distributed to other companies. Work with the procurement department to add a note on all purchase order forms telling vendors not to add the campus to mailing lists.

Several organizations act as nationwide clearinghouses for direct marketing address lists. In addition to contacting specific senders of junk mail, contact the clearinghouses and request to have campus names and addresses suppressed. Contact the Direct Marketing Association to suppress residential-oriented

junkmail—meaning mail intended for private individuals, such as credit card applications, sweepstake packets, and charity mailers. The DMA can be reached at

Mail Preference Services  
Direct Marketing Association  
P. O. Box 9008  
Farmingdale, NY  
11735-9008

or on the Web at [www.the-dma.org/consumers/offmailinglist.html](http://www.the-dma.org/consumers/offmailinglist.html)

To help reduce business-oriented junk mail, two companies in particular should be contacted. The Dun & Bradstreet Customer Service Center can be reached at 800-333-0505, or by e-mail at [goodS@dnb.com](mailto:goodS@dnb.com).

Also, contact InfoUSA by fax at 402-331-0176, or by mail at  
InfoUSA  
P.O. Box 27347  
Omaha NE, 68127.

When contacting these companies, make sure your letter says, "Attention - Business Update Department" at the top. Your letter should include the complete business name of your campus, its address and phone number, the name and title of the person requesting the deletion, and that person's signature.

For more information on reducing junk mail, visit the King County Solid Waste Division's Web site on the topic: [dnr.metrokc.gov/swd/nwpc/bizjunkmail.htm](http://dnr.metrokc.gov/swd/nwpc/bizjunkmail.htm)

*Picture #3, Caption: Undeliverable and unwanted junkmail can be a major problem to waste reduction and recycling efforts.*

- *Toner and inkjet cartridge reuse.* Cartridges manufactured by most major companies are rechargeable. Many manufacturers will provide shipping envelopes and cover the cost of mailing empty cartridges back to the factory. In some areas, businesses will recharge cartridges for as low as half the cost of purchasing new ones, while some companies will purchase certain brands of used inkjet cartridges for refilling and resale. For more information, California-based recycling professionals can visit the California Integrated Waste Management Board's Cartridge Recycling Web site at [www.ciwmb.ca.gov/projrecycle/laser/default.htm](http://www.ciwmb.ca.gov/projrecycle/laser/default.htm).
- *Electronic communication.* Promote the use of e-mail as an alternative to paper memos. Store documents electronically and only print them when needed. Route incoming fax lines through computers instead of standalone fax machines; this gives the recipient the opportunity to review the faxed message on-screen before deciding to print it. Create department e-mail lists for department-wide communication. Use the "Print Preview" function to look at documents before printing; use "Spell Check" and edit on the screen. Establish a bulk e-mail listserv sent to all staff, faculty, or students as an alternative to campus-wide memos. Encourage administrative departments to provide electronic forms. Encourage the online publishing of campus newsletters and journals

- *Envelope reuse.* Advocate the reuse of envelopes for on-campus mail. Have departments place collection boxes near central staff and faculty mailboxes for collecting used envelopes. When mailing an on-campus letter or memo, simply cross out the previous name and address and substitute the new destination. A more formal version of this procedure is to use pre-printed routing envelopes with multiple address spaces. This way, envelopes can be used multiple times. With each use, cross out the previous address and write in the new one on the next line. For letters going off campus, use blank labels to cover over the previous address and write in the new one.

**Picture #4, Caption:** Set aside an area near staff and faculty boxes for envelope reuse.

- *Per sheet pricing.* There are two ways to charge students for printing documents in computer labs on campus. The first is to charge them a flat fee as part of their tuition at the beginning of the term, allowing them to print an unlimited amount of paper. This method tends to encourage wasteful printing practices, however, and forces those who print less to subsidize the excessive printing of others. A better option is to charge students for each copy printed, using an account system where they pay in advance for a certain number of printing credits. California State University, San Bernardino uses this type of system for their computer labs, as well as copiers and microfilm machines. Students purchase printing credits on reusable plastic cards with magnetic strips. The cards are then inserted into devices attached to each printer. Linking the cost directly to the printing service, as CSU San Bernardino does, provides a tangible incentive to print only what is needed (Dyck, online).
- *On-time purchasing.* Encourage departments to print only as many catalogs, brochures or forms as they plan to use in the immediate future. Ordering excess quantities can cause material to become dated, requiring expensive replacements. In cases where forms or catalogs do become outdated, print insertable correction slips or stickers to inform the intended reader of the changes. Humboldt State University's Admissions and Records office found that they consistently had several pallets worth of unused course catalogs at the end of each year. Once they recognized this trend, they were able to reduce the number of catalogs ordered annually by a thousand—saving more than \$2,000 in printing and disposal costs.
- *Office supply exchange.* Campus departments frequently throw out surplus or unneeded office supplies because they don't have a use for them, or because they take up needed storage space. Often, the discarded supplies are in good condition and could be used easily by other campus departments. An office supply exchange acts as a clearinghouse, passing surplus supplies from those who are discarding them to those who need them. Though similar to a property office, an office supply exchange typically handles smaller, every day items such as rolodexes, staplers, binders, and desk organizers. Property offices tend to handle large items such as desks, chairs, and computers.

The University of Vermont and the University of Oregon programs reflect a common approach to supply exchanges. In each case, campus staff, faculty, and student groups are invited to bring surplus supplies to a centrally located, locked storage room. The key to this room can be checked out from a nearby department

office during normal business hours. When picking up or dropping off supplies, users are asked to sign a guestbook and list what materials they are handling. Both programs are monitored and organized by staff from the recycling office. The University of Oregon's program, known as R.O.S.E. (Reusable Office Supply Exchange), has operated since 1992 and has found new homes for close to \$115,000 worth of usable supplies. University of Vermont's program, known as O.S.C.A.R. (Office Supply Collection and Reuse Project), has also seen success during its first year of operation.

*Picture #5, Caption: An office supply exchange links those with surplus items to those who are looking for them.*

The University of Michigan has a program known as eXchange Files, which puts people discarding supplies in touch with those who need them. The eXchange Web site provides a bulletin board where staff and faculty can post "available" and "wanted" listings for specific materials. Once a match is made, the individuals can make private arrangements to exchange the supplies.

Promoting an exchange program is important to its success. Outreach methods can include mailing a brochure to department secretaries, sending e-mail messages on campus-wide or select group listservs, and maintaining a Web site with a regularly updated inventory. There's also old-fashioned word of mouth; satisfied customers are likely to tell their friends. One tool is to keep records of which departments are interested in particular items, and forward those items directly to the departments once they become available.

*Picture #6, Caption: A postcard sent to campus departments at the University of Vermont advertising the Office Supply Collection And Reuse Project.*

Another variation on the exchange is to encourage departments to set up their own internal supply depot for surplus items. This depot can be a shelf or closet where goods such as file folders, tape dispensers, or staplers can be dropped off or retrieved.

To learn more about the programs mentioned here, visit their Web sites:

University of Vermont: [www.uvm.edu/~uvmppd/solidwaste/oscar.htm](http://www.uvm.edu/~uvmppd/solidwaste/oscar.htm)

University of Oregon: [darkwing.uoregon.edu/~recycle/rose.htm](http://darkwing.uoregon.edu/~recycle/rose.htm)

University of Michigan:  
[www.plant.bf.umich.edu/grounds/recycle/ExchangeFiles/](http://www.plant.bf.umich.edu/grounds/recycle/ExchangeFiles/)

- *Property.* Surplus property warehouses are similar to office supply exchanges, but generally handle larger objects or items with campus property tags. Items such as desks, copiers, modular furniture, and computers from department offices are forwarded to the warehouse for storage until another department takes them, or until the items are removed from campus. In many cases, materials that do not find a home elsewhere on campus are offered to local schools, other state agencies, non-profit organizations, or to the public through auctions.

While most campuses have some kind of surplus property warehouse, their value as a diversion program varies depending on the motivation of the managing department. San Francisco State University (SFSU) illustrates this point. Prior to 1996, the SFSU surplus warehouse was overseen by the property accounting office, which made little effort to promote awareness of its existence or to find new homes for the property. The warehouse was only open for viewing a few hours a week, and most items languished there until they were tossed in the dumpster. In January 1996, the program fell under the control of the university's Recycling/Resource Center—which promptly rechristened it the S.W.A.P. (Surplus with a Purpose) Shop. The new management shifted the focus of the warehouse, turning it from a storage “graveyard” into an operation that maximized the reuse potential of surplus university property.

With its new focus, the program has dramatically increased the university's ability to turn discarded materials into reusable materials. In its first two years, the S.W.A.P. Shop collected and redistributed 200 tons of university property. During the fiscal year 1997/98, close to \$400,000 worth of material was given a new home. Find out more on the S.W.A.P Shop Web site:  
[www.sfsu.edu/~recycle/mainsw.htm](http://www.sfsu.edu/~recycle/mainsw.htm).

Keene State College in New Hampshire has created an efficient surplus auction program, operated by its purchasing department. Materials to be sold are listed on their Web site complete with pictures of high-end items such as computers. The public can view auction items and submit an online, blind bid. The auctions take place on a weekly basis, allowing for a quick turnaround of material. Computers that fail to sell are donated to a local vocational training program, which rehabilitates the functional machines and disassembles the non-functioning ones for spare parts. Learn more about Keene's program at  
[www.keene.edu/purchasing/](http://www.keene.edu/purchasing/) (Jensen, online)

Arizona State University's Surplus Property Department operates much like a retail store. Open during normal business hours, Monday through Friday, the surplus property warehouse sells everything from streetlight poles to kitchen and restaurant equipment at fixed prices. The program generates between \$345,000 and \$447,000, enough to pay the wages of its four full-time and two student employees, as well as cover operating and capital costs. The department also invests \$30,000 to \$40,000 of the property revenue into the university's recycling operations, which it also manages (Chase, online). Visit their Web site at  
[Property.asu.edu/surplus/](http://Property.asu.edu/surplus/)

**Picture #7, Caption:** *Surplus property programs such as this one at San Francisco State University can save substantial disposal costs, raise money for recycling programs and aid charities, schools and non-profit organizations in the surrounding community.*

## **Food service**

- *Per serving pricing.* Work with your dining services to implement a pricing system that encourages diners to buy only what they plan to eat. All-you-can-eat pricing encourages waste for a very simple reason: people tend to have an oversized appetite when they serve themselves. When charged for each serving

separately, diners are forced to evaluate what they will actually eat. The end result is less wasted food.

- *Bulk servings.* Replace single serving food, beverage, and condiment packaging with refillable dispensers. Install breakfast cereal dispensers instead of mini-serving boxes. Sell milk, soda, and juices through bulk dispensers with cups or glasses instead of cartons and bottles.

Picture #8, Caption: *Breakfast cereals served in bulk containers avoid the waste of single-serving cardboard boxes.*

- *Reusable vs. disposable dinnerware.* The single biggest source of waste in most dining facilities is disposable plastic utensils and paper or polystyrene plates, bowls, and cups. The debate over which material is more environmentally sound—paper or polystyrene—is subjective, and glosses over the fact that both are inherently wasteful. From a waste reduction perspective, implementing the use of reusable, durable dinnerware, washed in dishrooms, is an important step towards reducing the waste stream in dining facilities.

Picture #9, Caption: *Reusable dinnerware for in-house meals can cut down on dining hall waste dramatically.*

Humboldt State University has established a policy banning the use of disposable plates, cups, utensils, bowls and other dinnerware in its residence hall cafeteria. Though durable dinnerware was already used for in-house dining, polystyrene shells and paper cups had been available for “to go” meals. Now, the management sells and rents reusable, insulated, Tupperware-style bowls with airtight locking lids. The bowls are sold at cost. Some students may forget their mealware, or only need it for a single afternoon; these students can check out the containers by leaving an electronic deposit on their meal cards. When the containers are returned, the deposit is credited back to their accounts. Returned containers are then cleaned in the washing room alongside the regular dishes. These procedures have helped push the dining facility’s diversion rate to nearly 80 percent.

Picture #10, Caption: *Disposable dinnerware piles up fast.*

Dining halls sometimes have a problem preventing their durable dinnerware from “walking off.” The loss of plates, bowls and utensils is often cited as the number one obstacle to using reusable dinnerware. However, precautions can be taken. It’s possible to use aggressive educational tactics to inform diners about the cost of replacing stolen dinnerware, and how such theft can drive up the price of their meals. Cashiers or other dining hall monitors can also be trained to watch for people who take plates and bowls.

*Reusable travel mug.* Encourage the use of durable mugs as an alternative to paper or polystyrene cups, using on-site displays next to coffee and drink stands. At many schools incoming residence hall students receive a free travel mug at the beginning of the year. Work with coffee and drink vendors to establish a policy of discounting beverages served in reusable mugs. The average college student uses 500 disposable cups in a year (a practice known as “dump and run”). A

forty-foot tall tree roughly yields about 3,000 paper cups; extrapolate how many cups are sold on campus and run a promotional campaign pointing out how many trees it takes to make them.

Picture #11, Caption: *Displaying reusable travel mugs next to coffee stands reinforces their use in people's minds.*

*Donate unserved food to local food banks.* Train kitchen staff to preserve unserved food portions at the end of each mealtime. The food can then be either reserved for the next day, integrated into new meals, or donated to local foodbanks.

## Facilities

- *Custodial.* Investigate the feasibility of replacing paper towels in bathrooms with electric or cloth hand dryers. Though this project may require substantial retrofitting of bathrooms across campus, it can increase the campus diversion rate and save substantial amounts of money in the long term. Purchase hand soap dispensers with a refillable reservoir, instead of the kind that requires disposable bladder pouches.

There is a growing trend toward using automated portioning control systems for custodial cleaning detergents. Instead of mixing the concentrated detergents by hand, the automated portioning system dispenses the exact amount of product necessary. This system removes the need to guess the correct quantities, thus preventing accidental over-application of the detergents. After one year of using this system, Humboldt State University found that it had reduced its cleaning detergent usage by 25-40 percent (Kronick).

University of California, Davis also uses a similar automated portioning control dispensing system. The amount of packaging waste can be typically reduced by a factor of 200-400 percent. For example, to produce an equivalent amount of RTU solution, a disinfectant concentrate diluted 1:64 will require approximately four times the amount of packaging than a similar super-concentrated disinfectant diluted 1:256. Thus, the chemical waste used by a custodian can be reduced by close to 20 percent.

The amount of packaging savings increases dramatically if you compare super concentrated products to bulk ready-to-use products. Comparing dilution ratios on a product-by-product basis is a fair way to estimate reductions in packaging waste. Using silk-screened labeled bottles, which can be reused hundreds of times before being recycled themselves, also reduces the waste stream.

The super concentrates are packaged in recyclable HDPE bottles. Recycling staff at UC Davis has found this to be an effective way to reduce the waste stream; it reduces unnecessary inventory and storage space. UC Davis products are used to provide custodial services to over seven million square feet of building space spread across thousands of acres. Effectively packaged, these products have reduced the amount of chemical deliveries to individual custodial closets—down to once every three months from once a month or more (Austin, online).

Picture #12, Caption: *Automated portioning dispensers for custodial cleaning agents.*

- *Grounds.* Grasscycling or “Xeriscaping” is a common method of eliminating grass clipping waste. Modern, institutional-size lawnmowers can pulverize the clippings as they mow the grass. The mowers then shoot the grass back onto the ground, leaving little or no visible trace of the clippings. Instead of bagged manure and fertilizer, use bulk truckloads. Use a chipper/shredder to turn branches and other woody materials into landscaping mulch. As with custodial services, grounds services can use automated portioning dispensers for chemicals such as pesticides or liquid fertilizers. The chemicals can be bought in concentrate, reducing the number of containers needed. When installing hardware items such as benches or parking stops, establish a policy requiring long lasting, durable items instead of easily broken or degradable alternatives. For instance, both benches and parking stops can be purchased with recycled plastic, which lasts up to three times longer than wood or concrete alternatives.
- *Trades.* From plumbing pipes to lumber to paint, carefully estimate quantities needed for the job to avoid unusable scraps or residual amounts. Set up an area for storing scraps that can be used for future jobs. Also set up an area for salvaged materials, which can be used for other projects.
- *Motor pool.* Promote the use of retread tires on fleet vehicles. This can save significant amounts of money without compromising quality. The California Department of General Services requires that state vehicles with tires greater than nineteen inches in size use retreads (DGS).

Picture #13, Caption: *Retread tire can offer the same quality as new ones, while costing substantially less.*

- *Carpets.* Recycling has been making headway in the area of carpets over the last decade. Despite many remaining obstacles, there are an increasing number of options available. For example, several carpet manufacturers have begun offering lease programs in which they will install carpets, and then retrieve them for recycling or rehabilitation at a later point in time. Some companies are also accepting previously installed carpets for credit towards new carpets. Here are a few of the manufacturers currently offering lease programs:

Interface Flooring Systems, Inc  
1500 Orchard Hill Road  
La Grange, GA 30240  
888-RE ENTRE

DuPont Flooring Systems  
15651 Saticoy Street  
Van Nuys, CA 91406  
(888) 422-3999

For more information about carpet recycling and leasing, as well as carpets made of recycled materials, visit these Web sites:

[www.epa.gov/epaoswer/non-hw/reduce/epr/carpet.htm](http://www.epa.gov/epaoswer/non-hw/reduce/epr/carpet.htm)

[www.stopwaste.org/materials/carpet.html](http://www.stopwaste.org/materials/carpet.html)

[www.metrokc.gov/procure/green/carpet.htm#8](http://www.metrokc.gov/procure/green/carpet.htm#8)

- *Architects and engineering.* Instead of sending copies of blueprints to every participant, establish a centralized map room that keeps a single copy. If copies must be sent out to multiple people, make sure only relevant pages are sent, rather than full copies with unrelated information. Where possible, avoid blueprint paper; it is non-recyclable, and can often be substituted with plotter or plain copy paper.

## General

- *Residence halls.* Participate in appliance repair and mattress rebuilding programs. In many towns, service organizations such as St. Vincent de Paul have job skill development programs that repair appliances or mattresses. Ohio University in Athens, Ohio has developed a partnership with the local St. Vincent de Paul to recondition up to 1,000 degraded mattresses each year. The campus sends its mattresses to the organization's facility, where they are stripped down to the frame, sanitized, given new springs and padding, and sent back to the university. The returned mattresses look new, but only cost a little over half the price of their brand-new counterparts. The campus saves about \$2,000 annually through this arrangement. In return, St. Vincent de Paul secures the funding needed to develop the rehabilitation facility (Newman, online).

Pictures #14 and #15, Caption: *Worn out mattresses from Ohio University are rehabilitated and sanitized and returned good as new at a substantial savings.*

- *End-of-the-year “move out” collection drive.* At the end of each school year, departing residence hall students across the country discard thousands of tons of unwanted belongings, often because they can't fit them in their cars. Frequently, materials end up in dumpsters because students have no time to take them to local thrift shops. Virtually anything students might own can be found in the discard pile—including clothing, stereos, books, packaged food, bikes, computers, kitchenware, televisions, appliances, loft wood, and furniture. Collection drives to recover these items during “move out” week are increasingly common at colleges and universities across the country.

A common approach is to set out containers, anything from 35-gallon cans to large dumpsters, outside the residence halls. The bins are well labeled with lists of acceptable types of material. (Large, bulky items typically require calling a phone number to arrange a special pickup.) Collected items are either donated to local charities, auctioned off as a fundraiser for the local recycling program or housing department project, or stored over the summer and resold to returning students.

Collection drives are most effective when they provide drop-off spots alongside existing trash and recycling areas. These spots work because students are already trained to bring their refuse there, and because convenience often dictates where discards are dropped off. If a collection drive requires people to carry items to a centralized location, it will not gather as much material. The best programs offer multiple drop-off spots, located near individual residence halls.

Humboldt State University has had a “move-out” collection drive in place for several years. Working with the Arcata House—a local non-profit that provides transitional housing to homeless families—and the local St. Vincent DePaul, HSU sets out receptacles at each residence hall for clothing, electronic equipment, appliances, and miscellaneous household items. A collection truck empties the containers each day, with extra runs scheduled during the last few days of the intense moving out activity. Clothing is taken to the St. Vincent De Paul for sale in its thrift store. All other items are delivered to the Arcata House, which holds a garage sale to raise money in support of its programs. During the most recent 2000 collection drive, over 3,500 lbs. of clothing and 2,500 lbs. of other items were collected.

University of California, Berkeley operates a comprehensive collection drive at the end of the school year, targeting off-campus housing co-ops, fraternities, and sororities throughout the city, in addition to on-campus residence halls. Working with the local Goodwill and the City of Berkeley, the university holds a one-day curbside drop-off for reusable items placed in specially marked bags. Furniture, mattresses and other large bulky items are also left at the curbside for collection by special trucks. During their 2000 collection drive, Berkeley gathered an estimated 8,700 pounds of material, valued at close to \$50,000 (Chong).

An organization named Dump & Run, Inc. has developed a special format for collecting unwanted materials from students as a fundraiser for charities. This non-profit organization will work with campuses to develop a program tailored to the specific campus. In addition to providing technical assistance on developing promotional materials, publicizing the event, and working with campus officials to get the program off the ground, Dump and Run will send a representative to the campus to help scout appropriate collection sites and identify any obstacles to a successful collection drive. Dump & Run, Inc. can be reached at:

Dump & Run, Inc.,  
PO Box 397,  
Brookfield MA 01506  
(508) 579 7188  
[www.dumpandrun.org](http://www.dumpandrun.org)

- *Theater sets.* Theater productions can generate significant quantities of waste at the end of a run. By instructing stage crews to disassemble sets carefully, a great deal of material can be saved for future productions. During the construction phase, the crew can simplify the breakdown process by designing easily disassembled sets—and by using removable screws instead of nails. Once sets are disassembled, store them along with reusable props until they are needed again. Salvaging set materials can save money on disposal costs, as well as reduce the need for new materials in future productions.

**Picture #16, Caption:** *Once a theater production is over, stage sets can be deconstructed and materials stored for future productions.*

- *Procurement.* Encourage the purchase of durable, long lasting items in regards to everything from copiers to computers to custodial equipment. While the impulse to buy cheaper models might be strong, less costly items are more likely to break

sooner and require replacement—and the older item will require disposal. Especially in the case of electronics, cheaper models are rarely designed to be repairable, and thus have shorter life spans. Quality products last longer and ultimately save money.

- *Bookstore.* Campus bookstores can help save unwanted books from being thrown out at the end of the term. In addition to buying back textbooks for the following term, they can also accept donated out-of-date textbooks. There are numerous charitable organizations that will accept old books and redistribute them in economically depressed areas or foreign countries. Two such organizations that collect books in California for distribution in Asia are:

Bridge to Asia  
1214 Webster Street, Suite F  
Oakland, Ca 94612  
510 834 3082  
[www.bridge.org](http://www.bridge.org)

The Asia Foundation  
Books for Asia  
451 Sixth Street  
San Francisco, CA 94103  
415-982-4640  
[www.asiafoundation.com/](http://www.asiafoundation.com/)

- *Vendor packaging reduction.* Vendors who work with campuses can play a role in reducing waste on campus. Either through friendly agreements or formal purchasing guidelines, campuses can direct vendors to eliminate excess packaging and deliver goods in reusable containers. For example, Rutgers University in New Jersey implemented a vendor packaging return program in 1992. The University Procurement and Contracting office contacted vendors who supplied goods to departments on campus, and requested that they take back product packaging for reuse. Working with the vendors, the campus arranged a convenient system in which departments were instructed to set aside packaging in clearly marked bags for the vendors to pick up the next time they made a delivery (Lyons). This system was also convenient for the vendors.

Pictures #17 and #18, Caption: *Pallets and reusable delivery crates are two examples where vendors can reuse to minimize packaging waste.*

## Additional source reduction information

- Environmental Protection Agency: [www.epa.gov/epaoswer/non-hw/muncpl/reduce.htm](http://www.epa.gov/epaoswer/non-hw/muncpl/reduce.htm)
- National Waste Prevention Council:  
[dnr.metrokc.gov/swd/nwpc/index.htm](http://dnr.metrokc.gov/swd/nwpc/index.htm)
- Landscape Waste Reduction Outreach Partnership:  
[wastediversion.org/landscaper/index.html](http://wastediversion.org/landscaper/index.html)

- California Integrated Waste Management Board:  
[www.ciwmb.ca.gov/WPIE/](http://www.ciwmb.ca.gov/WPIE/)
- National Directory of Computer Recycling Programs:  
[www.microweb.com/pepsite/Recycle/recycle\\_index.html](http://www.microweb.com/pepsite/Recycle/recycle_index.html)
- Small Business Waste Reduction Guide:  
[es.epa.gov/new/business/sbdc/sbdc6.htm](http://es.epa.gov/new/business/sbdc/sbdc6.htm)

# Chapter 2. Basic Diversion Program

## Laying the groundwork

Establishing a successful diversion program requires more than simply using mulching lawnmowers on turf, or sending someone to pick up cans and bottles at a few locations. Unlike simple garbage collection, which involves setting out containers and emptying them on a regular basis, a waste diversion program must have a sophisticated collection network for recycling, as well as methods for identifying and changing wasteful consumption practices. It also requires convincing people that participating in these efforts is in their own best interests. Each part of the program requires careful study and research—of your own unique environment as well as successful methods used at other universities.

Garbage collection is a fairly standardized practice from campus to campus. Waste diversion programs, however, are far more likely to develop distinctive features based on the conditions at a particular campus. For instance, one campus may opt to collect plastic bottles along with aluminum and glass beverage containers in the same receptacle, as long as they have a local company willing to accept the mixed materials. A different campus may choose to use separate receptacles for each type of material because no local contractors will accept comingled materials. A third campus may decide not to collect plastic bottles at all because they comprise only a fraction of the waste stream, and the cost to collect and sort them is greater than their value. With this and other such cases, understanding the local situation becomes essential to a program's success.

## Five steps to developing a successful program

While local conditions will determine the shape of a program, certain fundamentals apply to both collegiate and other diversion programs in general.

### Administrative support

Establishing a successful diversion program requires motivating the entire campus community to participate. To get people to buy into a waste reduction program on a broad scale, whether through using recycling containers or changing wasteful habits, one must first obtain administrative support. The Association of Higher Education Facilities Officers (APP) has produced a manual for college and university facility maintenance entitled *Facilities Management: A Manual for Plant Administration*.

In the chapter dedicated to collegiate recycling programs, the manual points out:



Administrative support is vital to the successful implementation and operation of a recycling program. Lack of support results in an ineffectual program (Melnick 922).

You can obtain such support in several ways. A good place to start is by having the campus president or chancellor send a memo to the entire campus. The memo should introduce the program, state its objectives, state the reason for its implementation, and ask directly for everyone's participation. In addition to raising awareness of the program, such a memo lends the program credibility and lets people know that everyone on campus has a role to play. Similar statements or resolutions of support, targeting specific segments of the campus population, can come from administrative bodies such as student government and residence hall councils, or from department or auxiliary directors.

A second important form of administrative support comes from policies and procedures designed to support specific diversion activities. These can come in many forms and affect different targeted audiences. The University of Oregon, for example, is one of several campuses that requires all office paper be purchased with postconsumer recycled content, as long as quality and cost are equal. University of California, San Diego, in contrast, has a more comprehensive waste prevention and recycling policy. This policy directs various practices in areas such as source reduction, purchasing, new building construction, and vendor contracts.

In addition to motivating participation in waste diversion activities, campus policies can protect recycling programs from unrelated activities that adversely impact them. In some cases, campuses have acted to prohibit fluorescent colored papers that can contaminate paper recycling containers. Colleges and universities, as well as other state agencies, can also integrate policy into vendor contracts. The University of Chicago uses contract language to promote waste reduction with its food service vendors:

The Vendor shall participate fully in the [University of Chicago recycling] program in the disposal of all recyclable waste materials including, but not limited to, newspapers, metal and aluminum cans, cardboard, and glass, and shall separate and prepare such material as required by the program. The Contractor shall, to the greatest extent feasible, minimize the use of non-recyclable packaging (RECYC-L).

In some cases state laws may apply to specific functions of colleges and universities, such as in California where the Department of General Services has a policy that calls for retreaded tires.

### **Recycling/ waste reduction coordinator**

The second component to setting up an effective program is to hire a waste reduction and recycling coordinator. But this position isn't just responsible for managing the recycling collections. The coordinator plays a lead role in creating the waste management plan that guides the diversion program, and works to implement it on a long-term basis. This person can be expected to coordinate different tasks such as

- overseeing recycling contracts and agreements
- maintaining compliance with state and local regulations
- researching programs
- networking with other coordinators from other campuses
- preparing and managing budgets
- developing promotional material and education programs for staff, faculty, and students
- tracking recycling and solid waste tonnages, and calculating diversion reports
- maintaining equipment
- training
- supervising collection and education staff
- preparing grants, reports, and proposals
- promoting the program to the campus community

To accomplish these and other tasks requires a dynamic person who can work in multiple capacities. On any given day the coordinator may organize a promotional event, lead a workshop for department staff, or present a project proposal to a campus vice-president. An effective coordinator must have a firm grasp of the waste reduction, recycling, and solid waste field, possess good organizational and communication skills, and be able to work effectively with people from all parts of campus.

In addition, effective managerial skills are important for supervising the actual collection program. Terry Brennan, a recycling specialist at the California Integrated Waste Management Board, states it well:

The ideal coordinator must be motivated, have some political savvy, have the knowledge to develop the program, and have the authority to influence campus decision makers (Kennedy 11).

The importance of having a dedicated waste reduction and recycling coordinator is recognized and advocated by several authoritative sources. In California, state regulations specifically require such a position for state agencies, including community colleges and California State University campuses:

...at least one solid waste reduction and recycling coordinator shall be designated by each state agency . . . The coordinator shall be responsible for implementing the integrated waste management plan and shall serve as a liaison to other state agencies and coordinators (Public Resources Code 42920 [c]).

APPA also stresses the importance of designating a dedicated staff position:

A recycling coordinator should be appointed to oversee the recycling program. This position should be dedicated to this task only . . . This is especially important in the start up phases of any new recycling program . . . As recycling becomes more commonplace and established . . . the value of having a recycling coordinator will become more apparent. Hiring a full-time recycling coordinator demonstrates a strong commitment and allows the program to mature as the recycling infrastructure develops and changes in the industry take place. Just as an engineer would be hired for a designing position, appointment of a professional to fill the recycling coordinator position should be considered as the industry develops and regulations become more complex (Melnick 922-923).

### **Campus waste reduction committee**

The role of a committee is to investigate waste reduction and recycling options for the campus. It should be comprised of administrators, staff, faculty, and students that represent a cross section of the campus. Committee members should also be in positions of authority that allow them to implement the committee's findings.

Working with the waste reduction coordinator, the committee evaluates current solid waste management practices on campus and works to create a new plan or blueprint upon which the diversion program will be built. Once the plan is created, the committee retains the ongoing task of investigating additional diversion activities, policies, and procedures. As the diversion program progresses, the committee will monitor its adherence to goals and objectives according to the established timeline.

The ability of a committee to succeed will depend entirely upon its membership. By including members from all parts of campus, the committee will benefit from a  hand perspective from a variety of areas. This will help with the identification of potential challenges and opportunities. This is particularly true in the case of administrators from key areas such as purchasing and facilities, which hold the greatest potential for diversion activity.

Members can also play an important role in taking the priorities of the committee back to the areas being represented, acting as advocates for the people with whom they interact. Members should be designated as liaisons to top administrators such as vice-presidents or vice-chancellors, and help to keep them apprised of the committee's activities.

### **Waste characterization study**

In order to create a successful waste diversion program, you must know what kinds of materials you will be diverting. A waste characterization study identifies what types of materials comprise significant portions of your waste stream. It also identifies the origin of the materials, and provides the information needed to prioritize recycling and other waste reduction activities. Some of this information can be gathered by less formal means, such as walking tours at night to see what materials are being left in waste baskets and trash cans. Walking tours can help on an

anecdotal level, but will likely not provide the data needed to target resources effectively.

Though all campuses can be expected to generate many of the same types of waste, the proportions of each waste type can differ tremendously. For instance, a campus with a significant on-site housing population will produce garbage more like that of a residential neighborhood than will a commuter campus. An urban campus with minimal landscaping will be far less likely to produce the volume of compostable greenwaste one would expect from a rural or suburban campus.

While some of this might seem obvious, studies show that such factors can often produce unexpected results. A 1998 study conducted at University of California, Berkeley found that paper made up a considerably smaller portion of the campus waste stream than anticipated. Based on a past study, the staff members predicted that paper would make up about 60 percent of the total waste stream. Instead, they were surprised to find that it comprised less than 45 percent. They were equally surprised to find that a relatively obscure material such as paper towels made up more than 5 percent of the total waste stream (Bucknell 3).

As you can see, the results of a waste characterization study provide the information needed to prioritize diversion programs effectively. Paper towels might not often be considered as a potential diversion source—but a study that locates a significant presence of them in the waste stream might lead to an investigation of alternatives such as cloth towels or electric hand dryers. Likewise, if further analysis of the paper in Berkeley's waste stream revealed that a high grade ledger comprised 60 percent of the total, but cardboard comprised only 5 percent, focus would shift to collecting or minimizing the consumption of the ledger rather than the cardboard.

Finally, a waste characterization study provides some of the baseline data needed to measure a program's progress over time. Another Berkeley study, conducted 10 years earlier, had shown paper comprising 60 percent of the waste stream. The 15 percent-plus drop by the time of the 1998 study indicated that progress had been made, and that more work still needed to be done.

### **Creating a solid waste reduction plan**

A solid waste reduction plan is the blueprint for operating a diversion program. Such a document integrates the work of the waste reduction committee, and outlines the program's goals and objectives based on a prioritized list proposed activities and initiatives. Though similar to the model integrated waste management plans, a waste reduction plan goes into much greater depth. A good plan resembles the source reduction and recycling element (SRRE) plans required of all California municipal governments, passed as part of Assembly Bill 939 in 1989. The local city or county's SRRE can be an excellent resource when developing a campus waste reduction plan.

A solid waste reduction plan should provide a list of goals and objectives for the program. It should also list the specific projects and initiatives needed to achieve them. It should include a business plan that outlines projected budgets and identifies sources of income and project costs. Based on an evaluation of the options available, it should prioritize the order of the projects, identify who will be responsible for the individual steps of the project, and provide concrete dates for completion or reevaluation. For each of the proposed projects, the plan should also identify

potential barriers to completion and what steps can be taken to overcome them. Finally, the plan should outline methods for monitoring program success, and define the criteria by which they will be measured.

Humboldt State University (HSU) followed all of these steps in creating its plan. Having recycled different materials with varying success for nearly twenty years, HSU organized its efforts under a single solid waste reduction plan in 1993. Its primary goal was to consolidate the different projects into an integrated program that could be coordinated and monitored. It divided the program into basic components and provided an outline for their implementation. In addition to discussing source reduction, recycling, and education, the plan included a procurement and funding component, described the programs to be established, listed resources needed to support them, provided timetables for their completion, and outlined criteria for measuring their success. HSU's solid waste reduction plan can be found in its entirety at [www.humboldt.edu/~recycle/](http://www.humboldt.edu/~recycle/)

## Four components of a program

A solid waste diversion program is made up of four basic components: source reduction, recycling, composting, and education. Each component plays an important part in reducing the amount of garbage sent to the landfill. This section provides descriptions of each component.

### Source reduction

Source reduction is considered the first and most important of the components. As opposed to recycling, which seeks to capture material already in the waste stream, the intent of source reduction is to change purchasing and consumption practices to prevent unnecessary waste from being created in the first place. The California Solid Waste Management Act defines source reduction as “any action which causes a net reduction in the generation of solid waste.” Or, as noted waste analyst (or “garbologist”) William Rathje puts it, source reduction “is to garbage what preventative medicine is to health: a means of eliminating a problem before it can happen” (Rathje 9).

Source reduction is important for three primary reasons. From a purely environmental or resource conservation perspective, source reduction completely eliminates the impact of consumption. Though recycling keeps material out of the landfill and reduces the demand for natural resource extraction, it still requires energy and other resources to collect, transport, and remanufacture materials. Source reduction, in contrast, requires none of these. Paper that is not consumed requires no logging of forests, and a reduction in plastic packaging minimizes air and water pollution.

From a waste management perspective, source reduction logically simplifies the job of collecting and processing materials for recycling. Waste that is not created requires no management.

The third and most tangible reason is cost savings. Source reduction walks hand-in-hand with other operational efficiency practices, and it can reduce unnecessary purchases.

While source reduction eliminates the need to manage waste material, it still requires an upfront and ongoing investment, albeit one of time and creativity rather than equipment or other large capital costs. Educating faculty and staff about the importance of source reduction can be more intensive a project than merely convincing them to deposit empty bottles in appropriate receptacles. Source reduction requires changing ingrained practices that have developed over many years. Educating people to alter their consumption patterns means communicating exactly what it is you want them to do, and letting them know why doing so is important to them and the campus as a whole. A successful program will create a culture in which people accept and mutually reinforce the practices being promoted. Finally, a successful source reduction program requires constant reminders and monitoring; new practices need time to become habit and ritual.

## **Recycling**

Of the different means of diverting campus waste from the landfill, recycling is the best known example.

Recycling as a means to conserve natural resources is pretty well understood. For colleges and universities, the task is to integrate recycling practices into daily operations as a means of increasing efficiency and cutting disposal costs. The key to doing this is to have a professional coordinator who understands the fundamentals of running an effective operation. It also requires understanding the services available locally and having a well-defined plan that reflects the priorities and resources available on campus. For most colleges and universities, the recycling program will target basic consumer and packaging materials such as cardboard, office paper, newsprint, aluminum, steel, glass, and plastic beverage and food containers. More developed programs may also collect specialized materials such as construction and demolition materials, obsolete computers, and large appliances.

As the name implies, recycling is a process of turning what is old into something new. To complete this process requires “closing the loop” by purchasing products made from recycled materials. For recycling programs to function, there must be a marketplace demand for such materials. By developing aggressive “buy-recycled” practices on campus, the campus helps to generate the demand that guarantees sufficient revenue for the recycling program itself.

## **Composting**

Composting is nature’s way of recycling organic material back into a usable form for new plant life. On college and university campuses, organic waste often comprises a large component of the total waste, typically one quarter (Kennedy 35). Since most campuses already have a system established for collecting and centralizing organic material, it can also be one of the simplest diversion activities to establish.

Composting is also aided by the fact that there is relatively little processing or sorting required during the collection phase. In the final analysis, composting offers one of the best waste diversion options available to colleges and universities in relation to the initial investment.

Composting activities can be divided into two categories: food and yard waste. While the two can be composted together, typically they are handled separately. Yard waste is usually segregated between branches and other woody materials and green waste,

(materials such as grass clippings, plant trimmings and leaves). Woody material requires chipping to allow it to break down faster. The chipped material makes excellent mulch for plant beds, or it can be used for covering dirt paths. Green waste can be composted several ways, the most common of which is to gather it into piles or windrows. The green waste is mixed together with other nitrogen-rich materials, helping create the chemistry needed for decomposition. With periodic “turning” of the piles or rows to allow in oxygen, the organic waste is composted into a usable soil amendment within six to eight weeks.

Food waste can either be composted along with the green waste in piles, or through containerized, or “in-vessel,” systems that break down the waste through artificial means. In some cases, in-vessel systems can be large mechanical boxes that use heat or constant mixing to accelerate the process. A less technical method uses worms to break down the food through a process known as vermicomposting.

In many cases, campuses have the option of composting material on campus or sending it to municipal or privately run facilities. Fees to drop off yard waste can vary between a nominal or no-charge arrangement, to prices in the same range as garbage tipping fees depending on the area and services available. For campuses with the space and motivation to compost material on-site, it may be possible to combine the operation with academic programs run by an agriculture department.

## **Education**

Education is one of the most important factors in the success or failure of waste reduction programs. Reaching the campus population effectively will determine the quantity and quality of materials diverted for recycling, the ability to implement successful source reduction and “buy recycled” initiatives, and the ability to influence the program’s overall level of campus support.

Efforts that seek to convince the skeptic or convert people to a utopian vision of resource conservation will get bogged down and accomplish little. Most people are receptive to recycling, and simply need to be provided with the “how-to” tools. Education programs should be designed with an understanding of whom they intend to reach and how the audience will likely respond. For instance, a campaign encouraging office staff to recycle paper at the deskside should be professional in tone, and should anticipate staff concerns such as limited space and who will be responsible for emptying the containers. The promotion should take into account that people have their own jobs and priorities; it should show how the activity will require only modest changes to their daily routine. In general, the more personal the message, the greater its likelihood of success.

An education program has several objectives. As with recycling, the objective is both to encourage program participation, and to teach people what is and is not recyclable. For many people, the inclination to recycle is greater than their knowledge of what actually can be recycled. This is especially true with paper, where contaminant materials are common and can seriously impact the quality of the material and the ability to market it. For source reduction and “buy recycled” promotions, the objective is to get people to evaluate how and what they consume. The trick is to show people that effective recycling practices are relevant to them, and that they can be implemented without a great deal of inconvenience.

An education program is successful if it can create a culture of general group enthusiasm, where people feel that they are contributing to a common goal. By giving the campus community a sense of reaching for that common goal, people's own desire to participate will help them attain it.

# Chapter 3. Planning the Recycling Infrastructure

There are many factors for colleges and universities to consider as part of planning the establishment or reorganization of recycling services on campus. What will be the scope of the program? Will it be comprehensive in nature, or merely target the high volume, high visibility materials? What collection methods will provide the greatest diversion potential? Who should do the work? What types of collection bins should be used, and where should they be placed? What education will be used to support recycling efforts?

The answers to these questions differ from one institution to another. For instance, a large campus will be able to better justify the purchase of expensive automated equipment. Similarly, urban campuses will not have as much motivation to focus on composting as a spread-out campus with extensive green space. These and other questions are important to consider during a program's planning stages.

This chapter specifically addresses two questions that need to be considered before implementing a recycling program: administrative infrastructure and locating recycling containers on campus. Future chapters will focus on other recycling-related topics such as collection and processing infrastructure.

## Administrative infrastructure

While many if not most collegiate recycling programs are operated by a facilities department, recycling is unique among the physical operations of a college or university. It does not necessarily have to be operated by the facilities department or even a single administrative department. Unlike other facility services such as building maintenance, custodial, or landscaping, many aspects of recycling operations do not require skilled labor. In addition, recycling operations are more wide ranging in scope, encompassing everything from emptying paper recycling buckets at workstations to preparing training workshops for staff and faculty members. As an outgrowth of the solid waste management sector, there is a substantial private service industry in place for recycling. Finally, recycling is unique from other facility operations because its purpose is to increase the efficiency of other university functions, and to minimize the environmental impact upon the campus, rather than fulfill an essential function in itself.

For all these reasons, recycling enjoys flexibility in how it can be administered. As such, the shape a program takes is largely determined by considerations specific to its campus.

## **Facilities**

Collection programs operated out of a campus's facilities department can be structured in several ways. In some cases they are autonomous programs, while in others they function under the supervision of custodians or groundskeepers. At many campuses the recycling functions are divided; custodians may be responsible for collecting materials inside buildings, while the recycling staff collects everything outside buildings. How a program can best be structured in this situation is largely determined by local conditions.

Objections from custodial unions or lack of enthusiasm from individual department managers are a few of the considerations that can affect where and how the program is structured. An important point to remember: recycling should be done with consistent management and a dedicated crew. Custodial or ground-operated programs that try to perform recycling activities as a secondary task, with shifting crews or sporadically available equipment, will not provide a service that responds well to campus needs.

The predominate strength of a facilities-operated program is that a professional, well-paid labor force will be able to accomplish specific tasks as needed. Facilities programs usually offer greater flexibility for special needs than students or contractors, because the employees are available and can be directed throughout the day.

## **Students**

Recycling programs operated by students usually start as a result of inaction from the campus itself. Most of the early student programs that began in the 1970s and 1980s did so at a time when campus administrators did not see a need for recycling, so student environmental activism stepped in to fill the void. The recycling programs at California State University, Long Beach (CSU Long Beach), San Francisco State (SFSU), University of California Berkeley (UC Berkeley), University of California, Davis (UC Davis), California State University, Chico (CSU Chico), California State University, Northridge (CSU Northridge), and Humboldt State University (HSU), all began due to student activism.

Over time, student programs have demonstrated strengths and weaknesses that set them apart from facility operated programs. Having played a significant role in the movement to establish recycling and waste reduction at colleges and university over the last twenty-five years, student-run programs have declined or relinquished at least part of their operations on many campuses.

The main strength of student programs is the creativity and enthusiasm that the students bring. This is true both for recycling collections and education. Student programs are more likely to initiate collection programs that target non-traditional materials such as packing peanuts or used office supplies, items that a facility-run program might avoid due to cost/benefit concerns.

Student creativity is especially effective for designing educational efforts such as skits, staging attention-grabbing displays, and other promotional activities. Student programs can develop innovative albeit unorthodox ideas. For instance, students at several campuses, including CSU Chico, UC Santa Barbara and Humboldt State

University, have integrated custom-built bicycles with trailers into their collection programs. In addition to conserving natural resources, the bicycles have been effective at creating attention and attracting volunteers.

In most cases, student recycling programs are funded by the student government or are otherwise officially sanctioned as a campus club. As such, student programs often act as a low or no-cost alternative to a facilities-operated program. Funding is generally derived from student fees instead of state money. The labor costs for these programs tend to be less as a result of lower wages, access to work-study funding, and the willingness of many students to volunteer. While the campus receives a student-subsidized service, the rational for using student fees is that they are being used to provide work and leadership experience to the students running the program.

The main drawback to student programs is a lack of consistency. Student labor is transient, and requires continual training. Scheduling around classes can be difficult, and often students leave a program without someone to cover last minute call-ins or other employees reporting sick. In addition, student employees often lack the communication skills and professionalism that are characteristics of full-time staff employees.

These and other shortcomings can be balanced by having a dedicated, well-paid coordinator to oversee the operation. Both CSU Chico and CSU Northridge have full-time coordinators employed by their Associated Student governments to provide consistency and program supervision. With a professional coordinator, student recycling groups can be operated efficiently and still provide a valuable learning experience to students.

### **Contractors**

Contracting out recycling services can have several advantages. Administrative, labor, and equipment logistics are handed over to someone else. For small campuses with limited capital budgets, it can be more cost effective to bring in a hauler who already has the trucks, balers and other equipment to do the job. Even for large campuses, a contractor can be required to provide dumpsters and smaller recycling containers, substantially reducing capital costs to the campus. On the whole, a contractor can be expected to offer consistent, professional service.

Stanford University is an example of a campus that successfully contracts all of its solid waste and recycling services. Recycling at the university had been operated for a number of years by a student program. When that program began to falter in the early 1990s, the university's garbage hauler for over fifty years, Peninsula Sanitary Service, Inc. (PSSI), stepped forward to assume recycling services. The university established an agreement that gives complete oversight of recycling collections to PSSI, which in turn hired a full-time coordinator to maintain and develop the program. To ensure they get a good value from their contract, university staff members annually review costs and existing cost controls for comparison against competing services (Fong, online). The company has subsequently taken an active role in promoting and developing recycling on campus, pushing the campus diversion rate to its current 53 percent. The company has developed education initiatives for the university beyond contractual requirements, including the promotion of source reduction and "buy recycled" initiatives. The arrangement has worked for Stanford

largely because of the mutual trust that has developed over the extended length of this relationship. The university gives the contractor latitude to manage nearly all aspects of its waste stream, and the contractor in turn provides the campus with a high level of personalized service (Muir, online).

## **Considerations for contracting**

Facilities, as well as student programs, may offer significant advantages over contracted recycling services:

- The coordinator or manager retains control over the shape and evolution of the program. Especially in the early stages of developing a collection infrastructure on campus there is often a need to adjust schedules, relocate receptacle locations, and perform other important duties.
- Facilities and student programs have greater flexibility to offer special services, such as providing special collection containers to faculty or staff who are clearing out large quantities of old files.
- Usually, in-house collection programs can merge their education and collection efforts together. Collection employees can identify locations with contamination problems that need greater signage, and can be trained to provide informal education as they go about their collection routes. For example, CSU Chico and UC Berkeley have programs where recycling staff collects paper inside offices during the day. The employees develop a rapport with office staff, identify who is following correct recycling procedures, and provide feedback.

In outlying areas with little competition, contractors are in a better position to dictate terms on issues such as cost and level of service. The service provided can be inflexible and strictly limited to the letter of a contract. If the campus requests that a full bin be emptied after the contractor has completed its route, the bin may be left alone until the next scheduled run.

In addition, getting tonnage reports from contractors can be difficult if not stipulated in the contract, and the cost of the service can be prohibitive. CSU Hayward found itself with a mixed paper collection and hauling contract that cost as much as \$20,000 a year for less than 75 tons of material diverted. Without a designated account representative, the campus was often forced to make repeated calls for basic services such as additional containers. When it requested tonnage reports, the university was told that weights were unavailable. After much pressing, the hauler eventually provided incomplete and inaccurate volume-based estimates (O'Keefe, online).

Clearly, the quality and cost of service depends on the contractors and the nature of the relationship they have with the campus. In the case of Stanford, PSSI is a small company that counts on the university for its entire business. As such, the motivation to provide a high quality service is essential to the company's survival. Hayward, on the other hand, contracts with a large publicly owned hauler, for whom the campus is just a small portion of a larger business. While the size of a company does not necessarily determine the quality of service, the experience of the two campuses does underline the importance of evaluating the level of customer service provided by potential contractors. Customer service, then, is just as important as cost.

An important step to take when contracting out recycling services is to carefully consider your own needs. Make sure these needs are included in the contract. Having strong language that closely defines what the campus expects is the surest way to guarantee quality service. For campuses with limited experience looking to contract for the first time, one option is to sign a short-term contract for a single year. This offers campuses an opportunity to evaluate the contractor, as well as to better understand their own needs. At the end of the year, the contract can be reviewed and amended as needed. See Chapter Six for more information on specific contract language.

### **Multiple administrative areas**

There are campuses, usually larger ones, which divide recycling collections into multiple departments under different administrative areas. This is often the case where a university has multiple campuses or a semi-autonomous facility such as a medical school. Another common variation is for campus auxiliaries such as housing or dining services to operate or contract out their own recycling collections. Separate recycling operations often reflect a general duplication of administrative services between the main campus and the auxiliary. Though they may oversee separate operations, the two recycling programs may share some resources, such as exchanging processing equipment or cooperating in a joint marketing arrangement.

### **Other administrative arrangements**

Various considerations have led some campuses to develop recycling programs under unique administrative arrangements. In some cases, recycling operations have been assigned to departments with seemingly little relationship to recycling. At California State University, Fullerton, for example, the purchasing department operated the recycling program along with services such as shipping and receiving, mail distribution, and property management. Arizona State University started its program under its facilities department, but later reorganized it under the property management department. Perhaps even stranger is California State University, Fresno's arrangement, which placed its recycling program under the management of the athletics department. Using grant funds, the athletics department set up a small community dropoff facility with roll-off dumpsters and Gaylord containers. Members of the track team provided labor for collecting beverage containers and paper around campus (King, online).

Administrative arrangements such as these frequently evolve during a program's early stages, when the operation is smaller and relatively easy to manage. In many cases, as with Fresno and Fullerton, individual staff members within specific departments assume the responsibility of running the program. Such departments may also be motivated by the potential to generate revenue from the sale of collected materials. While an athletics department may not seem an obvious home for recycling collections, it would make sense for the program to be run by a property office, or a similar department that already handles the flow of materials. Such a program is likely to possess the equipment needed to operate the program, such as trucks and forklifts.

Another practice used at a few campuses, including CSU Sacramento and UC Berkeley, is to work with job training programs such as local conservation corps districts. CSU Sacramento has a community drop-off yard and processing facility,

both operated by the Sacramento Local Conservation Corps. In addition to staffing the facility, the corps is responsible for collecting all beverage containers and office paper. In exchange for providing collection services to the campus, the corps retains any revenue generated from the sale of material; it is also allowed to use the facility for processing material collected from off-campus sources.

As when dealing with contracted waste haulers, working with outside organizations such as the conservation corps means relinquishing a certain amount of control over how the operation is run. Flexible scheduling and calls for special collection must be filtered through the organization's manager.

### **Hybrid programs**

Many campuses do choose to outsource some of their recycling program while doing some of it on site. Usually this involves delegating control of certain material or different stages of the collection process to different departments or contracted vendors. A common approach is to collect materials with department staff and then deliver them to a contracted processor. This contractor would then take responsibility for baling or otherwise preparing materials for market.

Many campuses use department staff to consolidate campus material in a centralized location, where a contractor can pick it up. In situations where a contractor is paid to actually run a collection route on campus, the route is usually limited to specific materials at high volume locations. For instance, the contractor may send a compactor truck to collect cardboard from a bookstore, dining hall, student union, or other location that has a steady flow of material. This type of arrangement leaves smaller volume locations to be collected and consolidated by campus employees.

### **Professional oversight**

Regardless of how recycling services are structured administratively, it is important to ensure that the program is coordinated professionally and given sufficient resources to carry out its mission. Especially in situations where student groups oversee the operations, or where operations are contracted to outside vendors or split among several administrative areas, it is important that a coordinator or manager exists in a position of authority to work across departmental lines. An effective program must have someone who can make all elements of the program work in tandem with each other. The person who coordinates these activities must be competent in the intricacies of recycling and be skilled both as an administrative analyst and as an operations manager. From one day to the next, the person should be capable of functions as diverse as planning long-term objectives or operating forklifts.

Without professional oversight, recycling programs risk being inconsistent and losing the support of the campus community. Because it requires people to change their behavior, recycling in many cases must be able to "prove" itself. A program that has a poor community reputation will have a difficult time eliciting enthusiasm and participation.

## Stakeholders: Supporting roles

Recycling touches all areas of a campus. At the same time, recycling depends on the input and support of many people both on and off campus. To fully integrate recycling into the daily operations of a campus, it is important to develop relationships with the people who directly affect its development. The following are some of the people who can play a supporting role in a campus recycling program.

- *Solid waste manager.* In situations where the person overseeing garbage collection is different from the recycling coordinator, the two individuals should have a close working relationship. This relationship is important for coordinating day-to-day collection activities as well as long-term planning. They will need to make sure that trash and recycling containers are paired next to each other, and that changes with the collection of one waste stream do not adversely affect the other. They will need to provide feedback on areas of campus where concentrated amounts of recyclables are being thrown out with trash. They may also wish to share equipment or staff.

Campus policies designed to encourage recycling through chargeback price incentives will require coordination between the two individuals. If a contracted waste hauler handles the garbage on campus, the contract administrator becomes a conduit for coordinating with the hauler.

Perhaps the most important part of the relationship is the need to plan long-term changes to the overall management of solid waste and recycling on campus. Any diversion program will aim to reduce the flow of garbage while boosting recycling practices. As progress is made, it will be necessary to alter both garbage collection and recycling operations in order to reflect the new situation.

- *Vendors.* A campus recycling coordinator should have a contact person with contracted vendors with whom they communicate on a regular basis. Recycling collection runs do not remain static, and they require changes over time. Service may need to be increased or decreased in certain areas. Problems with contaminants in recycling bins will need to be addressed. Special pickups may be required at certain times. The campus will need to receive regular reports of tonnages. All of these are issues that may require coordination between the two organizations.
- *Custodial.* Custodians are the eyes and ears of a campus, and they can often provide feedback on a recycling program's successes—as well as point out its problem areas. For instance, custodians may observe that particular garbage cans are full of recyclables, while a recycling bin down the hall sits empty. Knowing this information helps the recycling coordinator to reorganize collection locations and schedules.

Custodians are also frequently aware of special collection needs. They may notice new furniture or computers being delivered, and the need for extra cardboard pick-ups. They may know when staff or faculty are discarding old files, and can warn the recycling coordinator to deliver special collection containers. Custodians play an active role in the recycling program on many campuses; they are often responsible for collecting indoor containers and

consolidating them to a centralized location. Working with individual custodians is necessary to address issues such as bin placement and ergonomic problems with the containers used.

It's particularly important to work with the custodial manager when planning changes to indoor collection practices. An increasing number of campuses are experimenting with changes in the collection of trash and recycling in classrooms and at workstations, supporting efforts to increase efficiency and encourage recycling. For instance, some campuses have cut back on collecting wastebaskets to twice or three times a week in order to free up staff time for servicing recycling containers.

- *Contracts officer.* The recycling coordinator can provide input to contract officers regarding solid waste and recycling contracts as well as general contracts. When solid waste and recycling contracts are being prepared, there are many important provisions of which the contracts officer may not be aware. Everything from the fundamental structure of a contract to determining the specificity of service to be provided is important to communicate. From the beginning stages of a Request for Proposal or bidding process, through to the signing of a contract, it is essential to communicate the program's needs with the contracts officer in charge. These needs should be integrated into any final agreement.

The recycling coordinator can also work with contract officers to include special language and provisions in contracts not directly related to recycling including food vendors and construction and demolition contracts. One example would be inserting a clause into beverage vending machine contracts, requiring that plastic bottles be replaced with aluminum cans. The same contract could also require the beverage vendor to contribute funds or equipment in support of recycling efforts.

- *Architects and engineers.* Ensuring that recycling considerations are taken into account when new buildings are being designed will pay dividends for years to come. From providing ample room on loading docks to including inset walls in offices for receptacles, it is important to communicate with architects and engineers during the planning stages.
- *Administrators.* Recycling requires getting people to change habits. Make sure top administrators, including the university president or chancellor, provide visible support to the program. In addition to publicly encouraging the community to recycle, administrators can support recycling when new policies or operating procedures are proposed.
- *High-volume generators.* Develop a working relationship with staff and directors from offices and departments that generate large volumes of material. Doing so can help identify ways to reduce and recycle their waste. Some examples of areas likely to produce large volumes include the campus bookstore, copy centers, graphic or printing services, and computer labs. For example, you can work with the director of the campus copy center to ensure that all future copiers have double-sided copying capacity. Once the copiers are in place, work with staff to make sure the machines default to double-sided copying. You can also ensure

that campus copy and printing offices use high post-consumer content paper. Discourage or forbid the use of hard-to-recycle fluorescent colored paper.

- *Building coordinators.* Building coordinators generally control where recycling and trash containers are placed inside buildings. In some cases, the building coordinator may be a department chair, or the building may be under the purview of an administrator.
- *Police.* Coordinate with campus or local police or public safety departments to deter vandalism and theft of recyclable materials. Especially in urban areas, theft and vandalism can heavily impact a recycling program. Also watch for illegal dumping of garbage in campus dumpsters. In each case, the recycling coordinator can help educate the police and devise strategies for crime prevention. Let the police know that only certain people have authorization to empty recycling containers; tip them off to areas with consistent problems. In addition to overseeing law enforcement and parking permits, public safety officials may have input on issues such as where recycling containers can be placed around campus.
- *Fire.* Each campus has a designated fire prevention specialist such as a Fire Marshall to ensure compliance with fire codes and regulations. Before selecting collection bins, carts, or equipment and placing them in buildings, it is always a good idea to let the fire department be aware of your decisions.
- *Facilities director.* Obviously, a facilities director will have to be involved when the facilities department administers the recycling program. But even for non-facilities programs, the director may play a role. Student programs may need to request “back up” collection or equipment help. Solid waste and recycling contracts with outside vendors are likely to be administered from the facilities department.
- *Auxiliary directors.* Semi-autonomous operations of the university, such as residence halls, dining facilities and off-campus facilities, often receive recycling services from the same source as the main campus. Such services often require a formal memorandum of understanding and a chargeback fee. Even when this isn’t the case, the person responsible for solid waste and recycling needs to keep track of tonnages generated by auxiliaries for reporting purposes, and should thus maintain a relationship with the appropriate staff member. In California, community colleges and state universities are responsible for the overall campus’s diversion rate even if an auxiliary such as housing is administratively separate.
- *Environmental health and safety (EH&S) officer.* EH&S officers are, to a degree, in the same business as you are: handling waste materials on campus. Whether a recycling program needs to forward hazardous materials that show up in the recycling stream, or simply share equipment and other resources, the EH&S officer is a good person to know. In many cases the officer is also the person to turn to for training collection staff on operational safety procedures.
- *Associated student council.* Student-run programs typically reside under the umbrella of student governments and are thus dependent on the elected council

members for their annual budgets, capital costs, and even the scope of their mission. As with any other elected government body, politics can play a role in the allocation of resources. Maintaining a good relationship can be important to ensuring the ongoing support from council members. Promoting the program and its benefits, through the use campus newspaper articles and other publicity that casts the program in a positive light, help to show Associated Student councils the importance of the recycling program. Presentations to the council, program open houses and “V.I.P.” collection runs with council members can also help elicit support.

It's valuable to garner the support of student government even when students do not directly operate the recycling program. Students are often the strongest advocates for recycling and waste reduction programs, and they can help provide the political support to lobby resources from an administration. As the primary voice of the student body, Associated Student councils can pass resolutions of support and otherwise advocate for your program.

- *City and county recycling coordinators.* Recycling coordinators from local government can be an excellent resource for campus recycling programs. Most municipalities and counties in California have had recycling programs for at least a decade. Local coordinators can help with issues such as working with local haulers, negotiating local market conditions, and sharing education resources. Local government recycling programs can also be an excellent source of collaboration. They can help with promoting and coordinating activities such as America Recycles Day events or end-of-year move-out donation drives.

## Locating collection sites

### General considerations

Locating recycling bins requires more than simply sticking them around campus at random. The placement of containers can affect issues such as how frequently the containers will be serviced, rules governing fire safety and campus aesthetic standards, contamination of the materials being collected, and the amount of labor time needed to collect them. Most importantly, it can affect the willingness of the public to use them for recycling. Several fundamental considerations should be factored into this decision.

- *Convenience.* This is the North Star that guides all recycling efforts. Most people will not seek out recycling bins, so the bins must be placed in locations where people are likely to use them. Bins for beverage containers should be placed in high traffic areas such as major walking arteries, building entrances and lobbies, and congregation points such as outdoor quads, picnic areas, indoor lounges, and breakrooms. Bins should also be placed next to where recyclable materials are being generated. Office paper recycling bins should be put next to copy machines, printers, fax machines, computer labs, and staff mailboxes. Locations for office paper recycling should also target areas with tight concentrations of work stations, or hallways lined with staff and faculty offices. For beverage containers, bins should be placed near vending machines, concession stands, and walk-in markets. A walking tour through buildings and public areas is a good

way to gather information; pay attention to locations with disproportionate amounts of recyclables in the trash, and look for any patterns that can help you decide where to place recycling bins.

*Caption # 1: Paper recycling containers should be placed next to copiers, printers and other generation points.*

*Caption # 2: Bins for mixed office paper located near staff mailboxes make recycling automatic for staff discarding memos and unwanted mail.*

*Caption # 3: Beverage container receptacles near building entrances can be convenient for recycling but may cause odor or noise problems.*

*Caption # 4 & #5: Outdoor locations where people congregate, such as a campus quad or bus stop, are obvious places to locate beverage container receptacles.*

- *Alongside trash receptacles.* Pair recycling containers with trash containers whenever possible. People who generally support recycling will still discard whatever they have in the first receptacle they see. A distance as small as five feet between a trash container and a recycling bin will guarantee that some recyclables end up in the trash, and trash in recycling. To encourage recycling, it may be necessary to remove certain trash receptacles altogether to ensure parity with recycling.

*Caption # 6: Placing well labeled recycling bins alongside trash receptacles helps prevent people from throwing recyclables in trash, as well as throwing trash in the recycling containers.*

- *Accessibility to collection crew.* There may be tradeoffs between making receptacles convenient for the public and also making them accessible to collection workers. Will workers have to carry heavy loads down stairways? Are they going out of their way for only one or two modest volume-generating locations? Keep the needs of the collection workers in mind as you make your decisions.
- *Scavenging and vandalism.* These are difficult issues that are best addressed through locking mechanisms and thorough policing. However, location can have an impact as well. Bins in remote or poorly lit locations will be hit harder than bins placed in high visibility areas. It might also help to increase the signage in these areas.
- *Aesthetics.* Bottles and cans should be placed with noise and odors in mind; receptacles directly outside of classrooms or offices will likely draw complaints. Outdoor beverage container receptacles often attract yellowjackets and other pests during hot weather, adding to concerns over locations near building entrances or windows. Receptacle locations often require input from campus space or aesthetic committees and/or building coordinators. Their criteria for appropriate locations frequently differ from that of the recycling coordinator. While they may be looking to push recycling containers into remote, out-of-view areas, it is important to stress that the recycling containers are ineffective if not seen.

- *Fire codes.* Fire codes control what types of containers can be used and where they can be located. California fire codes require that any receptacles containing combustible materials (such as paper) be made of metal and have a self-extinguishing function.

Though fire codes are established by the state, deputy fire marshals and local inspectors have discretion in interpreting them. To avoid the hassle of rearranging locations or facing possible citations, review recycling plans, bins, and bin location in advance with the local fire officials. California State University and University of California campuses fall under the jurisdiction of state deputy fire marshals, and many University of California campuses have their own assigned deputies. State-funded community colleges are monitored by deputy fire marshals and local inspectors (California Code of Regulations).

### **Centralized consolidation points**

Unless a collection system calls for removing all recyclables as they are picked up inside a building, a central location is needed for consolidated material. Under this common system, custodians or other collection employees empty containers from throughout the building into large carts or dumpsters in the central storage area. From there, the material is picked up with trucks for delivery to a processing facility. Ideally, the consolidation point for a building is on a loading dock, or in a fenced-in enclosure area adjacent to the building. With many older buildings or in densely built areas, these amenities can be nonexistent. In this case, one either chooses a collection system where material is removed completely from the building each day, thereby removing the need for a consolidation area, or space must be annexed from parking spaces, landscaping, or other uses.

A centralized storage area should also take into consideration the number and size of the bins to be used. Three primary factors influence what types of bins and how many of them will be used:

1. The volume of material coming from the building will require a minimum storage capacity. The recycling coordinator should take the time to look at the occupancy load of the building, what types of activities are taking place inside, and the number of smaller indoor containers to be emptied.
2. Space is the second consideration. The ideal collection system allows for storing the most material possible, thus cutting down on the frequency with which bins must be serviced. However, the space available for storage bins may limit both the number and size of the bins; available space will also affect the loading and dumping of bins. Loading docks must have enough room to wheel carts around. One-and-a-half to three-yard dumpsters must be at ground level for certain types of trucks to be able to dump them, effectively ruling out the use of elevated loading docks in this case.
3. The third factor is the standard in use across campus. The recycling and waste management professional will seek to use the same types of containers for individual materials throughout campus for obvious efficiency reasons. When planning the collection system for the entire campus, consider what types of bins and equipment will function well in all locations.

Once you know what type of bins to use, you'll still need to figure out the collection schedule. To compensate for some buildings generating higher volumes than others, you will have to consider whether to place additional bins at the high volume buildings, or use a staggered schedule that hits certain buildings with greater frequency than others.

*Caption #7&#8 : Loading docks and fenced enclosures should have sufficient storage space and easy access for collection trucks.*

A final consideration to make with storage areas is accessibility. Bins must be easily reached by the indoor collection staff, as well as the vehicles that will be servicing them. While in most cases a flatbed pickup truck will have enough flexibility to approach closely, allowing the driver to wheel out smaller carts, larger compacting or curbside-style trucks will need space to maneuver if the location is in a cul-de-sac or other space that requires backing up or turning around. Such a vehicle generally needs at least twenty to twenty-five feet of space to maneuver.

### **Determining the number of containers needed**

It's important to provide a sufficient supply of recycling containers for both buildings and outdoor areas. This will help guarantee that there are enough separate locations to provide accessibility, and ensure that there is sufficient collection capacity for the individual types of materials being generated.

There are several criteria to evaluate when deciding the appropriate number of containers for a given area. The first step is to look at the occupancy load and type of recyclable materials likely to be generated. For any given building, how many offices or workstations are there? How many classrooms are there in a building? Though paper and bottles and can containers will be generated in each case, classrooms are likely to produce a disproportionate amount of bottles and can containers, while workstations will produce far more paper.

Even between staff workstations and faculty offices, there may be differences in volume significant enough to affect the recycling system; you must consider whether the area is more populated by faculty or administrative staff. Both generate large amounts of office paper, but faculty tends to discard paper in purges rather than in a consistent daily flow. Administrative staff, on the other hand, is more likely to produce a continual heavy output of waste paper. This information can help you decide where and how many recycling containers to allocate. If areas with high concentrations of administrative staff warrant a medium-sized container for every 10-15 people, for faculty it may suffice to use a higher ratio of 15-20 people to a container, while simultaneously creating an arrangement that provides special collection services when files are emptied.

You need to look beyond the general profiles of the building as well; keep an eye out for situations that warrant special attention or services. Journalism departments, for instance, often receive multiple copies of issues from many different newspapers, generating enough material to deserve special collection arrangements. Libraries will also produce a large amount of newspapers and magazines as they replace their periodicals with microfilm copies. Science stockrooms will discard large amounts of cardboard from incoming supplies. Mailrooms can generate significant amounts of

undeliverable mail and catalogs. Departments can overwhelm normal paper recycling containers with bulky, lightweight shredded paper. For buildings with a large amount of paper being shredded, more frequent collection service may be required from central storage areas.

Recycling coordinators can employ several methods for identifying these potential special situations, as well as understanding the general material volumes around campus. The first method is to walk through buildings, speaking with staff and asking them about any special situations. The second is to look at purchasing records to find information such as how many reams of paper a department buys in a given period. Perhaps the best way to gather relevant information is to actually examine the contents of garbage at specific buildings, which can be done by conducting a waste characterization study. For more information on performing a waste characterization study, see Chapter Eight.

*Caption # 9: Bulky and lightweight, shredded paper can be awkward to store and handle.*

A final note to consider when placing recycling containers around campus: the location of recycling containers can and will change over time. By studying which recycling containers are underused and which garbage receptacles continue to fill with recyclables, you can move bins around and find the optimal locations. Additionally, as education efforts take effect and people adjust to the new system, the number of containers needed in different locations will likely require adjustment. Naturally, you will not want to continually shift bins around—this will cause confusion—but periodic reevaluations can help keep the system running efficiently.

### **Office/classroom buildings**

Building interiors present their own range of issues to be considered when locating containers. In office/classroom-oriented buildings, where paper is the predominate material, a common system is to collect material in several stages. Each staff and faculty member should have a small (10-30 quarts) deskside container for collecting discarded paper, just as they do with wastebaskets. Without such containers, the paper will usually end up in the wastebasket. These small containers are then emptied into centralized medium sized (25-40 gallon) containers. The final stage is to consolidate these containers into the large bins or dumpsters located at the storage/loading dock areas. Because of its bulky nature, cardboard is rarely handled with intermediary receptacles inside buildings; instead, it is collected from individual workstations daily and taken directly to the central storage area or removed from the building completely.

*Caption #10: Each office and workstation should be provided with deskside containers for collecting office paper.*

### **Residence halls**

Residence halls generate the most diverse mixture of solid waste on campus. Whereas other campus facilities lean disproportionately to certain types of waste—such as paper in offices and classrooms, bottles and can containers in sports facilities, or food waste and packaging in dining halls—residence halls tend to produce a balance of all types. As such, a comprehensive recycling program for residence halls requires collection containers for many types of materials. The collection process is

somewhat simplified, however, since residents are generally required to bring their recyclables and garbage to a few centralized locations.

Recycling infrastructure varies depending on the type of building. For instance, for smaller buildings with only a few floors, the most efficient collection system will be to establish a single recycling/trash drop-off location either on the ground floor or just outside the building. The location should be easily accessible by truck. Larger and taller buildings will require multiple locations because of the distance loose materials have to be transported. In these situations, a chute system can be put in place so that gravity can do all the work, or a recycling/trash closet or room can be provided on each floor.

This last option may be a difficult one. Closets or rooms can be labor intensive to service, requiring collection workers to negotiate recycling bins through hallways and elevators on each floor. This handling process prevents the use of large dumpsters, but smaller, more-mobile containers such as wheeled carts fill up fast when a large population relies upon them. You can either place multiple carts for each material at each location—or if there is not enough room, you may find yourself having to service a limited number of carts on a frequent basis.

Despite their advantages, using chutes can be problematic as well. While chutes help consolidate recycling and garbage to the ground floor, in older buildings they are usually designed to handle a single waste stream: trash. In this situation, the trash may continue going down the chute as it always has, while 50-100 gallon carts are set up in the designated closets on each floor. In this situation, it's important to not separate the trash containers from the recycling containers if at all possible. As with other situations, such a separation will inevitably lead to more recyclables in the trash.

Regardless of how the centralized drop off area is organized, it is also good to focus on the individual residents in their rooms. The determining factor in whether someone will recycle is often decided at the point of generation. If people are only given one container in which to put everything, many people will not choose to sort through their trash once they bring it to the central drop site. Just as you would provide office workers with deskside boxes, you should provide each dorm room or suite with an additional small container for recycling.

Suites with cooking facilities should also be given recycling containers. Where possible, install cabinets for storing the containers. Cabinet space helps keep the recycling containers from being moved around or removed altogether.

### **Dining facilities**

Dining facilities will generate more bottles and cans and food containers and cardboard than any other materials. Receptacles for bottles and can containers in dining halls can be placed in several locations, such as dishrooms or existing trash containers. Outdoor patios and exit ways are also good areas. Dining halls will also generate newspapers, so paper receptacles should be provided as well.

Cardboard and steel/plastic containers for food are mostly handled by facility staff, and don't generally warrant recycling bins inside the public areas of the facility. Rather, such bins should be placed on loading docks or storage areas for access by

collection trucks. With these materials, it's important to establish and train facility staff about procedures for preparing the material for recycling—such as breaking down cardboard boxes, rinsing out food containers, and placing material in the collection containers.

### **Sports facilities**

The amount of recycling at sports facilities depends on whether beverages are being sold in pre-packaged containers or in disposable cups. In the case of the latter, there may not be a great deal of material to collect from public areas. As with movie theaters, many people attending sporting events prefer to let others clean up after them, leaving their waste sitting in the bleachers. For this reason, recycling beverage containers can be difficult.

Though locating receptacles near the exit may seem the appropriate choice, the best way to capture cans and bottles is often at the nearest point where the audience leaves the stands. When people see the receptacles as they get up from their seats, they may decide to pick up after themselves.

As with dining halls, cardboard is primarily handled by staff rather than the public. Assuming that concession stand staff is properly trained to recycle, cardboard dumpsters can generally be placed alongside existing trash dumpsters. See Chapter Nine for more information on special events recycling.

### **Designing recycling into new buildings**

With the construction of new buildings, recycling coordinators have a golden opportunity to proactively incorporate recycling into the design. Buildings constructed in the pre-recycling era can present considerable obstacles—just ask anyone who has ever tried to place a paper recycling barrel in a cramped hallway, or a cardboard dumpster near a building with no storage area. With new buildings, effective planning during the design phase can eliminate many of these problems. However, architects rarely think of recycling or trash issues when juggling the hundreds of other factors involved in design.

Inside the building's hallways and rooms, make sure that space is allocated for containers. The preferred method for doing this is to include inset areas in the walls. These should be deep enough into the wall, between 16-24", to fully remove the receptacles from passing foot traffic. The space should be long enough to fit multiple containers, with extra room for any future expansion or change of use. Depending upon the intended uses of specific rooms, you can also include recycling cabinets or closets.

Central storage areas outside the building are equally important to include in the design. Take the time to consider what types of bins will be used and what types of trucks will service them; keep in mind the various factors already discussed in this chapter. If a loading dock is intended for the building, enough area should be provided for both storage and loading/unloading. If no loading dock is planned, make sure there is space allocated for a fenced or walled-in storage area, and that large trucks will have sufficient maneuvering room.

For new high-rise buildings or residence halls, chute systems should be installed for handling multiple materials. New systems designed in recent years even allow for

collecting recyclables that are source separated. This system uses a single shaft that empties into collection bins on the ground floor, with the bins situated on a revolving carousel that automatically rotates to the designated material type.

Looking beyond design elements, be sure to anticipate equipment and receptacle needs for the building. Make sure their purchase price is covered in the overall project budget, especially if the building is large and requires several thousand dollars worth of equipment to serve. You'll have better luck finding the resources you need in a construction budget containing tens of millions of dollars, rather than in the limited budget of a recycling program.

Incorporating recycling considerations into the design of new buildings should be seen as a basic, cost-saving investment, like motion detector lighting and ergonomic furniture. By taking steps to plan for recycling at the beginning of a building's construction, your campus will benefit from the long-term operational efficiencies and cost savings that recycling can bring.

# Chapter 4. Building Management Support

## What's so important about management support?

Management support is the difference between a program that thrives and one that squeaks along. For those working in recycling programs with managers dedicated to reducing costs, saving money, and helping the environment, be grateful—and take the opportunity to show your university the value of a well-run recycling program.

For those who have only slightly supportive managers—who are not stopping recycling programs from being implemented, but are not actively moving them forward—be patient. You can still demonstrate the value of a well-run program. Knowing the situation you're faced with is the first step towards devising a strategy for change.

Management support will help ensure the longevity of your programs. Someday you will leave your job and move on to a new phase in your career. When this happens, you want the programs to continue without you, to be ingrained into the campus culture. To accomplish this, your programs need to be institutionalized. Developing and maintaining upper-level management support will help keep your programs alive.

## Gaining management support

### Start at the top

It's important to have the endorsement of the highest officials at your college or university. You want them to agree with what you do, and you certainly want them to promote the importance of recycling. You need to be able to promote the fact that the Chancellor/President recycles, so that the faculty, staff, and student populations understand recycling to be an accepted and expected way of doing business.

### Communicate with your benefactors

One of the best ways to build management support is to keep the lines of communication open. If you have a problem, discuss it with your manager and ask for guidance. Realize that you probably don't have all the information about campus people and practices, and that your manager will know more than you do about campus politics. You have been hired because you're a professional who knows the recycling business; you should be able to discuss problems with your manager openly.

## **Prioritize your efforts**

You won't be able to make everyone like you or your program. A percentage of people will never be swayed to your vision. Recognize who they are and move on without them. Spend your time and effort on people whom you can persuade. In fact, once you persuade the people who are open to your message, they may eventually apply peer pressure to those who remain skeptical about the benefits of recycling.



## **Work with the students**

Getting involved with the students' environmental concerns is the best way to earn their support for your program. Work with and sponsor environmental clubs and events on campus; let students get to know you. The Public Interest Research Group (PIRG) chapter on campus is a good place to meet the student environmental activists, and to familiarize yourself with their issues. It can also be effective to work with members of student government.

Keep in mind that most campuses have different names for their environmental clubs, such as the Student Environmental Action Coalition (SEAC). Look for student groups that could be supportive of your issues. Encourage student activism.

University officials will be reminded quickly that they actually work for the students; if the issue is important enough for the students to petition the Chancellor/President, it's important enough for the allocation of staff and budget resources.

## **Be friendly**

Meet the staff in every campus building you visit. Find out who the key contact people are, and introduce yourself to them. Goodies never hurt either; promotional items such as pencils, pens, and notepads with your contact information are effective "leave behinds."

While most of your program will serve students, staff and faculty comprise a large portion of your audience and will appreciate being remembered and included. In addition, staff and faculty are excellent resources for identifying and resolving potential problem areas in your recycling program.

## **Write your own rules**

Campuses generally have a "policies and procedures manual," which is an excellent place for a recycling and waste management policy. This policy can serve as an official guideline for making key recycling decisions.

Developing such a policy needs to be an inclusionary process. You want to have all the players at the table when the policy is being created. Be sure to have representatives from faculty, Purchasing, Student Affairs, student government, Recycling/Waste Management Staff, Housing, Dining and any other departments or disciplines that the policy could affect. Be sure to include the Environmental Studies/Engineering department, if your campus supports one.

When forming such a committee, you'll want to build a "community." You can do this by

- Serving refreshments at meetings.
- Making sure the meeting area is pleasant and conducive to productive exchanges.

- Having an agenda for each meeting.
- Giving participants copies of other campus policies before each meeting.
- Developing specific questions that need to be answered by the policy.

This committee will become an advocate for recycling and environmental programs on campus, so dream big and encourage the participants to do the same. They're going to have ideas of what will work, but they will also look to you for guidance. As always, you were hired because you're the expert in the field—so be prepared.

Developing a policy is generally a long process on a college/university campus. Be patient, and prepare yourself for a massive influx of information. But you'll have the opportunity to work closely with managers and leaders from other areas of the campus, and that's an excellent way to build your support base.

When you have the details of a policy that you want and the consensus of the group, your next step is to take the policy up the “chain of command.” It’s generally a good idea to have discussed the policy with the appropriate officials beforehand, so you’ll encounter no surprises when you seek their final approval. This is a good opportunity to work with your manager or administrator, who knows the players and can help you navigate the minefield.

## **Conclusion**

All of these methods can help build management support for your recycling and waste management programs. You are starting a revolution on your campus, and it requires a certain amount of effort—but many times, you’ll find that the campus leaders will follow your lead and provide the necessary resources for your recycling initiatives.

# Chapter 5. Job Descriptions

## Introduction

In order to create a well-organized, efficient, and consistent university recycling program, it is important to analyze your campus needs and develop a support system that will accomplish your goals. Every campus is unique in resources, size, space, and other details, and your administration may choose different avenues and strategies in order to meet your program objectives.

Utilize the strengths within your campus community, such as a dedicated custodial staff, enthusiastic student participation, or association with private industry. Individual strengths can help create a well-rounded, viable program. One important thing to remember, however, is to analyze your entire waste system and find a way to reduce, reuse, and/or recycle material in the most efficient way possible. This is where a full-time recycling coordinator and support staff are needed.

## Management positions

### Recycling Manager

Recycling managers oversee all elements of a recycling program. Their responsibilities include developing programmatic policy and planning, budgetary decision making, grant writing and administration, ensuring compliance with state and local regulations, and supervising multiple full-time and part-time staff. This is an administrative position, responsible for decisions regarding the “big-picture elements” of program establishment, growth, and implementation.

### Recycling Coordinator

Recycling coordinators oversee the daily operations and details of a recycling program. Coordinators implement programmatic elements such as policy, planning, and expansion. They provide training and guidance to staff, faculty, and students, and serve as the main contact for daily operational information. They are responsible for the education and promotion programs. In general, coordinators are not held responsible for budgetary funds, grant administration, or staff supervision. Rather, they help implement, establish, and grow the program as designed by the manager.

### Common titles for recycling staff

- Recycling Manager, Recycling and Solid Waste Management Manager, Program Administrator
- Recycling Coordinator, Solid Waste Reduction Coordinator, Waste Prevention Coordinator, Administrative Analyst/Specialist

## **Common departments for recycling staff**

- Facilities Management
- Physical Plant
- Campus Services
- Grounds and Custodial Services
- Operations Office of Grounds Services
- Student government

## **Responsibilities and duties**

The responsibilities of the Recycling Manager or Coordinator are wide and varied. This section addresses many of the positions' potential responsibilities.

### ***Programmatic planning and development***

Develop, implement, and manage a comprehensive integrated solid waste management and recycling program that will meet the conditions of legislative mandates.

Plan, organize, manage, implement, develop, evaluate, and coordinate all recycling collection and removal activities, collection standards, and storage areas. Monitor buildings for participation in recycling programs and resolve day-to-day operational and customer service issues. Implement projects and programs to improve recycling in residence halls, dining commons, apartments, offices, and maintenance shops.

Oversee maintenance inventory of equipment. Conduct field investigations.

Operate programs using the financial resources available. Manage program costs and income for recycling and waste reduction programs. Assist with development of annual budget; recommend equipment purchases and supplies. Bill clients for services. Submit annual budget and capital expenditure reports.

Research private and publicly funded grant opportunities to fund the expansion of waste prevention and recycling programs. Develop and write competitive grant proposals. Implement grants, and write status reports and/or summaries as required. Ensure that the grants are kept within budget and within the timeframes specified. Maintain a good relationship with potential funding agencies.

Serve as primary facility contact for all waste prevention and recycling activities.

Collect, maintain, and analyze type and quantity of materials from all facility recycling efforts. Prepare periodic summary of diversion reports for financial analysis and submission to regulatory agencies.

Coordinate and administer contracts/service agreements made with recycling vendors, including contract specifications, terms, conditions, and services. Initiate and negotiate competitive bidding and marketing of recyclables and landfill fees. Monitor agreements throughout duration of contract. Serve as liaison with waste disposal companies on refuse issues.

Establish and maintain computer database of campus waste disposal, recycling, and waste reduction programs for contact information, disposal amounts, and potential for targeted diversion programs. Use database information to expand service offered in buildings and to improve customer satisfaction levels.

***Programmatic planning and development***

Establish annual goals for waste minimization and recycling, and serve as principle advisor and consultant to facility departments and organizations. Work with local and state waste agencies to achieve goals of the program and to advance the visibility of facility recycling throughout the state.

Track program objectives and goals to ensure increased recycling and reduction in waste-to-landfill. Provide quarterly status report to administrative office. Provide background information on facility waste reduction and disposal for legislation and administrative orders.

Give presentations and lead discussions on the facility waste reduction and disposal programs with facility departments, student organizations, and vendors.

Work with purchasing office to provide information pertaining to the legal requirements of recycling and buying recycled products. Track information on the quantities of recycled content materials used at the facility.

Work closely with recycling associations and industry experts to monitor and analyze changes in waste disposal and recycling industries.

Develop forward thinking facility policies and/or procedures as they relate to waste reduction and disposal; lead implementation efforts. Organize and serve as principle advisor to facility recycling/waste advisory/conservation/green committee. Provide committee members with current waste diversion and disposal information, market information, and status on potential grants and expansions.

Review remodeling and new construction plans to incorporate waste systems that meet departmental goals, governmental regulations, or mandates. Work with capital projects to develop standards for space to accommodate recycling and refuse collection activities in new and renovated structures.

Analyze present waste disposal and recycling systems and costs, and make recommendations based on developing technologies in the trade. Keep facility waste diversion and disposal programs on the cutting edge of the field by implementing new and aggressive technologies.

Evaluate and conduct dumpster audits to monitor waste disposal activities, modify waste disposal agreements, monitor pick up schedules, and analyze the number of dumpsters needed to measure cost effectiveness of programs. Evaluate effectiveness of program using weights, volume reports, or surveys.

***General responsibilities and duties***

Hire, train, schedule, educate, supervise, and evaluate part-time and full-time employees. Participate on interview panels for other positions in the department.

Provide guidance on performance standards, work procedures, and safety practices.

Ensure that the team participates in appropriate health and safety activities designed to foster awareness; assist them in working safely without degrading the environment. Organize training sessions and seminars on safety and technical aspects of the trade. Maintain a functional awareness of the typical hazards of the work place. Monitor staff performance. Promptly report accidents on the job, and prepare, investigate, and submit accident reports.

Determine need for additional staff, and recommend salary actions.

Periodically participate in recycling operations.

***Educational elements***

Develop and implement education and outreach programs/campaigns targeting facility audiences to promote the cooperation and support of programs by facility departments, faculty, staff, and students.

Develop incentive programs to acknowledge people who actively support facility waste reduction and recycling efforts.

Promote program goals and awareness through newsletters, brochures, Web sites, advertising, posters, contests, events, and promotions.

Provide leadership and direction for students through internship opportunities.

Work with local media to promote positive aspects of program and projects. Write news releases and public service announcements.

***Programmatic recognition and public relations***

Research, monitor, and submit nominations and applications to award programs for waste prevention and recycling programs.

Serve on committees and boards of directors involved in the advancement of waste reduction and recycling programs.

Represent recycling program at regulatory, community, and industry functions, educate professionals new to the field, raise awareness, communicate the benefits of such programs, and further waste reduction and recycling initiatives.

Communicate with recycling coordinators at other facilities to keep abreast of latest regulations, technologies, or successful programs.

Communicate successes and challenges to other facilities, departments, campuses, and the general community through conferences, articles, and Internet communication.

Represent program at conferences and meetings. Network with recycling organizations and programs.

***General skills and knowledge***

College degree with a major in business administration, public administration, environmental science, engineering, or related degree or equivalent combination of education and experience.

Experience planning, directing, and managing operational functions of a campus-wide program.

Ability to operate forklift, front-end loader/back-hoe tractor, and other material-handling equipment.

Proven ability to define program goals and objectives, target campus audience, and implement effective education programs and develop outreach strategies to expand campus involvement.

Knowledge of state, federal, and local public resource codes related to solid waste and recycling.

Excellent interpersonal, communication, written, verbal, and computer skills.

Ability to extract, compile, analyze, and present pertinent data effectively.

Ability to represent university in public forums, discussions, and negotiations.

Skilled in effective supervision, including ability to monitor production and quality of work.

Strong organizational, problem-solving, troubleshooting, negotiating, and decision-making skills.

Demonstrated ability to work collaboratively with people at all levels of the university and establish effective working relationships in a diverse environment of individuals and groups, using a variety of interpersonal skills and knowledge.

Ability to build and maintain customer relationships through a professional approach to customer service needs and problems.

Demonstrated ability to work effectively in a high volume, multiple-demand work environment.

Knowledge of and ability to instruct staff in the safe and proper operation of equipment. Ability to understand and apply university policies and procedures.

#### ***Compost collections***

Have basic understanding of the composting process

Manage departmental composting project.

Provide daily pick up service for specific food scraps in campus food service areas

Coordinate with appropriate facility units for necessary material input and rotation of piles.

Arrange for the distribution of the final products

Knowledge of health and safety codes and vector management

## **Collection and laborer positions**

### **Recycling Assistant**

Recycling assistant positions are student or non-student positions, either part time or full time. Assistants participate in the physical labor of recycling collections and processing, as well as general daily facility education. These individuals drive vehicles, sort materials, and are the core organizational element of the program. Assistants are often the one-on-one site contact with facility employees/customers.

#### ***Responsibilities and duties***

Assist Recycling Coordinator with daily activities associated with facility recycling program.

Collect recyclables at the facility from receptacles in offices, printing areas, and buildings on campus. Deposit materials in appropriate locations; sort and weigh materials. Clean containers and carts with pressure washer equipment as needed. Clean any spills from beverage container recycling or paper bins. Remove contamination.

Record daily log of recyclables.

Collect compost from food service locations. Deposit compost in appropriate locations; sort and weigh material. Clean collection containers after each shift. Assume responsibility for organization of materials picked up during shift routes, time management, and self management. Remove contamination.

Assist with set-up and break down of recycling collections during special events, receptions, and athletic events.

Assist with vehicle maintenance when appropriate.

Display excellent customer service and ability to work with diverse groups of people at the facility and/or within the campus community. Attend all scheduled staff meetings and training sessions.

Communicate with other recycling assistants and recycling coordinator on any problems, messages, or missed pick-ups.

Ability to operate a forklift. Wear and maintain personal protective equipment in good condition, such as gloves and eye protection, and follow applicable safety guidelines.

#### ***Requirements***

Ability to lift recycling containers weighing fifty pounds. Must possess a valid state driver's license. Ability to manipulate containers up to 200 pounds and ability to lift 50 pounds.

Must be currently enrolled in a minimum of six units at the university. Graduate students must be currently enrolled in a minimum of three units.

### **Student / Operation Supervisor**

The Student/Operation Supervisor assists Recycling Coordinators with daily operations. This individual is intimately familiar with the numerous details of program operations and educational programs. The individual assists upper management with conducting

studies, record keeping, evaluating program effectiveness, and staff training. Student/Operation Supervisors play an integral part in keeping the program well organized and safe for collection and operation staff.

***Responsibilities and duties***

Train and instruct student staff/interns on office procedures, safety, programs, timelines, projects, and guidelines. Monitor student projects and report progress to the Program Coordinator. Delegates special projects and tasks.

Evaluates student staff on quarterly intervals concerning safety and completion of projects; takes necessary action for improvement and recognition of outstanding work.

Recruits facility/student employees and interns, and assists Program Coordinator with the selection of new facility/student employees and interns. Monitors completion of timesheets and accuracy of hours worked by facility employees and staff.

Responsible for filling in and completing manager duties when Program Coordinator is absent.

## **Office management and coordination**

***Educational Assistants***

Education is vitally important in developing a long-term, viable facility recycling program. Education Assistants are part-time staff, full-time staff, or students who participate through internship programs. Educational Assistants understand the operational collections system, and develop education programs for facility staff and/or the campus community. These individuals are integral to helping make recycling a daily habit at your university.

***Responsibilities and duties***

Plan, organize, and implement educational recycling projects and activities.

Assist with organizing other interns, research, strategic planning, and educational programmatic implementation.

Assist Program Manager/Coordinator with coordination of facility-wide recycling collection and transportation efforts, and diversion statistics and reports.

Assess program effectiveness, development, and improvement. Monitor logistical program aspects. Compose reports, memos, e-mails, and letters. Develop and present proposals to campus groups. Correspond with departments and offices on campus.

Design and develop educational activities and materials to help educate the facility community. Plan outreach presentations and activities. Develop, write, and create educational and informative flyers promoting program and special events. Research, establish, write, and edit quarterly newsletter.

Assist with facility events and promotions, develop an educational calendar, organize letter writing campaigns and local/state tours.

## **Additional operations and education staff assistant titles**

Each recycling program incorporates a variety of complex processes that need to be addressed on a daily basis. Depending upon your individual facility infrastructure and needs, the appropriate support system for your program may include additional staff positions. Additional staff titles at a variety of classification levels include Operations Director, Recycling Manager, Occasional Workers, Recycling Education Organizer(s), Compost Education Organizer(s), Safety and Operations Manager, and Office Assistant.

# Chapter 6. Contract Language

A contract is an agreement for services made between entities where responsibilities are listed and policy and procedures are explained. There are many compromises to be made when creating “win-win” contracts for solid waste and/or recycling collection, processing, landfill disposal, and/or material marketing. This chapter discusses items to include in these types of contracts, tips for bidding out contracts, and ideas to increase resource conservation in other vendor contracts.

## Model contract

A contract for collection, processing, and/or disposal or marketing of solid waste, recyclables, and compostables may be combined into one contract or divided into separate contracts with different vendors. They can be bid together or as separate items at different times. All of these contracts may include the following language or areas.

### Definitions

It is very important to define words related to the contract to prevent confusions and misunderstandings. For example, the terms “garbage,” “refuse,” “recyclables,” and “composting” can mean different things to different people at different times. One might define “fixed costs” as “depreciation and interest on equipment,” “variable costs” as “other costs attributable to providing the service,” and “variable expenses” as “labor and fuel.”

### Term of agreement

Define the length of the agreement and any extension periods that may apply. One can have one-year contracts to thirty-year contracts, although long-term contracts are not as common as five-to-seven year contracts. Short-term contracts are good for vendors who are not making any significant expenditures to service the contract, and they also good in situations where you are contracting out for the first time, as it allows you to understand your needs without making a long-term commitment. Long-term contracts are useful if one wants the vendor to invest in the program by purchasing new bins and equipment. The longer time the vendor has to amortize equipment purchases, the lower the cost for the contract.

### Pricing

There are many ways to arrange for the pricing of services. Options include being charged for the number of pick ups, number of pulls, a flat rate per month, cubic yards collected, tons collected, or an exchange of services for the salvage revenue.

The garbage rates can include recycling, or you can require that two separate rates be developed. Usually, it costs the same to collect and haul garbage, recyclables, or compostables. The break comes in the disposal tipping fee (or the lack thereof) and the salvage revenue. Look for discounted rates for source separated materials such as clean loads of yard waste, wood waste, or paper.

Develop a strategy that encourages the university to waste less and recycle more. For example, as recycling increases and garbage decreases on campus, allow the option to remove bins or decrease the frequency or the size of bins.

Define when costs should be added or subtracted during the year and how that will affect the rates. For example, Harvard University's contract states, "Any significant additions or deletions from the established pick ups during the course of the contract shall be subject to negotiation for the purpose of increasing or decreasing the contract code" (12). Another contract may require that the rate not increase during the contract term, but only during the annual rate negotiations. Some contracts require that payment for service to a bin be paid even if the bin is temporarily removed; the logic is that the vendor's costs does not significantly change because one bin is missing from the route (assuming the vendor passes through the disposal costs). Rates can be negotiated on an annual basis or on a contract renewal basis.

When negotiating rates, remember that the vendor does have costs. These costs include labor, insurance, permits, equipment, fuel, bins, franchise fees, and maintenance. The vendor needs to pay its bills and answer to banks for loans.

## **General specifications**

This section of the contract usually includes boilerplate language involving insurance, indemnification, performance bonds, nondiscrimination, compliance with the Occupational Safety and Health Administration (OSHA), and other items. This section will vary for each university and contract. The university's legal department should have the necessary language for this section.

Other items addressed by this section include:

### ***Termination for cause***

This section defines the penalties for non-compliance with the contract. The contract should state what will happen if the problem is reoccurring; for example, after three warnings for the same violation, the contract may be cancelled.

### ***Non-performance or failure to perform***

This section defines liquidated damages (monetary fines) for unexcused missed pick ups, non-reported blocked bins, repetition of complaints on route, inadequate cleaning or maintenance of bins, and other issues that are important to the university. Each of these violations should carry its own sanctions. Vendors should be notified verbally or in writing that they have caused a problem, and that liquidated damages will be assessed if they do not fix it within a certain time period.

### ***Prevailing wage***

This section states that the vendor must be in compliance with prevailing wage rate laws for all employees, including drivers and sorters.

### ***Uniform***

This section requires the vendor's employees to wear uniforms with a name badge, as well as an identification card that has the contractor's name and the employee's name.

### ***Occurrences***

While servicing the campus, the vendor's employees may be the first to see inappropriate behavior or an accident. UC San Diego placed the following language in its contract: "Contractor will be required to report any occurrences or observations of damage to University property, public relations problems, hazardous conditions, or any work assignment that will not be completed as agreed immediately to the Campus Contact" (7). This language helps encourage feedback and communication from the vendor.

### ***Normal working hours***

This section defines how early and how late the vendor can service the university. It also designates special times, such as finals week, when the vendor should take extra precautions not to disturb students. Make clear that the academic calendar has occasions when the contracted work may need to be increased or decreased. Specify the holidays when the vendor is expected to provide service.

### ***Work rules and routes***

This section states that work will be done as quietly and orderly as possible, and that disturbances or noises will be minimized. Define the roadways, sidewalks, stairwells, and elevators that the vendor can use to perform service.

### ***Communication***

Require weekly meetings with the vendor to discuss problems and new ideas. Ask the vendor to be available through the Internet and e-mail. Also, ask to have radio contact with the vendor's employees when they are on campus, and/or an immediate contact via cell phone with a manager. UC San Diego requires its contractors to provide a two-way radio so the university can maintain contact with the service trucks on campus. In addition, a representative from the university and a representative from the contracted company should exchange emergency contact information.

### ***Campus contact***

Establish a campus contact person who has the authority to add and remove collection points and service, answer service questions, and receive compliments or complaints from the campus community as well as the vendor. This person should meet weekly with the vendor.

### ***Contractor vehicles***

Require the vendor's vehicles to be in sanitary condition, well painted, and in compliance with all government rules and regulations. Require them to clean up, notify, and report to the campus contact person any spills with significant amounts of vehicle fluids. Also, require them to have safety features in the form of back up alarms and television cameras.

### ***Dedicated vehicle***

Require that the vendor's trucks enter campus with no material in the body of the trucks, or have drivers determine their trucks' net weight before arriving on campus so that accurate weights and billing can be determined. Require the use of onboard scales or other methods for verifying tonnages. In addition, require that no other waste be picked up on the way to the disposal location, unless the truck is weighed to determine the new weight. If the vendor cannot do this, establish a quarterly survey week to weigh the trucks and extrapolate the data. Another way to track materials is to determine the volume of the dumpsters and multiply that number by a density factor.  Serve the right to inspect the trucks.

### ***Location on site***

Determine if it is appropriate to have an on-site location for the vendor. The vendor may need space for an office, a parking space, a bin storage and washing area, or a place to process or store recyclables.

### ***Statement of work***

Clearly state the services the vendor is to provide, such as:

- “Collect all front loader garbage dumpsters listed in Attachment A and haul to the Landfill.”
- “Collect all recycling carts listed in Attachment B and haul to the material processing facility.”
- “Accept all organic materials from the campus, and compost them into a usable soil amendment.”

### ***Collection***

Describe the type of collections (such as front loader or compactor/roll-off), the type of material being collected (such as garbage, recyclables, or food waste), and the type of vehicle needed including any special equipment (such as cart tippers or lift gates). Put each type of service under a separate heading in the contract.

If billing is calculated per ton, each bin must be weighed. This requires the vendor to equip the collection trucks with on-board calibrated scales. UC San Diego contracts carry the following language: “Contractor’s front end loading vehicles must be equipped with an onboard scale device that allows the contents of each dumpster to be weighed and recorded at the point of service” (6).

Under each heading, describe the frequency of collection. For example, if three-times-a-week service is desired, define that as Monday, Wednesday, and Friday pick

up. In the attachments, place a list of routes, locations, frequency of service, and quantity and size of containers. State if weekend work is desired. Be aware that some landfill disposal sites and recycling locations are closed on Sundays, or are restricted to certain hours of operations. Be aware of traffic issues in the region.

### ***Containers***

Under each heading, describe the types of containers needed or currently being used. Determine if the vendor or the university should own, supply, and maintain the bins.

Containers should be kept clean and painted. If there is a large quantity of bins, require that a certain number be cleaned and/or painted every year. Require the vendor to complete container maintenance within two weeks of being notified. Require the vendor to keep a log that includes container identification numbers, locations, who reported the damaged bin, when it was reported, and when the repair was completed.

Describe how containers are to be sanitized. Require that containers be cleaned upon request, although city or county ordinances may require food service dumpsters to be cleaned more frequently. The university may need to provide a location to clean the dumpsters if vendor does not have a facility nearby. Require that a container of equal size replace a container that is being maintained, sanitized, or painted. All containers should be labeled clearly for the contents within them; the university should approve all labels.

### ***Special services***

Describe special service requests such as move out, graduation, athletic, and special events. Describe the types of equipment and supplies that will be necessary for these special requests, and give the vendor plenty of advance notice.

### ***Collection sites***

Require that collection sites be left neat and orderly. Containers should be placed in their original locations with lids closed. Specify procedures for overflowing bins and extra material left next to bins. It takes time on the vendor's part to clean up material left outside of the bin or material that falls from overloaded dumpsters. If the university is paying by the cubic yard, overloaded bins result in free service. In either case, overflowing dumpsters contribute to litter problems.

### ***Recycling***

Research for yourself and explore with your vendor the types of materials that should be targeted for recycling or composting. The vendor can only collect and process those items for which a market can be found, unless the university agrees to pay for the recycling of certain items. Determine where to find the material on campus, and the equipment needed to collect it. State under the "Collections" section exactly which materials the vendor should collect. Different areas of the university (student housing, academic buildings, athletics) and different services (yard waste, comingled containers, paper) can be broken out in separate sections of the contract so that each area and service can have specific language.

The contract should state that the vendor is expected to provide all labor and equipment (if necessary) to perform the described tasks, and that vendor will assume

general responsibility for the cleaning and sanitary condition of the collection locations. Specify where the vendor is supposed to pick up the recyclable material—for example, at deskside baskets or in designated recycling areas. It might be helpful to state the general public's obligation. For example, "Residents of multi-dwelling units are to bring recyclable materials to the designated recycling area and place in the appropriate bin."

Require university-approved labels on all containers.

Establish a procedure for reporting contamination of recycling bins, as well as the removal of those contaminants. Decide if frequently contaminated locations should be tracked on an ongoing basis for the purpose of providing education and training.

### **Processing/composting**

Determine if the vendor or the university should provide for the processing of recyclables or the composting of organics. Allocate a facility to perform these tasks if no space is available on campus. The university can also require vendors to take certain loads to material recovery facilities where sorting and processing will take place. The university can also require the vendor to provide notification of where the vendor is delivering or marketing the material. The university could pay a processing fee or a composting fee to have the contracted vendor or another vendor provide these services. The university should stay involved in the process to make sure material is handled appropriately.

### **Disposal and marketing recyclables**

Determine if the vendor or the university should provide for the disposal and marketing of the materials. You can require the vendor to have its own contracts with landfills and markets for recyclables. Find out if your university qualifies as a state agency, and check to see if the local landfill gives discounts to state agencies.

After providing for all of the collecting and processing of recyclables, contract language should be added that guarantees material will not be landfilled. The contract could require the vendor to guarantee that all recyclable material collected through the campus recycling program will be recycled. The material could be used as feedstock for remanufacturing of another product, or reused in its existing form—but not disposed of in a sanitary landfill.

In addition, to ensure the university is receiving the best possible price, the contract could require the vendor to exercise diligence in obtaining highest and best price for all materials. If the vendor provides proof that local markets disappear for a certain commodity, this guarantee would be voided.

### **Salvage revenue**

Determine who will receive what proportion of the revenue from the sale of the recyclable commodities. There are many different ways to handle salvage revenue:

- This money can help pay for the additional costs that recycling and composting operations can sometimes incur. If the vendor is offering collection and processing services for free, the salvage revenue usually goes to the vendor. This vendor will have certain costs involved in establishing relationships with

commodities brokers and mills, as well as tracking the ups and downs of the market.

- If the vendor is charging for the collection and processing services, then it is common for the salvage revenues to go to the campus recycling program. The university can be paid for what the vendor is receiving—although this generally means the university pays more when the vendor has to move the material.
- Profit and risk sharing means both parties have an equal stake in the profit as well as the risk; they share revenue from the material and also the cost when necessary.
- To avoid risky commodity prices, another option is to add a price floor to protect the university from price drops, and a price ceiling to protect the vendor from price spikes. At some point, the cost of tracking market fluctuations and complicated contracts can sometimes outweigh the benefits. The simplicity of this arrangement is key, and can save money and time.

### **Invoicing and reporting**

Determine how the university would like to be invoiced; the options are per pick up, per pull, flat rate/month, cubic yards, or weight. If by weight, weight tickets should be included. Determine if it is necessary for the vendor to separate out collection fees, recycling fees, or landfill fees. Determine a payment schedule from the university to the vendor for services provided.

Determine the payment schedule from the vendor to the university for salvage revenue, if necessary. Require monthly or quarterly reports of tons taken to the landfill, processing facility, or composting location. The reports should include the date, delivery location, weight ticket numbers, weight of material, and salvage revenue, as well as any notable comments about the material. If the vendor is performing the processing service, require the vendor to give a break down of the tons for each type of material. If monthly reporting is required, be sure to give the vendor enough time to receive accurate information from other vendors and to reconcile the data.

If billing is by the ton and each bin is being weighed, require point-of-service reports that include monthly weights of refuse collected from each container at every location.

Require customer service reports to help you determine problems with blocked, overflowing, contaminated, or unserviceable bins.

### **Promotion and education**

Decide how much the vendor is required to participate in recycling promotional and educational efforts. The vendor could provide staff to help educate students, fund internships, or give a lump sum of money to be used for educating the campus community.

Require that the vendor be available for technical assistance to improve efficiencies and economies in the operation, and to offer assistance to students working on projects related to the operation.

## **Putting contracts out to bid**

A contract for garbage and recycling collection and processing services can be developed either for an in-house operation or an outside vendor—or even a combination of both. Consider if a separate contract is necessary for landfilling garbage, processing recyclables, or composting organics.

Partnering with an outside vendor does not mean loss of control over the program. Get to know the vendors in the area, invite them to campus, and listen to what they can offer your solid waste and recycling program. Structuring the contract so that it is a “win-win” is important to its success. The contractual relationship should be cost-effective, meet established diversion requirements, allow the vendor to purchase and maintain the tools necessary to fulfill the responsibilities of the contract, and enable the vendor to make a profit.

Develop goals for the campus solid waste and recycling program; keep these goals in mind when developing the bid package. At the beginning of a bid process, it is important to have bidding meetings and allow the potential bidders to tour the campus and the existing operations. Describe in the bidding materials the type of vendor being sought and the necessary requirements. This is especially important if the university plans to accept the lowest bid.

For each category list the type of equipment necessary to complete the job, the type of containers used, the frequency of service, and other necessary details. Describe how the whole collection and processing system works so the bidders can visualize the part they will play. If you’re starting from scratch or simply need advice, ask the potential vendors for their opinions on setting up a program.

## **Example contracts**

The following contracts are listed in the appendix:

The UC San Diego contract is an example of an outside vendor garbage collection agreement.

The Associated Student at Chico contract is an example of a university and Associated Students agreement.

The Humboldt State University contract is an example of an agreement between a campus recycling program and its processing vendor.

## Other contracts

### All vendors on campus

University of California, Santa Cruz includes simple language in all its vendor contracts that requires vendors to get involved in the campus recycling program. It states, "Vendor shall comply with all campus conservation programs" (Wade).

### Food vendors

All food vendors should participate in a campus mug program and food reuse and/or composting program. They can also be required to use recyclable or compostable containers that can be used for "to go" meals.

### Construction and demolition

Contract language can also be included that specifies the procedures for the reuse and recycling and reporting of construction and demolition debris.

## Conclusion

Including the items discussed in this chapter in your contracts for solid waste, recycling, and/or composting and other vendor contracts will allow you to communicate clearly with your hauler your needs and desires for your program, and allow you to create "win-win" contracts that increase diversion on campus.

# Chapter 7. Education and Promotions

## Importance of education

Educational programs provide the means to change the disposal habits of the campus community in order to reduce the quantity and toxicity of waste generated, and to increase the amount of materials that are recycled and composted. The campus community needs practical, "how-to" information. Students, staff and faculty need to know where, when, and how to recycle, how to make wise purchasing decisions to avoid unnecessary waste, and how best to handle specific materials. An effective educational program that reaches out to the entire campus community will make the difference between a successful recycling program and one that never gets off the ground.

## Points about running an education program

### Know your population

Who makes up the campus community? Understand the age, ethnic background, and attitudes of your campus. A periodic demographic analysis will keep the educational programs appropriately designed and targeted for your university's changing population. Remember: the more personal the message, the more effective it will be.

### Target communications

Prepare and disseminate information to target specific groups, such as current or incoming students, faculty, staff, your community, departmental secretaries, custodians, or students within a specific major. You may even target all populations during an event. Brainstorm on certain questions to help you choose and plan elements of an educational program:

- What do you want this group to remember?
- What is important to teach this group?
- How can you get their attention?
- How can you keep the group actively involved?
- How can you get their actions to reflect the education elements of your program?

Focusing on a target group is more likely to influence behavioral changes than mass media communications. The effectiveness of printed materials is defined by the

context in which the public receives them. Be careful of producing excessive and useless amounts of junk mail. Person-to-person delivery of materials is one of the most effective ways to change behavior. One way to do this is to conduct brief ten-to-fifteen minute workshops with staff and faculty in each department.

### **Focus information**

Recycling and waste reduction encompass basic and complex issues alike, from placing a can in the right bin to the intricate details of collecting, processing and marketing recyclable materials. Choose the topics that are interesting and relevant to your audience members, as well as topics that are unfamiliar to them.

### **Modeling**

It is important for the campus opinion leaders to set an example for others. People learn from people. University administrators, department chairs, student club presidents, student government electives, and co-workers are all effective role models. Using role models in both mass media and grassroots organizations is a cost-effective way to influence behavior.

### **Campus-wide feedback**

Monitoring and frequent reporting of the progress of waste prevention, recycling, and composting increases public participation and reinforces effective recycling habits over time. Provide specific details about any problems that need correction and give participants credit for progress achieved. Send out annual e-mails about how the campus is doing regarding waste diversion; include a goals statement for the upcoming year. This will help the campus community understand how individual actions can impact the program as a whole.

### **Program analysis**

After you have implemented an educational program or project, conduct an official or unofficial evaluation of it. This procedure may be as simple as noting the number of people who came to your event, or as complex as sending a survey to your target group. Evaluations can take place for both short and long-term educational programs, and can focus on one or many educational elements. You can get information about whether your program was successful by sending out e-mail questionnaires to your target group, tracking interest at educational tables, using counters on your Web sites, and listening to one-on-one feedback. Keep notes about what was effective and what might be improved; save the notes for next event or activity. You may not see quick changes in individual habits, but remember that educating early and often will make a long-term difference.

### **Integration**

Integrate waste prevention, recycling, and composting into all aspects of campus life. Relate the objectives of your plan to other issues on campus, and help make waste reduction a part of the university's self identity. For example, promote the fact that recycling helps reduce the amount of resources and energy we use, which benefits present and future generations. Appeal to public sentiment and promote the motto: "Today Decides Tomorrow."

## **Information exchange**

Tap into existing information exchange networks, rather than create new methods for disseminating information. The most cost-effective means to distribute information is to use the many newsletters, bulletin boards, and meeting announcements that already exist at your campus. Whenever possible, use paper-free electronic mediums such as e-mails, marquees, and electronic newsletters.

## **Timing**

Timing is a factor in when you should disseminate information. For example, point-of-purchase is the most appropriate time to provide information about waste prevention. Educate people to buy in bulk and to purchase products that use less packaging. Point-of-disposal is an effective time to provide information about recycling and increased costs in garbage disposal. Educate people by providing signage on or near your recycling bins. Posters on information boards reinforce the importance of recycling.

## **Consistency**

A good education program will be continual and long term. Campus populations are transient, so providing incoming students with continual, easy-to-understand information will help to increase participation and reduce recycling program contamination rates. Use consistent, repetitive messages and graphic images, which should be maintained over time to develop a strong, cost-effective program identity. Branding your program with a logo and a slogan will help with campus recognition.

## **“How to”**

Always stress practical "how-to" information. The environmental reasons for waste prevention, recycling, and composting are secondary; people need to know how to reduce, reuse, and recycle. Make your "how to" descriptions as simple as possible. People don't need long explanations, and if they do they will ask you. Making a list of "Acceptable" and "Unacceptable" materials is a quick and effective way to provide information; a brief list of "Tips" can also be helpful.

## **Training**

Train front line staff, such as custodial/grounds staff, student recycling staff, and department receptionists. All groups within the campus community must be well trained to share and explain "how-to" information.

## **Funding**

How much funding do you have available and what will your program cost? Education can either be inexpensive or costly. Inexpensive education elements often include tabling, e-mail distributions, flyers, speaker forums, campus or community radio shows, Web sites, brochures, and presentations. More expensive educational programs include giving away items such as recycled-content mugs, bumper stickers, or lapel pins. While word-of-mouth helps individuals learn about your program, giving them something that they can take with them and show to other people can create a strong impression.

If your program has limited resources, be creative. Investigate the possibility of sponsorships from local companies/haulers. Many companies will subsidize the cost of promotional items or events if their logos and names are on them. Fundraising can also be fun for students and program volunteers. Fundraisers such as dunk tanks, bake sales, or newspaper drives can be included in annual educational events, and can become worthwhile social activities. State agencies, such as the Department of Conversation, Division of Recycling, also provide free or inexpensive recycled content promotional items, such as shoelaces, for special events.

### **Planning**

Educational programs and projects are not generally planned, organized, and implemented overnight. While your educational event may be one hour, one day, or a series of week-long events, make sure you allow yourself enough time to plan your event. Brainstorm the programs, projects, and events you intend to implement an average of three-to-six months in advance.

Make realistic expectations for yourself and build your program in steps. Include student volunteers, interns, or environmental groups who can plan and support your event. Give notice to your target groups about your event; reinforce it with frequent reminders. A well organized, publicized, and informational event can help establish a track record of success and professionalism for your program.

### **Tips**

A successful education program can be inclusive, creative, fun, and enlightening. Not only will it be educational for the campus community, but also for those who plan, organize, coordinate, and participate in the event.

If you don't evaluate your event as "successful," discover the reasons why and make appropriate adjustments. Each year the interest in your program will grow, so stick with it.

## **Educational program examples**

### **Curriculum**

Incorporate integrated waste management programs into university research and curriculums. By offering a certificate or minor in this field, you create the opportunity for students to conduct class projects that have real-life applications, such as education, cost-benefit analysis, and campus planning. At most campuses, students are best relied upon for projects or studies that can be completed in one or maybe two class terms. The longer the project, the more difficult it is to keep students involved; also, students receiving credit must complete the projects within the time frame of the class.

If you are unable to establish a certificate program, team up with a professor who is willing to assist in supervising students for one-to-three class units. Offering internship opportunities is another good way to increase student participation in your program.

### **Promotional activities**

Use creative promotional activities such as skits and plays in classrooms and at large gatherings. Include creativity, fun, and a sense of humor. Developing activities that are interactive, hands-on, and “real life” can help make a long-term impact. Use impressive facts and numbers about your program, city, county, and state to help individuals understand the big picture. Always include others in the education process. Students do an excellent job at educating each other, and often know the best way to communicate important messages to their peers. Incorporate focused themes and catchy quotes.

Create annual programs that encourage department participation. Different departments can help by participating in used clothing and newspaper drives. Give certificates for the different departments to post on their bulletin boards, thanking them for their participation.

### **Symposiums**

Schedule symposiums on a variety of topics. Hold satellite conferences, invite respected experts to attend, and utilize the expertise of the faculty present at your campus.

### **Awards**

Everyone likes to get awards. Waste reduction awards that congratulate students, staff, and faculty on a job well-done show that your program appreciates their recycling efforts.

### **Common topics**

Choose educational topics based on the kinds of questions that your faculty asks you on a regular basis. If a person has asked you one question, generally there are others who want to know the answer as well. Choose one or a combination of educational elements that may answer the following questions:

- How can I reduce the waste I create? What are waste reduction practices?
- What can be reused on campus?
- Where and what materials can be recycled at our facility?
- Why are some plastics recyclable and others not?
- Why is it important to purchase recycled-content products—in other words, rebuy?
- How can I learn how to compost? Does our facility compost?
- What can we put in our recycling bins on campus? What cannot be recycled?
- How much does our campus recycle?
- What and how much do other campuses recycle?

- What are the recycling program legislative requirements?
- How do I reduce my holiday waste?
- Does our facility recycle construction and demolition debris?
- How can I get involved in recycling and make a difference?

## Target populations

### Faculty

Faculty has the ability to communicate with a large number of students each semester or quarter and can be helpful in spreading information. To develop a positive relationship with interested faculty, create and maintain a list of individuals who are interested in and willing to share information about recycling/solid waste reduction events and issues. Once this list is established, communicate with faculty via e-mail and ask them to give announcements to their students and colleagues.

Giving presentations in classes is also an excellent way to promote your program. Professors often appreciate the opportunity to have guest speakers talk about real life experiences and opportunities for student academic involvement. Recycling and waste reduction can be an issue for any major; music students can make instruments from recycled materials, computer students can disassemble computers for recycling/reuse, and agriculture students can conduct research projects on composting methods.

Establishing a strong relationship with faculty can also help your recycling program develop in unexpected ways. For example, a faculty member could assist by providing public relations or graphic arts interns.

### Tip

Send an e-mail about your program to new faculty and staff each semester. New faculty and staff are generally very receptive to becoming involved with the campus, and will appreciate your information.

### Facility/campus staff

Whether you have a voluntary or mandatory recycling program on campus, staff can be incredibly helpful in telling others that your recycling program is easy, efficient, and a good program in which to participate. To spread the word about your program, give a presentation to your staff council, write articles for campus publications, include an ad in campus directories, and offer to give talks to offices and departments about waste reduction and recycling issues. It can also be effective to include information about your program in new hire packets, or give a brief power point presentation during new staff orientations in person or via video. Again, awards can be effective; recognize those who practice great sorting, no contamination, or office reuse habits.

### **Tip**

Staff members often deal with purchasing for their department, so educate them on the importance of using recycled content products, light paper vs. astro-brites, and office supply reuse. Include staff in special events such as Clean Out Your Office Day.

### **Students**

Student education can occur in a number of ways. Your main goal is to encourage students to recycle on campus. While this may sound easy, the reality of daily cultural habits doesn't always translate into making choices that include recycling. Remember that educating early and often will help to impact your program. Be sure all new students receive program information. Get involved with student orientation, put a flyer in orientation student packets (new, graduate, and part-time), show a video about your program, or put on a play. Get their attention early on, and you will have consumers on your campus that will take an extra moment to find a recycling container.

Educating students in on-campus residences can be efficient and effective. On-campus residents are a concentrated population, and they are often looking for interactive and social activities. Engaging these students with the planning and implementation of educational programs can help increase participation, as well as improve the long-term results of your program. Post information about your program on display boards in the residence halls, and keep the information current.

Students educating their peers through clubs, internships, student government, or class projects can help increase receptiveness. Students are great at working together, sharing ideas, and getting actively involved with issues that are important to them. Channeling their enthusiasm can increase your program visibility, enhance its public perception, and help expand your program.

Students can also be hired as collection staff. This will help them learn how recycling programs work, as well as allow them to act as role models for other campus community members.

## **Educational activities**

- *Art shows.* Incorporate art shows into your educational events. Work with a professor to display an art show on campus, at a local café, or during an outside event. Re-use discarded materials for the art, or challenge students to use materials that can be recycled later. Do not use glue or other contaminating products.
- *Campus and community clean-ups.* Clean-ups are great during special events, and can become a community-wide effort. Start small and expand each year. Cities and county governments will often assist with community clean-ups.
- *Class talks, presentations and tours.* Give class talks to students during the beginning of the semester about how they can become involved with your program. Present information to environmental classes to encourage recycling on campus. Give tours of your program operation.

- *Compost demonstration area.* Build a compost demonstration area on campus. Include areas for compost bins, a small garden, and a greenhouse in order to display how finished compost is used.
- *Compost workshops.* Plan compost workshops at the compost demonstration area for campus members, kids, and the local community, or use an outside grass area on campus. Invite local elementary school students to visit your site and learn about vermicomposting. Invite professors to bring their classes to workshops.
- *Entertainers (speakers, concerts, workshop series).* Engage discussion about waste reduction issues with different majors in mind. Find speakers who will be of interest to your campus community. For example, if you have a strong Agriculture Department, find speakers who talk about sustainable agriculture and the importance of compost.
- *Faculty and staff presentations.* Give presentations to faculty groups and staff council members; they often have questions about how to recycle correctly.
- *Food waste weighing contests.* Have a contest between groups during a lunch activity; find out who has the least amount of food and trash left afterwards. This fun activity with children can take place at an on-campus children's center.
- *Free stuff days.* Many collection programs end up with office materials that can be reused, such as file folders, manila envelopes, unused paper, binders, folders, and dividers. Distribute these materials on campus for free. People will be surprised at what is thrown away, and will appreciate your free gifts. The week before classes and the first week of classes are the best times for Free Stuff Days.
- *Information, job and children's fairs.* Participate in and plan information, job, and children's fairs. Being present at these events provides your program with valuable recognition.
- *Interactive mazes, walk-through compost piles.* Mazes can be made inside or outside. By using fencing or backboards, you can decorate a maze with creative and interactive information and activities. Pose questions about waste reduction and recycling issues as people make their way through the maze. Walk-through compost piles can be made with black mylar plastic and pictures of fruit, vegetables, and insects.
- *Letter writing campaigns.* Hand out sample letters when you run information tables. A letter-writing campaign can be an effective tool for change in regards to campus and state issues.
- *Poetry.* Work with a professor to have a class write creative poetry about waste reduction and trash. Post or print the poetry in campus newspapers, newsletters, or journals.
- *Program field trips.* Take the students you work with and/or other interested parties on a tour to the local landfill, processing plant, material recovery facility,

transfer station, or compost facility. Seeing how recycled material is sorted and processed helps individuals understand the complexities of the waste system.

- *Recycling and used clothing drives.* Collection drives can be a good way to collect unwanted recyclables or items, which can later be donated to non-profit agencies. These programs help divert material and assist those in need. Good times to collect clothing include just before the cold season and residence hall move-out.
- *Recycled musical instruments.* Work with a professor from your music department to create musical instruments made from recycled containers and materials. Offer these as giveaway items during special events that involve children. These freebies can be an inexpensive and fun way to distribute promotional items, as well as pose a challenge for music students.
- *Recycling contests.* Have a contest between different student organizations, in which the winning group brings in the highest value of recyclables. These programs are generally more successful if they last four-to-five weeks. Send reminders and collection updates. As an incentive, give the winning group the total amount of money raised from the materials collected.
- *Reusable/reusable gift wrapping.* Educate the campus about holiday waste by making examples of environmentally friendly decorating. Use recycled content and reusable materials for displays at your student bookstore, on information tables, or in glass cases.
- *Photos/mug shots.* Take pictures of your events and post them in visible places, such as library glass cases and residence halls. Photos serve as a guide for later events, provide a visual history of your program, and demonstrate the importance of your program.
- *Surveys and polls.* Conduct student, staff, and faculty satisfaction and recycling knowledge surveys. Gather information that will help you decide the best educational programs to implement on campus. Simply handing out surveys about recycling heightens awareness of your program. Include a recycling question on your annual student government elections ballot.
- *Treasure hunts.* Children are particularly fond of treasure hunts. If you have a compost demonstration site, send the children or workshop attendees looking for worms, ants, mill bugs, strawberries, dragonflies, and other items of interest.

## Promotional items

Promotional items can be useful; however, be wary of falling into the trap of producing lots of “stuff.” The message of your recycling program will most likely encompass waste reduction as the main focus, so be careful of conflicting with this ideology. Choose promotional items that are usable and serve a purpose; purchase materials that utilize recycled content.

- *Bags of compost.* People enjoy receiving useful and creative gifts. Give out small bags of compost during special events for free, or ask for a donation. Have a drawing to win a wormbin.
- *Clothing (T-shirts, tank tops, hats, canvas bags).* Promote your program name and logo to the campus. Recognizable logos on clothing endorse the concept of recycling. Purchase recycled content and organic clothing when possible. Ask your campus bookstore to sell items with the recycling logo.
- *Flags.* Make a recycling arrow flag to display at an information table; the flag will help individuals notice your booth.
- *Holiday decorations.* Make environmentally friendly, compostable, holiday decorations and display them at an information table. Have materials available for visitors so they can make their own ornaments, or give them away for a small donation as a fundraiser.
- *Lapel pins.* Lapel pins are small, distinguished, and can be an inexpensive gift for volunteers and administrators.
- *Paper weights.* Office items can be used to help promote your program and are also good gifts for faculty, staff, and administrators who support your program.
- *Pens and pencils.* Pens and pencils are generally inexpensive in large quantities, and can be distributed to a large number of people. Pens made out of recycled plastic are now more readily available, as well as pencils made from denim, cardboard, or old money.
- *Reusable utensils.* Purchase spoons, forks, and knives from a thrift store, drill a hole in their handles, and place them on a metal shower ring. Give them away as inexpensive and useful gifts during special events.
- *Reusable shopping bags.* Promote reuse by giving away reusable canvas shopping bags to students, faculty, and staff. Put your logo and quote on the bags to reinforce program recognition.
- *Stickers, quotes, and catchy slogans.* Make a sticker with your recycling logo and quote on it. Give the stickers away during special events and tabling. You will be amazed how often you will see the stickers around campus.
- *Table tents.* Table tents are an inexpensive visual tool, and they help remind people to recycle in the dining area.
- *Web site.* Use your Web site to disseminate information about your program, educational events, and recycling as a whole. Web sites hold large amounts of material, are easy to update, can be helpful to other campuses, are accessible to students, and do not create waste.

## Promotional activities

- *Advertisements.* Advertise in current publications on campus, as opposed to creating a new publication. Work with your campus newspaper to cover stories about special events, recycling topics, and other pertinent issues. Ask them to allocate space for displaying campus collection totals. Utilize free calendar space.
- *Campus phone book/directory.* Many campuses print a campus phone directory every year. Work with the publishing staff to include a page dedicated to your campus recycling program. Ask for a space donation or a reduced rate.
- *Comic strips.* Write a comic strip, or work with a class/student group to create one. Submit the comics to your student paper or local campus newsletters.
- *Door hangers.* Door hangers can be a good way to promote a community collection program or special event. You can target a specific region and evaluate your response.
- *Drama performances.* Contact your drama department. Ask a professor to work with students in writing a waste reduction play to be performed during Recycle Week. The play could be directed towards all age groups.
- *Flyers and posters.* Flyers and posters on kiosks and information boards are effective for informing the campus community about your events and programs. Be mindful of how many you print, and use recycled content paper. Postings can also be archived for historical reference.
- *Games.* Games such as sorting recyclables, tossing bottles into the correctly labeled bin, and guessing the number of cans in a bin can help encourage program participation. Put each winner's name in a hat and draw items for a free prize.
- *In-service training and orientation.* Campus staff members are offered and sometimes required to take different kinds of in-service training sessions. Develop a campus recycling training information program, and include the session on training schedule flyers.
- *Library display.* Utilize library and other campus glass cases to promote waste reduction, recycling, and compost information. It does not require many resources to create visual displays, and they can usually be left up for a month or longer.
- *News releases and PSAs.* Create a list of local media sources. Write news releases and public service announcements about your events; establish channels of communication with local news sources. Provide local media with written information whenever possible, and contact them about all special events. Campus newspapers will often run stories about events that make an impact on campus, are informational, or will provide good photo opportunities. Always let your news sources know when you receive grants or other special funding.

- *Newsletters and on-campus e-mail announcements.* Utilize other groups' publications, or create your own publication if absolutely necessary. Internet newsletters are effective for promoting waste reduction on campus; e-mail is free and can be written quickly. Make your e-mail quick and to the point. Target groups such as students, faculty, and staff. People often enjoy recycling or other waste management tips, and like to be notified when program changes are made.
- *Pamphlets and brochures.* Limit the number of items you print; consolidate information when possible. You can also target a pamphlet or brochure to a specific audience for effective communication. Well-made pamphlets and brochures can be given to students, faculty, staff, and administration, as well as distributed at conferences.
- *Radio show interviews.* Ask your campus or local radio show host if you can appear on the air and talk about your special event, or about a general topic of interest. Campus and community radio stations are generally willing to help spread the word about recycling and waste reduction issues.
- *Signage on recycle bins.* Signage and labels on recycling bins help educate the campus community about what is and is not acceptable to recycle. Utilize the recycling arrow and reinforce good recycling habits.
- *Student orientation.* Ask to include recycling program participation opportunities in new student orientation packets. Give presentations or show a video.
- *Tabling.* Tabling is a great way to have one-on-one contact with the campus community. Table information can be fun, interesting, informative, and interactive. Give out free stuff such as reused office supplies, offer handouts, and provide treats such as cookies and gummy worms. Make posters and promote facts about your program. Take pictures for future displays, and for record keeping.
- *Visual displays.* Displays can make a strong impact on people, such as trash/garbage piles, or rows of disposable cups that demonstrate the number of cups used in a single campus day.

## Special events

The information below includes descriptions of various educational events that you can plan for your campus. For the most part, all of the events can be tailored to any target population. Some of the events take place over one day, while others are weeklong annual events. It is important to remember to be flexible with dates and timelines when planning an event. If your campus is on vacation during America Recycles Day, celebrate the holiday a week later. Find events that fit the needs of your campus community, and which you are comfortable promoting. Education does not happen in a closed box: it happens when people become creative by coming together and sharing ideas, thoughts and information.

### **Tip**

Always inform the local media about your event. Whether your event is big or small, send public service announcements and news releases to media sources well in advance. If it is a slow news day/week, there is a good chance that they will be there to cover your event.

### **Annual Events Quick Reference Guide**

|   |  |
|---|--|
| Keep America Beautiful, March–May               | <a href="http://www.kab.org">www.kab.org</a>   |
| Recycle Week, April 16-22                       | <a href="http://www.state.ca.us/state/portal/mycahomepage.jsp">www.state.ca.us/state/portal/mycahomepage.jsp</a> |
| Clean Your Files Day, April                     | <a href="http://www.usmayors.org/recycle/">www.usmayors.org/recycle/</a>   |
| Earth Day, April 22 <sup>nd</sup>               | <a href="http://Earthday.wilderness.org/">Earthday.wilderness.org/</a>   |
| Compost Awareness Week, May                     | <a href="http://Compostingcouncil.org/index.html">Compostingcouncil.org/index.html</a>                           |
| Second Chance Week, October                     | <a href="http://www.rummaging.com/resale/second/">www.rummaging.com/resale/second/</a>                           |
| America Recycles Day, November 15 <sup>th</sup> | <a href="http://www.americarecyclesday.org">www.americarecyclesday.org</a>                                       |
| Use Less Stuff Day, November                    | <a href="http://www.cygnusgroup.com/ULS/ULSDAY/ULSDay.html">www.cygnusgroup.com/ULS/ULSDAY/ULSDay.html</a>       |
| Buy Nothing Day, November                       | <a href="http://www.adbusters.org/campaigns/bnd/">www.adbusters.org/campaigns/bnd/</a>                           |

### **Background - Keep America Beautiful**

Founded in 1953, Keep America Beautiful (KAB) is a national, nonprofit, public education organization. One main project of KAB is “The Great American Clean-up,” which began in 1996. The Clean-up now involves over two million citizens who participate in making our environment a more beautiful, safe, and healthy place.

KAB has approximately 500 community affiliates throughout the U.S., and reinforces the ethics of environmental stewardship through public service and volunteerism.

KAB programs focus on helping volunteers gain the skills, tools, and resources necessary to improve our environment. KAB provides opportunities for individuals to take action through litter prevention, beautification, and community improvement projects. In addition, KAB emphasizes waste management reduction practices by educating individuals about reducing, reusing, and recycling. KAB has helped to increase public awareness and participation in over 10,000 communities and neighborhoods in thirty-five states.

To celebrate KAB on your campus, visit the KAB Web site, [www.kab.org](http://www.kab.org). Program examples and support materials are available. In addition, you will find award programs, elementary school teacher resources, public service announcements, and organization contact information.

### **Activities**

KAB events are generally one day long and focus on campus, park, lake, river, and seashore clean-up activities. Additional projects include graffiti removal, litter removal, recycling drives, painting programs, tire amnesty programs, and tree and bulb planting.

When considering a clean-up or beautification project, leave plenty of time for project planning. Project organization is the key. Include other groups and/or organizations, such as arboretum clubs, student environmental groups, environmental classes, or agriculture departments. Develop a planning committee to assist with pre-event organizing, as well as project details during the actual event. Making a list of campus/community needs, and brainstorming about areas in need of improvement, can be worthwhile activities and offer valuable insight into how your program will be organized. Clean-ups can take place on a variety of levels, from simple grassroots organizing to a more elaborate projects with awards and barbecues. Regardless of your program's level of complexity, remember that it will still make a positive difference.

***Tip***

Sponsors may be willing to contribute to your event. If you plan to give away mugs, T-shirts, or a barbecue lunch, talk with local businesses about donations or sponsorship funding. Many companies will donate funding to worthy causes in exchange for positive recognition on a T-shirt, poster, or news release.

**Background - Recycle Week**

In California, Recycle Week is generally the week leading up to Earth Day. (Other states may have different dates.) Whether you choose to celebrate Recycle Week as a one-day event, or plan an educational activity every day, you will have an abundance of topics and subjects from which to choose. Pick a theme or topic, such as "Corporate Recycling," "The Realities of Construction and Demolition Debris," or "Buy Recycled." Doing so will help you focus your energies and locate a target group.

Whether you plan five small events or one large event, try something different each year so you and the campus community are challenged to learn new things. Each year, your event will improve and your campus community will become more familiar with Recycle Week as an annual event.

***Activities***

Due to the many topics that surround recycling, you will likely have more issues to share with others during this week than any other week. Popular activities include inspirational speakers, information tables and displays, job and children's fairs, film series, educational forums, garbage sorts, and facility tours.

**Background- Clean Your Files Day/Week**

Clean Your Files Day (April 22<sup>nd</sup>) first began during Chicago's Earth Day Week in 1995. During this event, participants recovered up to twelve times their normal collection rate; in one building, 3500 employees recovered twenty-seven tons of office paper in one day. Due to this amazing success, a manual was developed and word about Clean Your Files Day was spread to help educate employees about recycling at work.

Clean Your Files Day encourages city offices, businesses, and campuses to recycle unwanted office paper. The event helps improve workplace recycling habits and facilitates recycling through purging old and unwanted files. To celebrate Clean Your Files Day at your campus or facility, review the Web site

([www.usmayors.org/recycle/](http://www.usmayors.org/recycle/)) for detailed program information, including the Clean Your File Manual, Promotional Materials, Participant Packets, Workshop information, and PR Packets. These resources will assist you in planning a well-organized event that will reinforce current recycling habits, as well as educate those who do not recycle.

### **Activities**

Clean Your Files Day activities on campus can take place over one or more days, and can include students, faculty, and/or staff involvement. Faculty and staff often keep files for many years, and giving them an opportunity to get rid of old files can be appealing to them. Students living in on-campus housing often collect a large amount of paper throughout the year as well. Giving students the opportunity to clean out their files, before the rush of move-out, increases your program's ability to capture materials that might not have been recycled.

The campus administration can also support the program, creating written policies and otherwise promoting the annual event. The administration's support will help validate the event, raise campus faculty and staff participation, and increase the amount of material diverted from the landfill.

Some important factors you will need to consider:

- Who will the main event organizer be?
- Who will be the sponsor?
- What media outreach opportunities exist?
- Who is your target population?
- Will you have assistant organizers, or city/county assistance?
- How will you measure the results of your program?

### **Background – Earth Day**

Earth Day began on April 22, 1970 with a nationwide grassroots demonstration for the environment. Earth Day events served as a forum for people to express their concerns about the lakes, rivers, the ocean, forests, animals, and air. The response to Earth Day was immense; people all over the United States planned events in observance of local and global environmental problems. Since 1970, campus communities have developed many traditions surrounding Earth Day, many of which focus on waste reduction and recycling practices.

Earth Day has been a long-standing tradition on many campuses and has helped raise awareness about many environmental issues on both a local and global level. Waste reduction, reuse, and recycling are common topics of discussion during Earth Day events. Make sure you are well informed about the events taking place on your campus, and be involved with these events in as many ways as possible. Include students when you organize your educational events, and play an active role in being visible during Earth Day. Since Earth Day is well known, and recycling is associated

with being an environmental practice, individuals will naturally look to your expertise during Earth Day events.

### **Activities**

Earth Day is a great way to be involved with educating the campus about waste reduction, reuse and recycling issues. Earth Day will most likely be planned by an environmental group other than the on-campus recycling program, so sign up for activities and represent your recycling organization. If possible, participate as a member of the Earth Day committee.

During events such as education/information fairs and music festivals, you will have the opportunity to set out recycling containers. Try to set out an information/education booth as well. Be a visible presence; set up interactive activities, conduct letter writing campaigns, plan recycling games, and hand out promotional items such as reusable mugs and second-hand cups.

The individuals attending Earth Day will often be of all age groups with many questions. Be sure to have information about recycling in your community as well as on campus. Fact sheets are useful for students who might be using recycling as a topic for a class paper. Keep all age groups engaged and active with recycle relays, walk-through compost bins, or by simply tossing a piece of bunched up paper or a plastic bottle into the right bin.

### **Background - Compost Awareness Week**

Compost Awareness (CA) Week, conducted during the first week of May, is sponsored by the U.S. Composting Council (USCC), a non-profit (501-C-6) organization with approximately 200 members. The USCC is involved in numerous compost issues such as research, public education, compost standards, expansion of compost markets, and increasing public support for compost practices. Now an international event with approximately fifteen sponsors, International Compost Awareness (ICA) Week events are organized in the United States, Canada, and Sweden.

ICA Week is designed to increase public awareness, enthusiasm, and participation in composting activities. To celebrate ICA Week at your campus, review the USCC Web site, [compostingcouncil.org/index.html](http://compostingcouncil.org/index.html). The site provides helpful information such as posters, information sheets, publications, and promotional items, as well as a Compost Awareness Week proclamation.

### **Activities**

You can create enthusiasm for the recycling of organic materials, and direct your efforts at all ages. Individuals can learn about the benefits of compost and what makes compost happen. Each year you can choose a theme that draws attention to the importance of composting in regards to small-scale home projects or large-scale community operations.

CA Week events can be planned for one day or as a week-long event. Valuable learning opportunities can take place during events, such as tours of composting facilities and demonstrations gardens, discounts on compost products, compost and vermicompost workshops, information tables, visual “how to” compost displays,

walk-through compost bins, compost video demonstrations, free samples of compost, or a worm-bin drawing.

Compost collection programs have become more popular on many campuses over the last few years. If you have a composting program, use news releases, your campus newspaper, and your campus radio to inform the campus community about how much waste your program diverts.

***Tip***

If you are daring and want to get attention on campus, find a group of enthusiastic people to dress up as a worm and pieces of fruit at a compost awareness event. Try including a drama class.

### **Background - Second Chance Week**

The first Second Chance Week was held from October 18–26 in 1997. Over 125 organizations from the state of California held more than ninety-five reuse activities, attracting almost 20,000 participants, and reaching over 370,000 people through direct outreach materials. These efforts resulted in the reuse of more than ninety tons of used goods and materials statewide, and laid the foundation for future efforts to promote reuse. Each year, the impact of Second Chance Week has grown by including more communities and diverting more waste. For more information, visit the Web site, [www.rummaging.com/resale/second/](http://www.rummaging.com/resale/second/).

Second Chance Week is a public awareness campaign that promotes reuse, repair, resale, and donation opportunities in California. During Second Chance Week, local governments, community groups, reuse businesses, and others work together to hold local activities geared towards giving a “second chance” to reusable items that might otherwise be thrown away. Through encouraging the public's support of existing reuse establishments—such as thrift stores and repair shops—and providing communities with new reuse opportunities such as city-wide garage sales and reuse art contests, Second Chance Week aims to help Californians take advantage of the many benefits of reuse.

#### **Activities**

Second Chance Week can be celebrated in one day or spread throughout a week-long celebration of events. Second Chance Week offers an endless number of educational opportunities for your campus community; promote the reuse, repair, and resale of items to reinforce the fundamental concept of waste reduction. Activities for the week can include newspaper drives, food and clothing drives, garage sales, information tabling, giveaways, bike repairs, thrift store coupon promotions, and clean ups. Explore what items can be reused in your community and network with other groups.

### **Background - America Recycles Day**

America Recycles Day (ARD) celebrations began November 15, 1997. ARD is organized by a national board of directors, which includes fifteen businesses, non-profit organizations, and local, state, and federal governmental agencies. ARD has seen a large increase in national participation, from 750,000 participants in 1997 to 2.9 million participants in 1999.

America Recycles Day has helped to increase national public awareness, enthusiasm, and participation in recycling, as well as educate people about the importance of buying recycled content products. To celebrate ARD at your campus or facility, contact your local state organizer listed on the ARD Web site: [www.americarecyclesday.org](http://www.americarecyclesday.org). Organizers can answer your questions and provide you with information regarding ARD events. In addition, the ARD Board has developed a “Planning Guide” that includes event guidelines and samples. Topics in the guide include samples of public service announcements, event organizing and structure, getting organized, suggested activities, ARD merchandise, resources, camera-ready art, national grand prizes, and a helpful publications list.

### **Activities**

ARD is a one-day event that will take less pre-planning time than a week-long event, and is a good way to start your annual educational program. Information tables are an excellent way to be a presence on campus and give one-on-one information to your campus population. Hand out your recycling program information, decorate your table in red, white and blue, make a map of the United States with the recycling rate of each state, or make a chart of facts about how much Americans recycle each year. Other one-day events can include panel discussions, speaker forums, campus or community clean ups, and student group contests.

### **Background - Use Less Stuff Day**

The concept of Use Less Stuff Day (ULS) was developed in 1995 by The ULS Report, a group that produces a bi-monthly newsletter for educating people about waste reduction and pollution prevention. ULS Day occurs the day before American Thanksgiving, and is sponsored by over 300 international, national, state and regional, county, and local groups.

The goal of ULS is to educate the general public about the large amount of waste produced during the holiday season, and to encourage people to take an active role in reducing this waste stream. By increasing their awareness during the holiday season, individuals will pay closer attention to the waste they create throughout the year.

While recycling has been a popular alternative to placing items in the trash, reducing waste in the first place is a high priority for any campus recycling program. Waste reduction practices are beneficial for a number of reasons: not only does using “less stuff” help the environment because less resources are used and discarded, but individuals also save money by not purchasing unnecessary items.

Review the Web site, [www.cygnus-group.com/ULS/ULSDAY/ULSDay.html](http://www.cygnus-group.com/ULS/ULSDAY/ULSDay.html), for additional information and samples of public service announcements, news releases, community ideas, publications, the “Waste Free Lunch” program, “earth friendly” holiday gifts, gift wrapping tips, waste reduction parties, and junk mail reduction information.

### **Activities**

ULS is a one-day event with a focus on educating others and providing them with helpful waste reduction examples. Information tables are a good way to hand out holiday waste reduction tips. Increase visibility and interest in your table by displaying sample gift wrapping, natural ornaments, and hand made cards. You can demonstrate how hand made gift certificates, good for “spending time with friends

and family,” can be used as a substitute for material gifts. Give these items away in sample kits, so people can share the concepts with others.

Gaining student government and administrative support can also be achieved by writing a campus proclamation in support of ULS Day. Use campus, national, and international facts to support the need for your proclamation, and provide a copy to local press.

### **Background - Buy Nothing Day**

Buy Nothing Day (BND) began in November 1997, the day after American Thanksgiving, as an educational and social awareness marketing campaign created by the Canadian-based Adbusters Media Foundation. Adbusters is a not-for-profit, reader-supported organization located in Vancouver, British Columbia. The Adbusters Media Foundation is a network of artists, activists, writers, students, educators, and entrepreneurs whose goal is to create social change. The Foundation publishes an *Adbusters* magazine that promotes social, economic, and human rights issues. For more information, visit the Web site, [www.adbusters.org/campaigns/bnd/](http://www.adbusters.org/campaigns/bnd/).

Traditionally, the day after Thanksgiving is the busiest shopping day of the year, BND challenges the concept of “shop-‘til-you-drop” by encouraging people to boycott shopping for one day. BND also encourages individuals to think about the direct and indirect global consequences of consumerism.

While BND does not directly discuss issues such as reuse and recycling, the concept behind BND directly correlates to reducing the amount of waste we use, save, and discard. Introducing the concept of using and needing “less stuff” will expand the focus of your recycling program and help educate others about the importance of waste reduction as a whole. BND is a creative way to introduce your campus community to new concepts, ideas, and actions.

#### **Activities**

BND is a one-day event; you’ll need to focus on getting the word out through the media prior to the event day. It is important to use public service announcements, news releases, flyers, and e-mails. Information tables with information about consumerism, over consumption, waste reduction, and other socially related issues will help educate your campus community about the importance of accumulating “less stuff.”

#### **Tip**

Use multimedia elements in your education program. Showing films, such as *Affluenza* and *Escape from Affluenza*, will catch the attention of students, faculty, staff, and community members. Professors often give extra credit to students for attending such educational films.

## **On-campus housing events**

- *Environmental/recycling monitors and contacts.* Students and employees volunteer to monitor the recycling and other environmentally related habits in their residences or academic buildings. They are responsible for hanging posters,

and acting as a liaison to the Recycling Coordinator in case of recycling problems. The students help inform others about recycling by posting facts and serving as a role model for their halls.

- *International students or family housing.* If you have a large or small population of certain international groups, work on translating your brochures into different languages.
- *Move-in.* During on-campus residence move-in, post flyers and/or posters about the campus recycling program. Catching student attention early on will help spark interest in recycling. A large amount of waste is also generated during move-in; place clear signage on recycling receptacles.
- *Mug shots.* Catch students on their way to a coffee house or dining hall, and ask permission to take pictures of them holding reusable mugs. Post the pictures in residence halls where your photo subjects live, and place creative captions on the pictures. Have a drawing for a free mug with all the people who had their pictures taken.
- *Move-out.* Students often have to move out in a rush, and forget to recycle. Huge amounts of reusable clothes, untouched food, furniture, books, unused toiletries, and anything else that cannot fit in a car end up in the trash. Plan a clothing drive the month prior to move-out and donate the materials to non-profit charities. Create a “move-out” diversion program for the day(s) prior to move-out. Put flyers in the halls listing what materials you plan to collect, ask Residence Hall Assistants to announce the collection program, and recruit volunteers to assist with the day’s events. One effective way to keep people from throwing away useful items is to set up collection stations at each dumpster site. Volunteers collect clean materials brought by residents, which can also be donated to non-profit charities.

## Contests

Competitive contests help stimulate interest and awareness of recycling, waste reduction, and community issues. Fraternities, sororities, and other student organizations traditionally enjoy competition; work with these groups to implement recycling contests into Greek Week competitions or other annual events.

- *Recycling contest.* Student organizations collect and take their recyclables to a central recycling center. Materials are weighted and recorded. The group that brings in the highest monetary value of materials wins the money brought in by all the groups combined, as well as a plaque.
- *2<sup>nd</sup> Chance contest.* Student organizations or students living in residence halls are asked to collect unwanted, reusable clothing and non-perishable food items for a month. Each item is worth one point; items are collected at a central location and given to local charities. Students who bring in the most items win a plaque and \$100 donated to a local charity of their choice. Other items to win: a tree planted near their hall and a plaque that displays their name, trophies, or food.

- *Recycling residence hall competition.* For about one week, weigh the material collected at each hall. The halls have to actually sign up to participate, and provide a resident contact person. Awards are given to the hall that collects the most material.
- *Race.* Recyclables and reusables are placed at a start line; recycling bins are placed at the finish line. Teams/individuals race to see how fast they can sort the mixed materials into bins. Include student government, journalists, deans, and faculty. The *Closing the Loop* education manual, produced by the California Integrated Waste Management Board, has a more detailed description of this activity, as well as additional lessons for K-12 graders.

## Speakers

Dynamic and interesting speakers are a great way to promote waste reduction concepts on campus. Many speakers will speak at your campus for a small fee. When you attend conferences or workshops, take notice of the speakers who catch your attention, and ask them if they would be willing to talk at your campus. Consider which target population would like to hear the speakers. If your funds are limited, explore the possibility of attracting sponsors.

## Awards

- *"Green Ticket" raffle.* Students and college employees volunteer to give out green tickets to anyone on campus "caught in the act," or doing something environmentally correct. These acts include using reusable mugs instead of paper cups, recycling correctly, or other pre-designated activities. Ask campus or local businesses to donate environmentally friendly prizes; raffle the prizes off once a month. Winning numbers can be posted and/or printed in the campus paper.
- *"Carry your trash."* Faculty, administrators and students are given two large, clear plastic bags. In one bag they put trash that cannot be recycled, and in the other bag they put their recyclables. Participants can only use trash generated on campus. The contest can take place for a day or a week, and the individual who produces the least amount of waste, trash and recycling wins a prize.

## Displays

- *Recycle cycle.* A display of pictures of the recycling process cycle, showing everything from material generation to buying back recycled products, can be a visible and effective way to educate individuals about resource management and the importance of buying recycled products.
- *Garbage can display.* Build a display that looks like a garbage can, slice it in half, and put Plexiglas on the front of each half—which can be removed when you want to update the display. Label one side with a description of what is in your campus trash. Include catchy phrases such as “Did you recycle today?” On the other side, place layers of recyclables and the percentage of each material

recycled on campus with quotes such as, “x tons of trash from campus are land-filled/ recycled each day.” This display can be modified to represent different kinds of information.

- *Buy bulk.* Take two paper grocery bags. Fill one up with ten empty five-pound bags of flour, and the other bag with one empty fifty-pound bag of flour. The ten-pound bags use more resources and take more space than the one fifty-pound bag; this display represents the importance of purchasing items in bulk.
- *Garbage pile/mountain of trash.* Pile one day’s worth of garbage from the entire campus in a high traffic area. Dump the garbage on tarps. This visual display can draw attention and be shocking as well. You will need the assistance of your Physical Plant Department. Place wood stake sticks with facts/statistics next to and in the pile(s). Some campuses have collected trash for three days and placed the pile next to walkways to enhance the effect. Photograph the display and talk to people about their thoughts. This project can be varied with trash/recycling materials from residence halls, specific buildings, or athletic stadiums.

## Games

- *Guessing games.* Have people guess how many cans are in a bale, how much different bales of material weigh, or how much trash or recycling is collected in one day. Give prizes such as free drink coupons, reusable mugs, and T-shirts.
- *Recycling trivia.* At your campus baseball game or another sports game, ask recycling trivia questions and give away recycling T-shirts or other environmentally friendly products.
- *Pledge program.* Ask students, faculty, and staff to participate in taking a pledge to reduce the waste they produce. Give them a sheet of tasks and have them evaluate themselves each month. Participants can receive a certificate and button for their participation.

## Campaigns

Harnessing student and campus enthusiasm by running a campaign can be fun, and help promote recycling awareness on your campus. For example, some recycling agencies promote their campaigns by asking businesses to use recycled material in their products. A campaign can also help display support for recycling legislation.

# Chapter 8. Conducting the Solid Waste Audit

## Introduction

Periodic waste audits should be conducted even if your university does not have a recycling program. An effective waste audit profiles your solid waste stream's volume, general composition, and areas of generation. It sheds light on existing refuse collection operations, while examining possible destinations for shipping various discarded materials. The waste audit should not only look at potential diversion activities, but also verify the level of solid waste disposal service needed by your institution. The audit is also important for maximizing the critical financial linkages between the actual volume of generated waste and the current level of disposal service. Seasonal declines in disposal volumes can lead to financial advantages, such as unit-based pricing contracts or frequency reduction strategies.

The waste audit can become an even more valuable financial tool once recycling collection activities begin. At almost every campus, the same truism holds: once recycling collection activities spread, the amount of solid waste at the university visibly diminishes. With a little creativity, you can structure your solid waste disposal contract to help offset your program's annual costs through refuse service adjustments. This integrated approach allows for the creation of financially sustainable recycling programs and cost-effective waste management.

## Background

Some of the first waste audits conducted at colleges and universities were based on the work of the University of Arizona's Garbage Project. This was one of the only models that attempted to sort and classify vast amounts of discarded material. The results of this research had a major impact on how solid waste management programs were perceived.

Starting in 1973, the Garbage Project meticulously sifted through drilled core samples using exhaustive scientific methods, with which they could even determine the actual number of chicken bones in a given core sample. However, the Garbage Project's study of excavated landfill strata had different goals than the present-day institutional waste audit. While the Garbage Project's landfill research focused on questions about disposal patterns that had already happened, the institutional waste audit is primarily concerned with what *can* happen. The waste audit examines current disposal patterns from a specific location that generates waste in order to implement efficient waste management practices.

## Getting started

Once your institution decides to conduct a solid waste audit, it has taken an important step along the rewarding road of eco-stewardship.

### Who's responsible?

As with any long-term campus project such as a waste audit, success can be achieved if you take the time to develop staff continuity and project "ownership." When hiring consultants to perform the waste audits, it is crucial that a staff person be actively involved in the audit and responsible for implementing any recommendations from the results.

### The Preliminary Study

The next step is to determine your institution's total waste generation. Examining the total generation, along with available markets and regional end-destinations for various discarded materials, is the pre-audit activity that comprises the Preliminary Study. This examination needs to be accomplished before deciding whether to conduct the actual audit in-house or to outsource the service.

The Preliminary Study can be accomplished by working with your contract solid waste hauler or in-house disposal wings. A few casual conversations with front-line service staff will reveal the time frame for annual spikes in waste generation. This activity will be reflected in billing statements from your disposal provider or end-destinations. By reviewing solid waste disposal billing records, you will be able to confirm periods of unusually high disposal volumes caused by student move-in, student move-out, commencement, and athletic or special events.

In terms of investigating regional markets and end-destinations, rely upon your disposal provider, the yellow pages, and Web resources. Doing so should make this research remarkably simple.

### Auditing the collection containers

In order to conduct the waste audit, you also need to become familiar with the equipment used in the collection of the waste stream. There are three primary methods utilized for solid waste transport and disposal.

1. Roll-off containers can be used—typically ten, twenty, thirty, and forty cubic yards in capacity. These rectangular containers slide on and off a rail truck equipped with a cable winch. Once the cab end of the rail is lifted hydraulically to an angle that allows the container to slide off or on, the winch pulls the containers aboard or lowers them onto the deck. The smaller containers tend to be used for heavy materials like dirt or asphalt. Most states do not allow these containers to exceed twelve tons in a given haul, and the various sizes can help maintain your cargo under these limits.
2. Another common method is compaction; many sites use compactors to crush generated solid waste and increase hauling efficiency by maximizing the legal transport tonnage allowed. Compactors condense refuse by an average ratio of three to one. These units come in different types and sizes with a variety of bells and whistles, but like roll-off containers they are transported on rail trucks.

3. The final standard method for campus refuse removal is front or rear loading disposal containers (commonly called dumpsters). These containers are typically 2-8 cubic yards in capacity. They interface with the same front or rear loading disposal vehicles that serve residential communities.

Roll-off container service is perhaps the easiest to track because roll-off containers and compactors use tonnage weights (along with hauling fees) as a means of disposal billing. Copies of their tare tickets, along with copies of the transport work orders, should be included with monthly billing statements.

Front or rear loading disposal containers may be more difficult to track, because they can be billed via a variety of methods. Unless the collection vehicle is equipped with an on-board scale, determining the weights of these individual containers is difficult—and even volume measurements are questionable if these containers are not full at the time of servicing. Conversion tables from different sources are available, but these estimates are based on full containers being serviced and may not reflect reality. Differing figures for these conversion tables and the accuracy of these estimates can also be problematic.

Outsourcing the waste audit to include an institution's total solid waste generation (disposal and diversion = generation) may be expensive and yield hazy results. A more reliable way to gather the information is to work with your solid waste hauler. Dedicate empty front or rear loading disposal vehicles to your site on prearranged days, and have these vehicles weighed at the landfill, transfer station, or on a certified scale. If you follow this method a few times each semester, or quarterly during periods highly representative of average generation, you will obtain a more accurate picture of your total solid waste stream.

The same tactic can also be employed at special events that use front or rear loading containers. Since most major athletic events and commencement activities tend to generate large quantities of refuse and occur on weekends, such events already require dedicated front or rear loading disposal vehicles. If this is the case, gathering weights from these service vehicles can be relatively easy to arrange. While composition estimates may have to suffice for the first year, it is easy enough to apply the methodology of the Preliminary Study to the front or rear loading disposal containers used in special events. In this way, you can determine total generation. If your institution is fortunate enough to have an industrial scale, these results can be achieved by transporting containers to this scale prior to servicing to be weighed, and then weighing the empty containers after servicing. The results of this method will not be as accurate as vehicle weights from the entire campus, but they can nevertheless provide reliable data on specific areas and special events.

Detailed analysis of the special event solid waste stream is an advanced subject, and probably should not be attempted with your initial audit efforts. This is due to the many different circumstances and venues that characterize special events. However, by averaging front or rear loading container weights and adding them to the tonnage of roll-off hauls—and combining them with special event disposal figures—you will at least have a yardstick to compare with outsourced audit results. If this exercise can be achieved by in-house means, the balance of the waste audit can probably remain a homegrown effort.

Once the Preliminary Study is done, you're ready to move on to the audit itself.

## **Outsourcing the solid waste audit**

Conducting the waste audit can be an in-house exercise, or it can be outsourced to external consultants. This chapter is primarily concerned with providing a framework for in-house efforts; however, if you hire consultants to provide solid waste audit services, it is important to understand that some limitations may be involved.

- Waste audits are recurring endeavors and that makes outsourcing expensive.
- Doing an in-house audit involves communicating with service staff, solid waste haulers, contract vendors, and other members of the campus community. Building these relationships is a valuable time investment, and cannot be done when consultants conduct the waste audit.
- Since consulting firms often employ different procedures and methodology, the results of their research can be wide ranging.
- The timeline for a meaningful analysis is often compromised by budgetary constraints.
- When consultants are hired, they lack familiarity with the institution.
- Make sure that the audits include the high and low volume generation periods.
- Watch out for conflict of interest issues in terms of who is performing the audit.

If you decide to contract out your initial or subsequent waste assessments, use the principles discussed in this chapter as a template for contract specifications. Hear a few different proposals and examine the results from the consultants' previous audit activities. This is a field that warrants no certification or rating for consultants, and the jury is still out on methodology and best practices. Without concrete specifications for the solid waste audit, the quality of the finished product can be subjective and have limited utility. An effective outsourced waste audit requires tight contract specifications—and it will require a measure of on-site audit expertise.

## **Application**

Most solid waste audits or assessments share common elements. Some research states that audited facilities should be classified by their function; other research states that the grouping of buildings should be done by size or location. But most agree that some breakdown of facilities is vital.

At its core, the solid waste audit's function is to take samples of solid waste from similar facilities and examines the contents by sorting them into several categories. These "Garbage Parties" can be held with student volunteers recruited from campus environmental groups or clubs, as well as environmental science classes. Many well-known case studies have used this sorting exercise as a means of publicizing the issues of solid waste management and recycling. It can also help raise awareness and increase campus participation once the recycling program is established. In fact, for

many years, the waste audit conjured up images of dumpster diving or mountains of solid waste in the middle of campus.

## **Sorting**

The Preliminary Study that you've already conducted, which will contain information on available markets and regional end-destinations, will heavily influence the number of material categories contained in the sorting. However, the most prevalent categories are:

*Corrugated cardboard (OCC- Old Corrugated Containers).*

*Paperstock materials.* This category can be broken down into grades such as white ledger (WL), office pack (OP – high-grade office paper), newspaper (News), magazines (Mag), and low grade mixed paper (MP). Mixed paper is essentially the balance of recoverable paper fibers with the exception of food service items such as paper plates, napkins, and wax-coated boxes. These foodservice paper products, along with sanitary items such as tissue paper and paper towels, are considered by most paper mills to be contaminates.

*Bottles and can containers.* This category can be broken down into glass (green-clear-amber), plastics (HDPE, PETE, and remaining varieties), and cans (aluminum and bi-metal).

*Miscellaneous items* with clear end-destinations such as toner cartridges from laser printers.

*Refuse* destined for landfills.

Other non-prevalent categories are:

*Organics.* This category can be broken down into green waste, animal wastes and bedding, and pre-consumer and post-consumer food waste.

*Construction and Demolition.* This category can be broken down into scrap metal, wood, asphalt, and concrete.

Once the sort of solid waste samples is complete, weight and volume measurements are made of the various material categories. These results are then converted into percentage figures that hopefully represent the types of waste generated from similar facilities. Next, these results are extrapolated to form the basis of the campus's solid waste composition.

Since most types of non-prevalent campus wastes are transported in roll-off containers, the Preliminary Study becomes vital for an accurate composition estimate of the entire solid waste stream. When examining solid waste billing records, you will note that the material type is often stated in the billing summary, tare tickets, or transport work orders. These documents are the only way to ensure that the disposal billing actually reflects the service being performed. They can also help reveal the composition of total generated waste.

## **Possible pitfalls**

Case studies conducted over the past ten years have represented some very thorough

and honest efforts, but their methodology has contained some errors. It's true that most of these efforts have helped to expand our understanding of the overall audit process. Nonetheless, the evidence shows a disproportionate emphasis on the composition data gathered by the physical sorting of collected refuse samples, particularly in the area of total solid waste generation.

One notable case was particularly thorough in its procedures, and even sorted a day's worth of campus waste based on records from the local disposal vendor. This highly publicized waste audit used over one hundred volunteers who sorted material into fairly logical categories. However, this sort calculated composition percentages from material weights—a problem because the weight was estimated for *all* materials sorted at 0.5 tons per container (Dawrant 16). The capacity of these containers is never supplied in the finished report, in either gallons or cubic yards, which is frustrating because  $x$  gallons or cubic yards of corrugated cardboard, solid waste, paper, plastic beverage containers, and aluminum cans all have vastly different weights for a given volume size. What is interesting is the volume data obtained through reverse calculations of the audit's results. Since landfill capacity and service life are ultimately hindered more by volume issues than weight, an honestly conducted audit would serve a greater purpose than simply meeting the immediate goals of the auditor—it could also be of use to other waste management professionals. Based on this volume data, the composition of this site's waste stream is very similar to the results of campus waste assessments conducted in the first half of the '90s.

In general, composition data from early audit procedures seemed to start with the assumption that we understand very little about the nature of the collegiate solid waste stream. However, we do not need to ignore important lessons from the past three decades of applied resource recovery in the collegiate setting.

Consider the following data. As early as 1992, the Center for Waste Management and Research at the University of Illinois published *University and College Solid Waste Reduction and Recycling*. Included in this work was a table outlining the average university waste stream. Although greenwaste and other industrial waste generated by collegiate plant operations and contractors were not included in the percentages of waste stream composition, this study does reflect the findings of early solid waste audits at colleges and universities across the country. The categories and quantities of this research are:

|           |       |              |      |
|-----------|-------|--------------|------|
| Paper     | 55.6% | Glass        | 5.7% |
| Cardboard | 10.2% | Aluminum     | 2.3% |
| Organic   | 8.6%  | Other metals | 2.6% |
| Plastic   | 7.0%  | Other        | 8%   |

These general categories are representative of the findings from dozens of other collegiate solid waste audits conducted during the first half of the 1990s. They seem to suggest that all universities share similar compositions of solid waste streams due to the similarities in their daily campus activities. These institutional waste audits also suggest that specific sub-categories of higher educational institutions such as agricultural schools, medical schools, and commuter schools also have very similar

waste characterization patterns within each category. Based on this data, the way institutions approach the collegiate solid waste audit is beginning to change.

### **Beware of fuzzy math**

In the 1990s, the collegiate solid waste audits often failed to include the campus nontraditional refuse. However, in the late 1990s programs may have focused too heavily on these materials in their waste audits. Although source reduction and reuse are on top of the waste management hierarchy, calculating these efforts for the waste audit remain difficult. Using estimation formulas for your waste audit can be highly problematic due to the various methodologies that are possible for calculating the diversion number. Calculated numbers using established formulas can vary enormously, even when the actual diverted amount remains the same.

Solid waste and recycling professionals must be aware of the issues in using estimates as actual waste audit numbers. If estimates are used in the institutional solid waste audit, the results will skew an institution's total diversion percentages.

The solid waste audit is primarily a tool for solid waste managers to maximize the efficiency of refuse and diversion programs. This tool can suggest pragmatic diversion programs that can make recycling the most effective method for dealing with the skyrocketing costs of solid waste management. Therefore, resource recovery operations greatly benefit from audit data based on measurable physical phenomena rather than estimates. Whenever possible, actual tonnage or volume data should be collected. This information is the only way to explore economically the relationship between effective recycling and less waste.

## **Combining your audit and your pilot recycling program**

As most available research continues to confirm that colleges and universities are high-grade, high volume sites, more streamlined audits are appearing as well. After all, the amount of potentially divertable solid waste may in the end be less important than the amount of solid waste your institution actually *can* divert from area landfills. For this reason, facility audits of the solid waste stream and your recycling pilot programs might be combined. The refuse from a given building might be weighed and compared to the weights of recovered resources collected simultaneously by the recycling program.

A further exercise may be to determine the amount of resources remaining in the solid waste stream once your pilot program is in place. This can be done through the limited sorting of solid waste samples. Likewise, captured resources will yield information about the potential quantities of various types of recyclable material. Once recycling collection programs are in place, periodically inspecting solid waste samples can indicate how your program is doing and what materials are slipping through your collection net.

The waste audit can also point to where you should begin recycling efforts by identifying print shops, copy rooms, computer labs, and other areas of high grade generation. Finally, the disposal service audit should be frequently employed to allow your institution to take advantage of receding volumes of refuse—which is bound to happen once recycling collection operations are introduced on a large scale.

### **Using the audit to verify service requirements**

Once the recycling program is in place, elements of the waste audit can be employed to verify the service requirements of a given institution. The information discovered about total generation could be important to base year figures relevant to recycling legislation, and the data from periodic samples can be used as a tool to evaluate the performance of collection activities. Experience has shown that the wastes in various kinds of disposal dumpsters such as green waste dumpsters, food waste dumpsters, art department dumpsters, and metal shop dumpsters all have similar waste at the top and the bottom of their containers. At the same time, the disposal stream at higher educational institutions contains large quantities of high-grade recoverable material, indicating that the higher educational solid waste stream tends to more constant than dynamic. Even seasonal special events seem to generate similar materials and volumes year in and year out.

# Chapter 9. Special Event Recycling

## Recycling at special events

Special events can be very wasteful. Attendees are usually unfamiliar with the campus recycling system, and they're too busy with the event to worry about it. Food is served and eaten with throw-away plastic plates and utensils, drinks are dispensed in plastic cups, litter covers the ground, and bulky cardboard boxes cause the garbage dumpsters to overflow. Sound familiar?

But special events do not have to sabotage a campus solid waste diversion program. In fact, with a little planning and cooperation, some large special events can reach an 80 percent or more diversion rate. Setting up a special event recycling program can increase diversion rates, bring in revenues from redeemable bottles and cans, and offer a great opportunity to showcase the campus recycling program. It can even help educate the public.

## Designing a program

Design a brochure that shows the steps to be taken for special event recycling services. Find a way to distribute these brochures to the departments and people who organize events on campus. Remind these organizers to reduce their waste and give advance notice of their need for recycling bins.

## Materials to collect

The collection categories for special events depend on what is currently being recycled on campus. Potential targets can include:

- *Bottles and cans.* Glass bottles and jars, aluminum cans, aluminum foil, tin cans, plastic bottles (possibly only #1 and #2 plastic). No napkins or plastic wrap or bags.
- *Paper.* Any kind of paper that tears, including cardboard, mixed paper, and newspaper. No food or oil contaminated, waxed, or plasticized paper.
- *Compostables.* All food waste, paper plates, paper cups, paper napkins, chopsticks, and biodegradable utensils and bags.

Calculate the waste that an event will generate, including waste connected with preparation, meals, and clean up. Determine what types of drinks will be served. Suggest or make a policy that drinks must be served in recyclable containers. If

drinks will be obtained from dispensers, recycling will not likely be needed unless the cups can be composted. On the other hand, if wine is being served in glasses, the wine bottles should be collected. Be sure there are paper recycling bins for those events that have flyers (such as job fairs) or paper programs (such as sporting events).

### **Choosing collection bins**

It is important to choose aesthetically pleasing bins that have restrictive lids, and which are appropriately sized, easy to move, and can be used in all kinds of weather. Ugly and ragged bins are not wanted by event organizers; such bins indicate that the campus does not care about recycling. Fortunately, there are many acceptable bins from which to choose.

Plastic wheeled carts with restrictive lids are commonly used for special events. The plastic carts hold up well in most types of weather and are safe and convenient to move. If heavy material is collected, such as with compostables or glass, two people may be necessary to empty the cart; mechanical cart tippers can also be purchased. The lids flip back so that material can be removed easily, and large amounts of material can be deposited at one time. For bottles and cans or paper, lids with restrictive openings can be ordered. The small round hole in the lid indicates to people that the bin is only for bottles and cans. The rectangular shaped slit in the lid indicates to people that the bin is only for paper.

These bins come in different sizes, which may vary for different types of special events. Recycling bins should be bigger for larger events; this way they will be noticed, and they will be able to handle large amounts of material. For small events in department offices, a small bin may be more appropriate so that the bin is noticeable but not overwhelming. Once the appropriate bin is selected, determine the number of bottles and cans or paper programs that it can hold.

### **Determine size and length of event**

Determine the number of people attending the event, as well as its duration. To determine the number of recycling bins needed, multiply the number of people by the number of drinks they are likely to consume or the amount of paper to be distributed. Divide that number by the total number of bottles and cans or paper that fit into a representative bin. Make sure enough bins are ordered so that there are no unsightly overflows. If the event is going to last over a period of days, make sure the bins are secured and checked daily.

### **Bin placement**

Plan specific spaces for the trash and recycling containers. Choose locations with high visibility. Make sure they're near waste-generating spots, such as food tables, entrances and exits, and tailgating areas. It is important that attendees see many opportunities to recycle. Another possibility is to have a central station, where garbage, recyclables, and compostables can be separated. It is important to make sure trash and recycling containers are always placed next to each other. If they're not placed together, you will get trash in your recycling bins and recycling in your trash bins.

## **Education and promotion**

Clean and concise labels are extremely important at special events. Labels should be placed on the side and on the top of the bin. For example, UC Davis made a banner and stand out of PVC pipe to place over recycling bins; this way, attendees could find the bins and recognize that they were not meant for garbage. At large events, posters describing the waste diversion process can be displayed, and demonstrations in composting and recycling can be performed. This will show attendees that their recycling efforts have a significant impact upon their local community.

{INSERT PICTURE OF UC DAVIS BANNER] Caption “UC Davis Special Event Banner”.

If possible, ask the event coordinators to designate someone to monitor the recycling bins and help educate the people who use them. These coordinators can remove contamination as soon as it occurs, as well as notify the appropriate person when the bins need to be emptied. Recycling volunteers, staff, students, and boy or girl scouts can be used for this purpose. Remember that it’s easier to monitor a centralized trash, recycling, and composting area during the event instead of sorting the contamination afterwards.

## **Collection**

Make sure recycling bins are emptied in a neat and timely fashion. If necessary, exchange bins with clean ones or wash them before returning them.

## **Feedback**

Collect feedback from monitors and coordinators of the event; hear about the successes of the program as well as suggestions for improvement.

# **Agreements, policies, and procedures**

## **Agreement with vendors**

Purchasing decisions have a great influence on the amount of waste generated by special events. It is important to have vendors only bring products that are recyclable, reusable, or compostable. Vendors should recycle the products that they use, and buy recycled products from other vendors. The event organizers should also use only reusable dishware in order to eliminate the use of disposable or compostable dishware. UC Davis, for example, ran its 2003 Whole Earth Festival using specific contract language and reusable dishware (i.e. plates, cups, utensils), and achieved an excellent 95.5 percent diversion rate (*UC Davis Whole Earth Festival 2003*, online).

One way of ensuring vendor compliance is to have them sign contracts stating that they will comply with the event’s waste reduction and recycling procedures. WEF required its vendors to make an environmental deposit; this deposit was returned to the vendor once they demonstrated compliance with their contracts.

In 2002, the WEF decided to eschew compostables and instead purchase reusable plates, cups, and utensils for its event. A deposit system was created for the dishware when festival attendees purchased any food items that required it. Attendees received their deposit back once they returned the dishware.

If your event can not convert to reusable dishware, help your vendors by developing a supplier list of environmentally friendly products such as cups, plates, bowls, straws, and utensils. Encourage vendors to buy recycled products such as high post-consumer content recycled plates and napkins.

Ask the vendor to follow these waste reduction policies:

- Only give straws and lids to customers who request them
- Use ketchup and mustard dispensers instead of single serving packets
- Use bread bowls instead of disposable bowls
- Sell finger food
- Use napkins instead of plates when possible (*UC Davis Whole Earth Festival*, online)

Event organizers, through event announcements and publications, can encourage attendees to bring their own cups, utensils, and plate—and ask the vendors to offer a small discount for those who do.

Require vendors to only use recyclable containers. Clearly specify what can be recycled on campus and what cannot. Do not allow non-recyclable containers such as polystyrene/Styrofoam cups or #3-#7 plastic cups unless there is a recycling market for the material in your area. If plastic cups are necessary, require only the plastic cups that are recyclable in your area.

Require that vendors use compostable/biodegradable food service products. Paper plates, napkins, and cups and chopsticks can be composted. Ask that paper plates and cups be bleach/chlorine free and not coated with a heavy wax or plastic. Utensils and bags made from cornstarch and cottonseed oils are now available. The UC Davis Whole Earth Festival makes it mandatory for festival vendors to purchase biodegradable utensils and bags; to help, the event organizers buy these items in bulk and sell them to vendors at below cost.

Finally, direct vendors to recycle their cardboard and other recyclables in the appropriate bins and submit reports on their waste reduction activities. Recycling staff can audit vendors for compliance.

As more and more events require waste prevention and reduction procedures, vendors will begin to incorporate these methods into their normal operating procedures.

### **Internal university policy**

When departments host an event where bottles and cans will be served, or large amount of potential throw-away paper will be distributed, they should be required to submit a work order for a recycling bin (and a garbage bin, if necessary). The work order should state the quantity of recycling bins, the day and time the bin is needed, the location, and the time it can be removed. The recycling program should deliver a clean, neatly labeled bin.

At some campuses a fee is charged for this service. Most departments understand the

necessity for the fee because of the labor involved in delivering the bin, sorting through the material, and removing and cleaning the bin.

In addition, the campus recycling program should be sure to place recycling bins in popular meeting rooms, such as department conference rooms or the student union, and service them regularly.

### **Clean up procedures**

After an event, the clean up crews should be instructed to separate trash from recyclables and be supplied with two types of plastic bags. As they are cleaning the ground, they should put all recyclable bottles and cans into clear plastic bags (a separate clear plastic bag for paper, if needed) so contamination will be easily identified. At the same time, they should place all trash into dark plastic bags. Once the material is separated, the clear bags should be taken to the recycling area and the dark bags should be taken to the garbage dumpster.

## **Recycling at sports facilities**

### **Clean up procedures**

Cleaning up at stadiums and other sport facilities offers a great opportunity to divert recyclables from the waste stream. The cleaning crew should use the method described above, using one clear bag for bottles and cans, another clear bag for recyclable papers such as game programs, and a dark bag for everything else. The clear bags can even be emptied at the recycling center and be reused or baled for recycling, if markets are available.

### **Special educational opportunities**

Because of the large number of people who attend sporting events, an enormous opportunity exists to educate the greater campus community about recycling.

- Educate ushers; they are the people who interact with the attendees. Ask the Athletic Department to allow a small section in the usher training manuals or instructions that describes the placement of recycling bins, as well as information about what can be recycled.
- Place an advertisement in the sports program. This may be expensive, so ask the garbage and/or recycling hauler or a local mill to sponsor the advertisement. It might be possible for the Athletic Department to place the ad for free as a service to the community, and to better its own recycling program. Remember that the more spectators there are who recycle, the less litter there will be after the event.
- Distribute freebies such as key chains, mugs, or T-shirts that promote recycling. Make sure the promotional items are useful and won't contribute to waste stream.
- Sponsor half-time events. Have the mascot promote recycling by participating in a skit or spelling out "RECYCLE" with the crowd.

- Ask to have the words “Please Recycle Your Bottles and Cans” scroll across the scoreboard between innings or quarters.
- Find out if the announcer can promote recycling measures throughout the game—and especially at the end of the game. Announcers usually require a three to five line script so they know exactly what to say.
- Decide in advance to donate all or part of the salvage revenue to a non-profit group, such as the boy or girl scouts or the local hospital. Be sure to let the attendees know what you’re doing so they will be encouraged to recycle.

Developing a good relationship with the Athletic Department is key to the success of these programs.

# Chapter 10. Organics and Composting

## Why divert organics?

Organic material is any natural material that decomposes. Yard clippings, grass clippings, woody materials, food scraps, crop residues, and animal manure make up about 35 percent of the waste stream generated in California (CIWMB 36). Diverting organics from the waste stream can contribute to a higher diversion rate for the campus, and also creates a valuable soil amendment.

## Organics collection

### Green waste

On most campuses, the grounds department has the potential to separate and collect leaves, branches, and grass. If this material is being sent to the landfill, it is being wasted. Green waste and litter is often mixed together, which prevents the material from being diverted efficiently. A solution to this problem is to have the groundskeepers separate the trash from the clean green waste.

On the Stanford University campus, the Grounds Department uses two-yard towable dumpsters to collect material. It used to be that as litter and green waste was mixed together, the material was taken to the landfill. But now, by tying a trash bag to the side of the grounds dumpster for litter and keeping the green waste clean, Stanford is able to send the material to a compost facility. This way, the university is able to divert more than 30 cubic yards per day. When the groundskeepers need to clean up more trash than usual, they use a separate two-yard dumpster and place it in a separate location so the hauler knows to empty it as garbage.

For large branches or large amounts of brush, a more economical approach to composting is to buy a chipper to reduce the size and use the material as a mulch.

### Grasscycling

Grasscycling is another way to reduce the amount of material that is handled. By mowing the grass with a mulch mower and not collecting the grass clippings, the grounds department reduces its labor and transportation costs; this procedure also leaves valuable nutrients for the soil. It can be difficult to quantify the tons of material that is diverted with these methods, and it may be necessary to conduct a study in order to assess the results.

An example of effective grasscycling can be found at the California State University, Chico, where the campus has chosen to grasscycle by using mulching mowers. The campus has a large amount of greenspace and the department recognized the benefits of grasscycling to reduce staff time and waste being sent to the landfill. The large amounts of yard waste in the form of leaves, non-mulched grass, tree limbs, and shrubbery cuttings are collected in a 40-yard roll off and taken to the city compost facility. At the university farm, this material is composed on-site in windrows.

### **Wood waste**

Wood waste includes logs, large tree limbs, lumber, and pallets. Depending on the size of the logs or tree limbs, this material can be put into a chipper and the grounds department can use the material as a mulch. Large logs and trees may require the use of a tub grinder, which can be rented, or the material can be taken to an off-campus composting facility. Either way, the cost of handling the material for diversion could mean cost savings since many landfills charge high rates for these larger items.

INSERT LOGS.JPG. Caption “Logs to be Ground Into Wood Chips”

Several eucalyptus trees have fallen on Stanford’s campus due to disease or wind, and others have been trimmed or removed for safety reasons. The Tree Crew cuts the logs into small enough pieces to fit inside of a 20 cubic yard box. The material is stored until enough material accumulates to warrant renting a tub grinder to grind the logs into wood chips. The wood chips are then used by the grounds department for weed control or by campus landscapers. In fiscal year 1999-2000, 405 tons of logs were ground into chips. If the lumber is clean, it can be ground up into chips or recycled at a compost or construction and demolition facility.

INSERT SCRAP WOOD.JPG. Caption “Scrap Pallets and Wood”

Wood pallets can be reused and sold; look in the yellow pages for a vendor. Pallet vendors are very particular about what pallets they want, and will pay \$1.00 to \$1.50 per pallet depending on the local markets. The 48x40 four-way pallet is in the highest demand. Often, the pallets need to be stacked by size and condition. If there are no markets in the area, pallets can either be reused (they make good composting bins), ground up, or sent to a compost or construction and demolition facility.

In 1998, CSU Chico purchased a medium-size chipper that can be transported to various locations on campus. When a tree has to be removed, or if limbs need to be trimmed, they are chipped and then reused on campus (as long as the tree is not diseased). This activity has saved the university money in transportation and disposal fees, and it has enabled the campus to reuse materials (mulch/chips) instead of purchasing them (Kopicki, online).

### **Food waste**

Food waste can be considered the last frontier in campus waste management. It involves more people, has more issues, and can be quite smelly if not done properly. Food waste is made up of pre-consumer waste (vegetable scraps), post-consumer waste, plate scrapings, coffee grounds, napkins and paper products, and waxed cardboard. A campus food waste program can tackle parts or all of these various streams.

The largest amount of food waste is found in student housing dining services or eateries on campus. A smaller amount of food waste is found in the academic areas. Mark Darling of Ithaca College in New York developed the following formula to determine how much food scrap is generated on campus:

- Number of Student meals per day x .36 pounds = Food scrap produced per day (1).

In order to further determine the amount of cubic yards, Darling gives the following formula:

- 1000 pounds of food scraps = 1 cubic yard (1).

Using these numbers, one can estimate the amount of food waste on campus and the best approach for handling it.

The first phase of a food waste program should focus on reducing and reusing. A dining facility may need to make fewer meals if it produces a large quantity of edible food on a regular basis. Excess edible food should always be donated to local food banks and homeless shelters. If there's rotting material, there could be safety issues; contact the campus or local environmental health department regarding applicable regulations.

Food waste collection needs to occur on a consistent basis in a sanitary and safe manner. Food waste can be very heavy, and is often collected in five-gallon buckets with lids or in plastic carts with wheels. Generally, food waste needs to be picked up daily or every other day. Bins need to sanitized and deodorized.

At CSU Chico, the Associated Students collect pre-consumer food scraps from two kitchen areas and three coffee stations five days a week. Students drive a Toyota Electruck with a small flat bed to each location. Clean bins are dropped off at each location. Kitchen areas use one-to-three 20-gallon yellow containers with a lid and dolly. Coffee areas use small buckets with a handle. Three times a week, the food scraps and coffee grounds are driven to the University Farm where they are dumped into a windrow and mixed with grass and cuttings from the farm university employees. University farm employees turn the pile at their leisure and use it for sustainable agriculture classes. Two times a week, the material is dropped off at the compost display area on campus where it is used in a variety of compost bin types and wormbins. Funding for this project was initially provided by the Associated Students Foodservice, which approved the funding for student salaries (one student, about two hours a day, for thirty-two weeks). After four years, AS Recycling was fortunate enough to receive consistent funding and subsumed this cost into its annual budget (Kopicki, online).

Seattle University collects about eight tons per year in coffee grounds and filters, and it does so separately from food waste. It only takes about two extra hours per week to collect from three espresso stands and four kitchens. Each espresso stand goes through 2-4 five-gallon pickle buckets per week, and the large kitchens produce 5-10 buckets per week. Each bucket weighs about thirty pounds. The buckets are exchanged at the same time that the recycling bins are emptied.

The university also provides offices with lidded, one-gallon containers. These get emptied either every week or every other week depending on their location. The five-gallon buckets are emptied into larger cans and then transported to an on-campus compost pile. The pile sits for about a month before it is turned. The pile does not attract rodents or bugs—and according to the Seattle University Grounds Department, it makes a good compost for the flowers. Coffee grounds are a little easier to handle, because they do not rot or smell as food waste does. This program is cost effective because the coffee grounds are fairly heavy, and the local landfill tipping fees are high (Broutis, online).

### **Animal bedding and manure**

Some universities have animal bedding and manure. Often, this material can be composted on campus or added to a mixture of material to help the composting process.

Stanford University's Stanford Barn produces forty cubic yards of horse manure per day. This material is simply stored in bunkers for about six months, where it composts itself. Once complete, the material is sold to landscapers.

University of Vermont takes low-value fiber waste and chops it up in small pieces for animal bedding. As the stalls are cleaned each day, the mixture is placed in a manure spreader and windrows are formed. The piles are turned with a bucket loader every 5-7 days; the finished product is ready for agricultural grad application within 2-3 months. 350 tons of fiber enters this system, saving the university disposal, bedding, and fertilizer fees (Clark, online).

## **Composting and processing**

Once the material has been collected, the university needs to decide if it wants to compost the material on site or bring it to an off-site vendor. A finished soil product counts as diversion from the landfill, and it can also be used on campus lawns, flower beds, and shrubs. Still, there are many obstacles to composting on site, such as finding space, completing and monitoring permits, and purchasing the necessary equipment. Composting is about managing the process to obtain the right environment to speed up the process of decay and to reduce odors and vectors. It requires a person who has the necessary skills and knowledge to oversee the system and create a consistent end product. This person would need to find the correct carbon-to-nitrogen ratio, the moisture content, and the pile temperature. For more information see the US Composting Council Web site, [www.compostingcouncil.org](http://www.compostingcouncil.org), or the Cornell University Waste Management Institute Web site, [www.cfe.cornell.edu.wmi](http://www.cfe.cornell.edu.wmi). In addition, Mark Darling's and Erin McDonnell's Ithaca College *Food Composting Operations Manual* (December 2000) is particularly helpful for on-campus composting programs.

### **Windrows**

Windrows are long rows of organic material. They require a large amount of space in an area of campus that will not be affected by odors or dust. Water is added and the pile is turned on a regular basis. Smaller windrows may be turned with a pitchfork; larger piles may require a front-end loader or a backhoe. As the material is turned,

contaminants such as plastic can be removed. It can take 6-12 weeks for the material to compost.

The University of California, Santa Cruz, collects fruit and vegetable prep waste from the kitchens, and coffee grounds from the campus coffee carts and coffee shops. They mix the material with leaves and wood chips generated on campus, and lay the material in rows. In another windrow they combine grass clippings and landscape wastes. Both rows are turned with a front-end loader (Wade, online).

Ithaca College uses forced aeration static piles inside a 40x80 feet steel building, allowing the composting of food into fertilizer in five weeks. The piles are screened of wood chips and placed outside in windrows to leach out the soluble salts, a byproduct of composting meat and dairy (Darling, online).

California State Polytechnic University, San Luis Obispo uses windrows, and developed a recipe using prep food waste with cow and horse manure, and bedding. They combine 50 percent vegetable prep, 25 percent dirt, and 25 percent horse manure, which composts in about thirty days. Once cured, the product is sold to local organic farmers and wineries (Johnson, online).

### **In-Vessel**

Problems of space and odor lead some universities to invest in an in-vessel composting machine. This machine takes up much less space than windrows, and contains the composting process inside itself to limit odors and vector problems.

Often, organic material is placed in the composting machine using cart tippers. Depending on the moisture content of the organic material being composted, bulking agents such as sawdust or wood chips may be added. Heat and moisture compost the material within the machine itself. Once the material has been composted, the machine is emptied and the material is cured in a pile. The final product can be used on campus as a soil amendment or mulch.

San Francisco State University used a 1000 pound-per-day Wright Environmental in-vessel composting machine. The university mainly composted food waste, and added wood chips to soak up the extra moisture from the post-consumer food waste. Since the chips did not completely break down, the staff used a screen to remove wood chips and cycle them back through the machine (Roe, online).

INSERT INVESSEL SFSU.JPG. Caption “SFSU’s Invessel Composter”

For more information about in-vessel composting machines, see Green Mountain Technology at [www.compost.gmt-organic.com](http://www.compost.gmt-organic.com) or Wright Environmental Management at [www.compost.wem.ca](http://www.compost.wem.ca).

### **Vermicomposting**

“Vermicomposting” means using worms to eat food waste. Worms can produce castings from this activity which are high in nutrients. Worms are placed in a container and covered with moist bedding, usually made of newspaper. Food is placed underneath of the bedding and the worms take care of the rest. Worms can eat an enormous amount of food, do not have an odor, and reproduce regularly.

CSU Chico has purchased a vermicomposting system composed of three 4x8 bins and several small vermicompost bins, as well as about ten compost bins. Staff delivers food on a daily basis and feeds it to the worms on a rotational basis. They plan to harvest the wormcastings, in order to use them for fundraising and also for the garden and green house.

INSERT BERKELEY WORMS TRUCK.JPG. Caption “Berkeley Worm’s Custom Truck”

Berkeley Worms, associated with UC Berkeley, collects food waste for a vermicomposting system that they designed and built themselves. They collect food from fraternities, sororities, co-ops and 4-5 dining halls in a special custom truck that has a candy cane-shaped cart lifter on the back to empty the food carts. Once at the composting area, the food scraps and slurry are emptied via a chute into the worm bins (Nafici, online). They have about 15 5-7' bins made out of plywood. Food is distributed in layers alternating with manure or "hog fuel" (half mulched wood chips). As the worms eat the food, the material works its way down until it is ready to be harvested from the bottom. The bottom screen is made up of a web of rope strands (Cooley, online). Berkeley Worms harvest and sell the material, in addition to worm bins and worms, at local farmers markets. They have also recently begun bagging their material in one-cubic yard bags for sale to home gardening centers, and offer their product loose to larger commercial consumers (Bauer, online). See their Web site at [www.ocf.berkeley.edu/~compost/index.html](http://www.ocf.berkeley.edu/~compost/index.html).

Humboldt State University developed its own vermicomposting unit called V2K. This unit holds worms in 1x2' trays, 6" deep. There are eight trays on each of the four levels. Staff members feed the worms vegetable scraps and coffee grounds (Rasmussen 7). Humboldt received a grant from the California Integrated Waste Management Board to purchase and install a vermicomposting system called Worm Wigwam ([www.wormwigwam.com/large\\_systems.htm](http://www.wormwigwam.com/large_systems.htm)), and looks forward to expanding the school's already successful system.

The Medical University of South Carolina uses a large-scale vermicomposting system from Vermitech Systems to compost about 200 pounds of food scraps per day. Staff members collect food from the main cafeteria including fruit and vegetable waste, jello, pudding, bread, and occasionally deli meat. Two employees are responsible for shredding cardboard and food waste and spreading the material in the unit. Finished compost is removed every two months and used by the Grounds Department (Von Kolnitz, online). The unit is 18x7' wide, and housed in a building with an 18x24' wide concrete pad coated with acrylic for easy clean up and electricity, water, and airflow hook up. Staff members have experimented with different recipes to see if they can encourage the worms to eat at an optimum pace; they have shredded the food scraps, used newspaper and cardboard as material to cover the worms, and varied the temperature, moisture, and air flow. Altogether, they spend an hour-and-a-half working with the bin each afternoon (Vermitech, online). For more information see [www.wormdigest.org/articles/index.cgi?read=50](http://www.wormdigest.org/articles/index.cgi?read=50).

### **Transporting to off-site facility**

Instead of developing a university-run organic composting system, schools can take their organic material to a commercial composting operation. Although transportation costs will increase, there's nothing more to do once the material is delivered.

Sometimes an arrangement can be made to backhaul a certain amount of finished product to the campus. Look in the phone directory or call the city or county for a list of commercial green waste composting operations; these facilities will likely charge lower tipping fees than landfills.

Once a facility is located, tour it and make sure the people are handling the material appropriately. Often, large bulky material such as logs, large tree branches, lumber, and pallets are being chipped and used as boiler fuel. If this is the only option, at least it's used material being burned and not virgin wood.

## **Education and promotion**

If you're running an organic composting and diversion program, the campus should know about it. Participate in fairs and festivals to demonstrate what your program is doing and how the grounds department is involved. Have a sale on compost and home composting bins. Set up an ongoing compost demonstration site. Finally, give tours and composting demonstrations and teach backyard composting to staff.

Contamination is one problem that faces every organics program at some point. Meat and dairy products, oily food, and plastic utensils are dumped in the food waste bin by people who do not know or care about the rules. Labeling and training are keys to preventing contamination. At each of the collection points, train staff and students on what material is and is not accepted. Be sure to tell them why. Attend kitchen staff meetings, if possible. Keep track of locations where contamination occurs frequently; return to those locations to conduct additional training. Create clear, concise labels with lists of "YES" and "NO" items. Make posters of the process so people can understand visually what is happening to the material.

Finally, thank the staff and students for taking time to separate the food waste. At the end of each semester, CSU Chico's AS Recycling Program gives the food service staff a "thank you" dessert of Oreo cookies and gummy worms (Kopicki, online).

## **Biodegradable plastic bags and dishware**

Although placing organic material in plastic bags may be convenient for food/yard waste collections, it can be problematic for processing. Many communities across the country have switched to collecting organics in large plastic carts or other containers, because it can be difficult to remove the materials from bags in a systematic way at the processing facility.

New biodegradable plastic bags and dishware made from corn or potato starch and mineral-based oxidizing polymers have limited the problem with plastic bags. This is because of their ability to biodegrade under aerobic conditions found in compost piles. Dishware made out of this material can also help to end the problem with disposable food service products. It must be made clear, though, that although these plastic bags and dishware are called "biodegradable," they will not biodegrade in a landfill. In order to biodegrade they need exposure to heat, water, and air—elements they will not get in a sanitary landfill. If the bags/dishware materials are to be

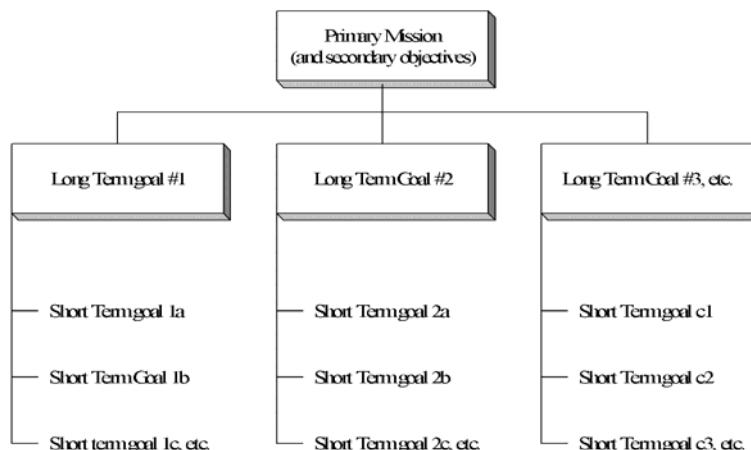
chipped instead of composted, visible pieces would remain. Before switching to these generally more expensive methods, check with your compost facility.

# Chapter 11. Quantifying Progress

Quantifying progress begins with setting goals for your program. Most campus administrators have a basic conceptual understanding of recycling, but they do not fully understand what a recycling coordinator does or what a recycling program entails. You need to prove to campus administrators that the program deserves their continued support. The way to do this is to define your mission and goals, and to demonstrate your progress in meeting those goals.

This process is illustrated in Table A. The following pages will describe each step in greater detail.

## **Setting your primary mission, objectives and goals**



*Table A*

## **Defining your primary mission**

The first step is to define your primary mission. As a recycling program administrator you have to figure out, bottom line, what your college or university is paying you to do. A typical answer to this question is “Run the recycling program.” However, that is a very vague mission. Your primary mission is much more

specific—and being able to define this mission is crucial for gaining the support and trust of your campus administration.

Often, your primary mission depends on who is funding and/or administering the recycling program. Recycling programs may be housed within Facilities Management, Business Services, Support Services, Associated Students or a wide range of other departments. These different “parent” departments all have different missions, and they can all affect the mission of the recycling program.

Most recycling coordinators, especially when supported by Facilities Management, are being paid to divert recyclable material from the general trash. Understanding this purpose is critical, because all projects or activities need to relate to that primary mission.

Some campus recycling coordinators receive funding from academic departments. A primary example of this is Brown University, where Kurt Teichert, their “recycling coordinator,” is actually a campus professor. In those cases, the primary mission may be to educate students about recycling—and running the recycling program is a means to that end.

Other campus recycling coordinators are funded by Associated Students (or a similar Student Government organization). In this case, the primary mission of the program may be to involve students with the recycling process.

For most campus recycling programs, however, education and student involvement are secondary goals. The primary mission is to keep recyclable material out of the trash. By making progress towards that goal, the recycling program will continue to earn the administration’s support.

You do not necessarily need a written mission statement on your Web site or business cards. However, as program administrator you should have a clear idea of your primary mission, and be able to convey this mission to your staff throughout all of your daily activities.

## Defining your secondary objectives

After you have defined your primary mission, it is also helpful to define secondary objectives. Like your primary mission, these objectives do not have to be contained in a formal written document, but should be clearly explained to staff or administrators who are involved in the program. Examples of these secondary objectives may include:

- Raising general awareness about recycling.
- Integrating the recycling program to support student academic goals or projects.
- Getting students involved in the program.

Secondary objectives should be pursued when they are cost effective and can help further your primary mission. If they do not help with your primary mission, they should be reduced in importance or completely abandoned.

## **Setting goals**

Defining a primary mission and secondary objectives is a good start. But it's important to give your goals meaning, and to begin tracking your progress towards meeting them. In order to do this, you need to set concrete goals for the projects that you hope to accomplish or the milestones that you hope to reach. These goals should be a quantified subset of your primary mission.

For example, if your primary mission is to keep recyclable material out of the trash, you may set a goal to divert 50 percent of your waste via recycling and source reduction efforts.

Such a goal gives you a quantifiable target. By utilizing appropriate data tracking forms, you can begin tracking your diversion percentages. This will give you a measurable, defined goal and a means for monitoring your progress.

To truly track your progress, your goals will need a time frame. Using the example above, by when do you plan to divert 50 percent of your waste? By tomorrow? By next year? By 2004? By 3008?

In addition, it may help to define for how long you hope to maintain a certain goal. For example, for how long do you plan to divert 50 percent of your waste? For a week? For a year? Indefinitely?

### **Long-term goals**

Long-term goals should be a quantifiable part of your overall mission. They help to define the primary goal that you are striving to reach.

Sometimes legislation dictates your long-term goals. For example, for campuses in California, regulations specify that state facilities should divert 25 percent of their waste by 2002 and 50 percent by 2004. This provides all state facilities covered by this legislation with a definitive, long-term goal.

If you do not have a specific legislated goal, you may want to dictate your own time period. A five-year plan or ten-year plan can give your program a map with which to chart its success over a period of time.

### **Short-term goals**

As valuable and well intentioned as long-term goals are, many of us lack the attention span to focus exclusively on long-term goals. Most of us operate in a specific time frame, such as a semester or a business quarter. Thus, a series of short-term goals should be developed. Keeping in mind your primary mission and secondary objectives, what specific projects would you like to implement or improve in a particular time frame?

Short-term goals should be goals that can be reasonably completed in the time frame allotted. What projects would you like to complete? Is there a new educational program you'd like to have in place? Is there a new brochure or label that you'd like to have designed and/or distributed? Are there new recycling containers you want to distribute within a building? These goals should be clearly communicated to everyone involved in the program, and should be your active "front-burner" projects during that time period.

Be careful not to make your short-term goals too rigid, sacrificing an opportunity to fulfill a long-term goal even when the chance arises. For example, one of your long-term goals may be to purchase a piece of capital equipment, such as a recycling collection vehicle to improve your collection efficiency, or to buy new processing equipment to improve the marketability of your recyclables. If you did not expect funding for this project in a particular time frame, it may not be among your short-term goals and will go "on the back burner." However, if an unexpected funding source appears—such as a grant or excess budget money at the end of the fiscal year—don't turn down the opportunity to meet one of your long-term goals.

## Keeping track of projects

The key to making goals work is to track your progress towards meeting them. If your goal is to implement a certain project by a certain time frame, keep track of whether or not projects are completed—and if so, how long the projects took to complete. Keeping a chart can be helpful (see Table B).

| Short Term Goal    | Status | Date Completed |
|--------------------|--------|----------------|
| Short Term Goal 1a |        |                |
| Short Term Goal 1b |        |                |
| Short Term Goal 1c |        |                |

*Table B*

It is also helpful for programs to do a formal or informal report at the end of their defined goal period. This may be done after each implemented program, each semester, each year, or each decade—whichever time frame is best for your program. Administrators can't be expected to track your program's accomplishments. But if they see a side-by-side comparison of goals and completed goals, they will remember how much value your program brings to the campus. It will encourage them to continue political and financial support to the program, and/or highlight the need for additional support in the future.

For program employees, such a report will allow them to see the actual results of their hard work. They will either feel good about their efforts, or recognize the need for future improvements.

## Conclusion

Defining goals and tracking progress may seem like the most mundane of administrative tasks. But recycling programs compete with other campus programs

for a limited amount of funding and administrative support. Unfortunately, the people who provide that funding are not recycling professionals, and do not fully understand what a recycling program entails. They need defined goals, benchmarks, and progress reports to convince them of the need for their continued financial and/or administrative support.

# Chapter 12. Quantifying Economic Achievements and Savings

## Program comprehensiveness

To truly evaluate the cost of any recycling program, you will need to evaluate your ***total solid waste management costs***.

- Total Waste = Recycling + Trash
- Total Solid Waste Management Costs = Recycling Costs + Trash Costs

It's important to remember that the recycling process is not introducing more total waste onto campus. Other factors may indeed increase or decrease your total waste stream, such as changes in the student enrollment, changes in faculty or staff populations, changes in the economy, or certain technological changes. Recycling itself, however, does not affect the quantity of the waste stream.

Rather, every time you collect a ton of recyclable material, you have less material that otherwise you would have had to collect and dispose of as trash. Conversely, any decision not to collect or divert potentially recyclable materials means that the materials will have to be collected and disposed of as trash.

*Remember: Although there are many different administrative models that can be effectively used to manage a recycling program, the true economics of your program are based on your Total Solid Waste Management costs.*

Throughout this section, you will find examples of campuses that have used economic tools to improve parts of their recycling program. In each example, a description is given explaining either why certain options were more cost effective than others, or explaining the methodology used by the campus to evaluate different options. However, these examples intentionally exclude specific dollar figures. Each campus operates in a different environment, and specific costs fluctuate wildly (such as driver's wages, student wages, fuel costs, market conditions, purchasing contracts, etc). Campuses interested in emulating one of these examples should follow the described methodology, but research and use specific dollar figures that are appropriate for their unique region and environment.

## Economic concepts

Three economic terms will be used in this section. They are explained below.

### Benefit-cost analysis

A benefit-cost analysis is one of the basic economic models for evaluating whether or not a program is effective. The concept is fairly simple. First, add up all of the benefits of a project or program. Then, add up all the costs. If the benefits of the project are greater than the costs, then the project is probably worth doing.

However, life is rarely this simple; we're usually faced with multiple options that render a single benefit-cost analysis ineffective. But the benefit-cost analysis can still be used. It becomes possible to do a benefit cost-analysis for each option, adding up all the benefits of the options and comparing them to all the costs. Simply calculate the net benefits for each option:

Net benefits = total benefits – total costs.

If this net number is a negative number (i.e. if the costs outweigh the benefits), then you have a net cost. Phrased differently:

Net costs = total costs – total benefits.

Your goal is to choose the option that maximizes your net benefits, or at the very least minimizes your net cost. When faced with several options, the option with the greatest net benefits (or the lowest net costs) is the option to choose.

Remember, however, that all benefits and costs should be considered. Some benefits and costs are easy to quantify, and can be assigned a simple dollar figure. But other benefits and costs—such as complying with legislation, monitoring worker safety, improving student morale, observing aesthetic criteria, and reducing odors—are harder to quantify. All benefits and costs need to be evaluated, even if a specific dollar figure cannot be assigned to each one.

### Opportunity cost

“Opportunity cost” is the cost of what else could be produced with the labor, time, or money that is dedicated to a given task. Considered another way, opportunity cost is what you have to give up in order to get something. For example, assume that one hour of grounds crew labor could either collect one ton of paper or mow one-half acre of lawn. The opportunity cost of collecting one ton of paper would be the one-half acre of mowed lawn.

### Marginal cost

“Marginal cost” is the per-unit cost to add an additional unit of something. In a recycling program, consider the following example. Assume that you want to bale paper. To bale the first ton of paper, you need to purchase a baler, install the utilities to make the baler run, pay for the labor to load and unload paper in the baler, and pay the electrical cost to run the baler. The cost of baling the first ton of paper includes all these costs. For the second ton of paper, the initial costs have already been paid,

so the marginal cost is only the cost of the labor and electricity needed to actually create the second bale.

## Components of the program

There are four major components to any recycling and solid waste management program. All four of these components must be evaluated independently and collectively to determine whether your program is operating in the most cost-effective manner.

1. Indoor collection system
2. Outdoor collection system
3. Transporting and processing, marketing, and recyclables
4. Education

A true evaluation of total solid waste costs equals:

*Indoor trash collection costs*

plus the costs of:

*Indoor recycling collection*

*Outdoor trash collection*

*Outdoor recycling collection*

*Processing and sorting trash and recyclables*

*Transporting recyclables to market*

*Any recycling education required*

*Transporting trash to the landfill or incinerator*

*Trash disposal*

*subtract:*

*Revenue from the sale of recyclables*

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*= Total solid waste costs*

**Remember!** As you increase the amount of material you recycle, the amount of campus trash decreases. Thus, as your recycling system improves its efficiency, your revenues on the recyclables will increase and your trash transportation and disposal costs will decrease.

## Indoor collection cost analysis

Recycling collection is nothing new. We have been collecting recyclable materials even before we had recycling programs. But we didn't differentiate the recyclable materials from the other wastes, and we disposed of everything as trash. A good

recycling program simply separates that same waste into two categories: recyclables and other trash.

Before the advent of recycling programs in universities, waste removal was a function of the custodial department. Typically, custodians would travel throughout a building and empty trash from every deskside trash bin and public area container in the building.

Once the recycling program began, this stream of office waste was split two or more categories: trash and recyclable material. This left a dilemma for many campuses. How should these two different categories of material be collected?

There are four primary models used to collect waste and recyclables within a building.

1. *Changing custodial solid waste collection schedule.* In this model, the custodial schedule is modified so that custodians pick up trash half of the time and collect paper the other half of the time. For example, if custodians generally pick up trash five days per week, a recycling program reduces the trash collection to three days per week. The other two days are used for collecting paper.

If custodial schedules are modified in this manner, there are no marginal increases in solid waste labor costs to handle recycling duties. However, some campuses may have difficulties with this option. For example, restroom trash may not be able to last a day or more without being collected. In other cases, the campus may already have scaled back on trash pickup because of custodial staffing cuts. Rescheduling and reducing trash pickups in order to allow for recycling pickups could have damaging effects—perhaps even creating health concerns.

2. *Changing custodial collection method to allow for co-collection.* Custodians continue to collect trash from each desk according to their usual schedule, but now use a split container or trainable container. By using split or trainable containers, custodians can collect both trash and recyclable paper at the same time.

In this co-collection system, the marginal cost of having custodians pick up two containers from each office (usually an additional ten-twenty seconds per office) is less expensive than the other options. Costs can also be reduced if custodians only empty recycling bins that are more than half full.

3. *Central collection containers.* Custodians continue to collect either trash or paper according to their usual schedule, and are not responsible for secondary collections of recyclable material. Instead, staff members are made responsible for emptying either their own deskside recycling bins or deskside trash bins into larger central bins. Custodians then bring these bins to a central dumpster or central pickup location.

This option forces a campus to consider the opportunity cost of office staff time. What else could that office staff be doing with the time that it takes them to bring their recyclables to the central bins? Is that opportunity cost more or less than the marginal cost of having custodians pick up recyclables from each desk instead of just from central bins? However, there may be no cost if staff members make the trip while they visit the restroom or during their breaks.

*4. No custodial involvement.* Custodians continue to collect trash according to their usual schedule, but are not at all involved in the recycling program. Instead, staff members are responsible for emptying their own deskside recycling bins into larger central recycling bins. At this point, recycling staff enters into each building and picks up the larger recycling bins.

This option also forces the campus to consider the opportunity cost of having its office staff empty recycling bins into central recycling containers. In addition, campuses must also consider whether the cost of having the recycling crew empty the central recycling containers is more cost effective for the campus than the marginal cost of having the custodians empty recyclables.

To evaluate each of the above systems, the costs of collection must be weighed against the benefits of the amount of material recovered. This benefit-cost analysis will reveal the best option for your specific institution. Since you are evaluating costs, you want to find the collection option with the lowest net cost.

**Remember!**

**Net cost = total costs – total benefits**

In each of the indoor collection options listed above, take into account the following costs and benefits:

- *Custodial labor costs for trash collection.* Custodial labor costs equal cost per hour for custodial salary and benefits, times the number of hours required to collect trash.
- *Marginal labor costs to add recycling collection* (if applicable). Marginal labor costs equal cost per hour for custodial salary and benefits, times the additional (marginal) time required to collect recyclables.
- *Cost of additional recycling containers.*
- *Opportunity cost of office staff involvement* (if applicable). To find this opportunity cost, determine how much time it takes for office staff members to empty their recyclables into a central container (if applicable). What else could this labor be used for?

In some cases, this office involvement is minimal. In areas where offices are clustered around a central departmental office, staff members can empty their own recycling bins when they use the copier, get their mail or use the restroom. However, in other areas, the departmental office may be an entire hallway or even an entire building away. In these cases, the opportunity cost of office staff involvement is much greater.

The opportunity cost of office staff is perhaps the most contentious cost of this system. There is very definitely an opportunity cost to have faculty and staff dump their own recycling or their own trash. In addition, there is also sometimes a “holier-than-thou” element to this situation, in which staff members feel they

are too good to touch waste. Sorting through such rhetoric can be difficult, but try to focus on costs, not emotions.

- *Cost of recycling crew involvement.* Recycling crew labor costs equal cost per hour for recycling crew salary and benefits, times the number of hours required to collect recyclables.
- *The benefit of the amount of material diverted.* This is an important part of any recycling system, and can affect the economics of your program significantly. If a recycling system is convenient to use and material flows out of a building on a timely basis, it generally leads to a greater amount of recyclable material collected. Conversely, if the recycling system is inconvenient to use and/or recyclables are not emptied often enough, it generally leads to a lesser amount of recyclables collected.

## Outdoor collection cost analysis

Once recyclable material has been collected from within the buildings, it is typically brought to a central collection area. From there, the “outdoor” collection of recyclables begins. There are four main factors that affect the cost of outdoor collection.

### 1. Where are recyclables stored while awaiting pickup?

Once materials are collected from inside a building, where will they be stored until they can be picked up? There are several options available, all of which have benefits and costs. Often the best system is one that mirrors the system being used for trash. Once an area has been dedicated for trash storage, the marginal cost of adding recycling bin storage is usually less than the cost of dedicating a whole new area for waste storage.

In addition to the construction costs of any enclosure, there is also the opportunity cost of the space required. If recyclables are stored in a storeroom inside the building, what other uses of that room are now precluded? If you use an outside dumpster or outside enclosure, what else could that space have been used for? Is it taking up parking space? All of these construction and opportunity costs must be weighed to discern the most efficient recycling system.

This does not mean your college or university should not recycle. It just means that there may be certain systems that are more financially viable for collecting certain materials. For example, if placing individual dumpsters at each building will take up too much space, you may want to consider a system that uses indoor storage. Also consider a centralized system, in which several buildings use one central roll-off or compactor.

### 2. What containers Are used for picking up recyclables?

The type of container used to store and pick up recyclables can have a significant effect on the cost of the recycling program. These costs are usually dictated by campus logistics, and each system has different costs associated with it.

Some questions to consider:

- What are the initial costs of the containers?
- How durable are those containers? What is their estimated useful life span? Cheaper quality containers often have a lower initial cost, but must be replaced much more often—leading to higher long-term costs.
- What type of vehicle is required to pick up the containers?
- How much does it cost per hour to keep that vehicle on the road, including fuel costs, vehicle depreciation, and wear and tear?
- How much labor is required to empty the dumpsters? What are the wage costs of that labor and what are the opportunity costs?

If you have a well-designed campus where a truck can access a dumpster easily and get out quickly, this system may make operational and financial sense. Such is the case at the University of California, Davis, which has the largest campus (in acres) in California. However, if you have a campus with a lot of difficult-to-access areas, where the driver frequently gets stuck in traffic or has to leave the truck to reach a dumpster, this system may be prohibitively expensive.

In the case of Loyola Marymount University, the staff decided to collect recyclables in towable trailer-style dumpsters rather than using a front-loader truck. They towed the recyclables back to the recycling center for processing, using three-fourth scale Gator vehicles. The savings from this system comes from several places. These vehicles are operated by a student with significantly lower salary and benefits than that of a front-loader driver with a commercial driver's license (CDL). Also, the capital cost of a Gator vehicle is only several thousand dollars and is lower than the cost of a front-loader truck (which can cost over \$100,000). A Gator vehicle also requires less fuel and maintenance than a front-loader truck. In addition, these Gator vehicles can get in and out of many campus stops more easily than a front loader.

Another option is the system used by Northeastern University. Northeastern is located in downtown Boston, where traffic is constantly gridlocked; a front-loader or rear-loader waste truck could get stuck for hours in traffic. Therefore, Northeastern has Physical Plant employees bring trash and commingled recyclable paper and cardboard to a series of centralized thirty- and forty-yard compactors. A collection vehicle only needs to come to campus periodically when one of the compactors is full. Thus, the campus is not paying the recurring cost of having a commercial driver and front-loader truck sit in traffic.

Dual collection systems are another option for many programs. A variety of vehicles on the market have compartments for both trash and recycling. For example, Hampshire College utilizes a truck that has a rear-load packer for trash, as well as a side-loading five-yard hopper. This hopper is used to pick up recyclables at the same time that trash is collected. This system does have limitations; the hopper for recyclables often fills up much faster than the packer for trash. Hampshire College has roll-offs on campus for emptying the recyclables, and thus avoids this problem—but if the destination site for recyclables is located at a distance, this problem could prove prohibitive.

### **3. Collection route efficiency**

The order of the collection pickups can have a significant impact on the recycling program. Keep the marginal cost concept in mind when planning your collection route. What are the labor, fuel and vehicle wear and tear costs to drive from the recycling center or facilities yard to pick up at the first building? What are the marginal costs of picking up from the next building? If the next building is near the initial building, then the marginal costs will be minimal. If the next building is all the way across campus, then the marginal costs will be greater. By minimizing your marginal collection costs for each “next stop,” you will improve the efficiency of your collection route and reduce your total collection costs.

There are always times when service needs prevent your collection system from being perfectly efficient. However, by keeping this marginal cost concept in mind, even the efficiency of these “special collections” can be greatly improved.

## **Collection labor**

Another significant variable in the cost of a recycling program is the cost of the labor used. Typically there are three types of employees used to collect recyclables.

- Salaried employees
- Students
- Other organizations (local conservation corps, prisoners, mentally or physically challenged)

*Note:* There are several other organizations that may be able to provide labor to assist with your recycling program. This labor is often available at no salary cost to the college or university. For example, many California campuses work with local Conservation Corps to assist with bottle and can collection. There are other options as well. California State University, Sacramento (CSUS) works with the Sacramento Local Conservation Corps (SLCC) to operate their community drop-off recycling center, and to provide the labor for their office paper recycling program. The SLCC provides this labor in exchange for access to the CSUS recycling center.

CSU Sacramento also works with a special crew of prisoners from Folsom Prison. This crew performs miscellaneous grounds duties on campus. They help divert green waste on campus for composting, as well as help to disassemble junk furniture to recover scrap metal for recycling.

Another option may be to work with organizations that assist mentally and/or physically challenged adults. Northeastern University and Wheaton College are Boston-area campuses that work with such organizations. The individuals assist with the processing and/or collecting of recyclables at the campuses; in exchange, their organizations keep any of the deposit refunds that they collect or process.

However, the cost of labor is not just reflected in salary and benefits. To truly evaluate each type of labor, you must evaluate both the costs and benefits of using that labor. Cost and benefits include

- Cost of paying salary and benefits.
- Cost of training staff.
- Benefits of staff productivity.
- Benefits of staff reliability (arriving at work on time).

The labor option that provides you with the lowest net cost is the best option to choose. Net labor costs equals labor costs (which includes the salary and benefits cost plus the training cost), minus the benefits cost (which includes the benefits of staff productivity and reliability).

Some of the general benefits and costs for each labor type are detailed on the next page.



|   | <i>Salaried Employees</i>  | <i>Students</i>   | <i>Other organizations</i>  |
|---|--|---|---|
| Cost of paying Salary and Benefits  | Typically highest salary & benefit costs   | Salary and benefit costs typically low  | Often no salary cost. Often looking to provide training or work experience for people.  |
| Training costs  | Often come with operational skills that other labor sources lack.  | Tend to have greater level of education and computer skills but require some operations training.   | May require significant training.   |
| Production while on-site (i.e. what benefits can the staff provide for the cost)  | Their operational skills may make them more productive. However, sometimes employees who have worked there for a while are so frustrated by the system that they have little or no motivation. | Sometimes students are very committed to the recycling “cause” and highly motivated. However, sometimes students feel manual labor jobs will not assist with their educational objectives. Also, they may lack certain skills, which make them less productive. | Often thankful for the opportunity of a job and may be very motivated. However, they sometimes lack skills or experience.   |
| How reliable is the staff? If someone misses a route, what are the costs? Remember, usually when recyclables are not picked up, they tend to find their way into the trash. | Other than the vacation and sick time that they have accrued, a full-time employee may be more likely to come to work consistently and on time.  | Sometimes a student employee may miss more work because of other more important educational duties, such as exams, papers & projects and sometimes other recreational activities.   | Often very reliable, because they have counselors who set their schedule. However, if there are unreliable counselors involved, this staff may prove to be very unproductive. |

## Marketing and processing your recyclables

### Learning paper grades and other material specifications

Market conditions are obviously not within a campus's direct control, but they can nonetheless affect the economics of a recycling program. For example, when recycling mills need more inputs for their mill, they buy more recyclable materials. When they don't need new inputs, they buy less. On a large scale, if many mills are looking for recycled material at the same time, they enter into a bidding war for paper to ensure that they get enough product to meet their needs. As a result, the price for recycled materials increases. If many mills all have enough input at the same time,

they do not want to pay much for recyclable materials—and the price drops. These fluctuations are all part of collecting and selling recyclables.

Most of the recycling market fluctuations are outside of a campus's direct control. However, by properly processing and marketing their materials, campuses can take steps to protect themselves from severe market fluctuations.

Two things will help prepare you for market fluctuations:

- The first is a specification sheet. A very good broad industry standard is published by the Institute for Scrap Recycling Industries (ISRI), and is available from their Web site ([www.isri.org](http://www.isri.org)). For recyclable paper, these specifications are known as the Paper Stock Industries (PSI) standards. The PSI standards are also located on the ISRI website. These standards will introduce you to the various grades of material available, which number in the hundreds—some being more valuable and some being less valuable.
- To determine the actual value of different grades of paper, you will need some sort of market pricing index. There are several published price indexes that show an average of what various mills in different regions are paying for a given grade of material at a given time. Each pricing index has a slightly different focus. One popular index is the Official Board Markets Yellow Sheet, available online at [www.packaging-online.com](http://www.packaging-online.com). This index shows what mills (primarily cardboard and paperboard mills) pay for different grades of baled paper. Other indexes indicate pricing for loose material or pricing paid by a different entity, such as a paper broker.

Regardless of which pricing index you use, high-quality papers (notebook paper, photocopies and computer paper) are typically more valuable, while lower-quality papers (newspapers and magazines) are less valuable. Mixed grades of paper that include both low-grade and high-grade paper are typically the least valuable grade of paper.

If you cannot afford the cost of a published pricing index, or are comfortable with one vendor and don't need a broad industry perspective, you might want to ask your vendor for a list of his or her historical pricing for each grade. This will give you an idea what vendors pay for different grades of material—both when the markets are good and when the markets are bad. With this knowledge, you can decide how best to separate your paper to maximize your revenue.

### **Deciding whether to separate different grades of material**

Each campus must weigh the value of different grades of material against the cost of separating those grades. For example, sorted office paper (SOP)—which is most office paper except newspaper and magazines—is usually quite valuable. For baled SOP, mills typically pay over \$70/ton for baled material, as compared to \$20-30/ton for mixed paper. Looking at just the per-ton figures, it would seem logical to separate or collect only SOP. However, this might not be true. Again, a benefit-cost analysis should be used to determine your best option.

To determine the benefits (or revenue) for each grade of material, the equation is simple. The expected revenue equals the price per ton for that grade of material, times the expected number of tons for that grade of material.

After you have figured out your expected revenue, you must calculate your expected costs. These costs include:

- The labor cost to sort or collect this separate grade of paper.
- The equipment cost of any sorting or collection equipment that you may need.
- The fuel or utility costs to power any sorting or collection equipment.
- The cost to maintain any sorting or collection equipment.
- If you are planning to sort material and you do not already have a recycling center or place to sort on campus, you must factor in the cost to construct one. This involves real estate space on campus, which might be very costly on some campuses. For example, dedicating space for a recycling center may be financially feasible in a rural land-rich area such as Davis, but may be very expensive in an urban, densely populated area such as San Francisco or Los Angeles. Each campus must determine these real costs and opportunity costs based on its unique location. Even in land rich areas, it may be very costly to acquire land for a recycling center.
- Another option for some campuses is to collect only valuable grades of paper, whether that is SOP or White Ledger or some other premium grade. When considering such an option, remember that your recycling costs are actually your total solid waste costs. If you only collect valuable grades of recyclable paper, what happens to other recyclable papers? Most likely, they are thrown away as trash and you will have to pay the cost to collect and dispose of that extra trash.

### **Processing and transportation costs**

There are several ways to ship materials to market. Each has distinct benefits and costs.

1. *Hauling loose material directly to market.* You can drive recyclables directly to market in the vehicle in which they were collected. For this option, you must figure:
  - a. The cost of fuel for your vehicle.
  - b. The cost of wear and tear and maintenance on the vehicle.
  - c. The costs (and opportunity cost) of the labor that is required to transport this material to market.
  - d. These costs must be compared to the benefit of any revenue that you receive for the material. Realize that, with such a system, you will be paid prices for loose material. These prices are often significantly less than the price for baled material.

2. *Consolidating loose material in a shipping container.* You can use a shipping container such as a roll-off or compactor. Both of these options compile recyclable materials into a load, which can often be transported more economically. For such an option, you must figure out:
  - a. The cost of a ramp, pit or lifting mechanism to enable your campus collection vehicle or containers to empty into this shipping container.
  - b. The cost to purchase or rent the compactor or roll-off.
  - c. The cost to maintain the compactor or roll-off. Roll-off boxes are fairly simple pieces of equipment. However, a compactor has several moving and hydraulic parts that must be maintained periodically.
  - d. If you are using a compactor, remember that it requires electrical power to compact material. These electrical costs can be obtained from the manufacturer and must be included in your analysis.
  - e. The cost to haul a full roll-off or compactor to market.

These costs must be compared to the benefit of any revenue that you receive for the material. Realize that, with such a system, you will be paid prices for loose material. These prices are often significantly less than the price for baled material.

3. *Baling materials.* You can bale materials using a vertical or horizontal baler. A baler tightly compacts materials into a dense cube, which is much more economical than loose material to transport long distances. Having baled materials also gives you the option to store the commodity longer if markets are poor. For such an option, you must figure out:
  - a. Whether you will need a conveyor or other lifting mechanism to enable your campus collection vehicle or containers to empty into this baler. If so, what is the cost of this conveyor or lifting mechanism?
  - b. If you do not already have an area in which to place the baler, what is the cost to construct such an area? What is the cost to construct the electrical infrastructure needed to operate the baler? What is the opportunity cost of using that space for a baler instead of another use?
  - c. What is the cost to purchase or rent the baler? Also include the cost to maintain the baler.
  - d. What are the utility costs to operate the baler? These costs are usually available from the equipment manufacturer or distributor.
  - e. What is the labor cost to load and operate the baler? Also, what is the labor cost to load completed bales onto a vendor's truck so they can be transported to market?
  - f. Where will completed bales be stored until they can be shipped to market? If an area has to be constructed or designated, what are those

construction costs and what are the opportunity costs of dedicating that space for bale storage?

As indicated above, the variety of processing options depends upon the unique logistics of each college or university. To highlight these options, imagine two different universities—University A and University B.

University A is located in a densely populated urban area. Land is scarce, so the cost of acquiring land for a central processing center is very high. However, it does have several private recycling processing facilities within about ten miles of campus, so the cost of transporting recyclable materials from campus to a private processing facility is relatively low. Unfortunately, the campus does not have its own trash or recycling truck, and lacks the capital to purchase one. Custodial and student labor on campus is very inexpensive. The campus is designed so that several buildings are clustered together into different sections, each with decent access to a loading dock area.

Campus A would likely choose to use a system of centralized roll-offs or compactors in each cluster of buildings. The inexpensive custodial and student labor would bring recyclable material to these central roll-offs or compactors. Once the roll-offs or compactors were full, a waste or recycling hauler could then transport them to one of the local processing facilities.

University B is located in a rural area. It has sufficient land on campus, which has been set aside for future growth. Thus, the cost of acquiring land for a recycling center is relatively low. The campus is at least an hour's drive to the nearest recycling mill or processing center, so transportation costs are very high. As a private university, University B has set aside a pool of money to invest in a collection vehicle and processing equipment—provided it can show sufficient return on that investment.

Thus, after a closer evaluation of its specific costs, University B is likely to build some sort of recycling processing center on campus. Such a center would allow the University to bale or densify recyclables on campus, making it much more economical to transport them to market.

## Educational costs

Education is a necessary part of any recycling program. People on campus must be trained about what can and cannot be recycled. They also must be encouraged to participate in the recycling program.

Unfortunately, without direction, education costs can escalate quickly. The key to curbing educational costs is to keep a benefit-cost mentality when conducting educational programs.

- The first question to ask: what do you hope to accomplish? Plan your goals carefully.
- If you accomplish your goals, what are the benefits to the program? Are the tons of material collected expected to increase? If so, what revenue will be generated

or trash disposal fees avoided? Is the education program expected to help keep unwanted contaminants out of the recycling bins? If so, how much would that save in sorting costs, or the cost of landfilling contaminated recyclables? Would the marketability and value of the recyclable material be increased? If so, by how much per ton and for how many tons of material?

- What are the costs of implementing this recycling program? How much labor will it require? Are there printing costs, and if so what are they? Are there other materials required, and if so what are the costs of those materials?
- Are the costs of implementing that educational program less than or equal to the benefits of the educational program? If so, then that program should be implemented. If the costs of implementing that educational program are greater than the benefits of the program, it should be reconsidered.

For example, imagine that a recycling program can choose one of two educational programs. Program A involves printing and mailing a full page flyer to everyone on campus, encouraging students faculty to recycle and explaining the environmental benefits. In the end, despite all of those printing and mailing costs, people still don't know what to recycle or where to recycle. Although they are more aware about the importance of the program, they have no idea how to participate—and recycling rates do not significantly increase. In this case, the benefits from program A are likely less than the cost of program A. The program may not be worth doing.

Program B involves printing labels for each recycling bin on campus. These labels provide detailed information about what materials to place in that bin. It is easily readable by anyone who sees the bin. The program results in keeping contamination out of the recycling bins, and increases the amount of material recovered for recycling. In this case, the benefits of program B are likely to be greater than the cost of program B. The program is probably worth doing.

A detailed analysis may not be required for every educational program. In some cases, the costs of the educational program may be so minimal that the cost of performing a detailed analysis is greater than the value of the analysis itself. However, recycling program managers should always keep in mind a rough idea of the benefits and costs of any educational program.

## Hidden costs

In addition to the basic recycling program components, there are a number of hidden costs. A thorough evaluation of your recycling program should include an analysis of these hidden costs, which fall into three basic categories.

1. Labor issues.
2. Campus Standards: aesthetics and potential disruptions.
3. Connectedness to academic departments.

## **Labor issues**

One of the most important labor issues to consider from an economic perspective is worker safety. Your labor costs are not only composed of hourly wages and benefits, but also the cost of any worker's compensation claims that you pay. This is often in direct proportion to the amount of intense labor required by your program.

Certain operational programs may appear fairly inexpensive because they have a low capital cost and rely mostly on existing equipment and containers. Such labor intensive systems tend to spring up in situations where volunteer labor is abundant and investment capital is scarce. However, as the program grows, this dynamic can carry a very high cost of worker injury.

Smith College represents a prime example of such a situation. A private liberal arts college in Massachusetts, Smith was using a system in which recyclables were collected in plastic bags using an existing campus dump truck. When recycling crews arrived at a stop on campus, they would pick up bags of recyclables and throw them nine feet or more over the retaining wall of a five-ton dump truck and into the back of the truck. Almost every member of the grounds crew was injured from this operation. In 1998, when Smith began a serious evaluation of the operation, they found they were paying over \$60,000 per year in worker's compensation claims from this crew alone.

This information, along with other data, helped the campus to justify the purchase of a new hydraulic dumping recycling truck and semi-automated Toter carts for each building. With this new system, carts full of recyclables were dumped hydraulically, eliminating the need for any manual lifting. For two years after the purchase of this truck, Smith continued to evaluate the effects of the new system on worker's compensation claims. During that period, there was not a single worker's compensation claim from the recycling crew.

## **Campus standards**

Aesthetic or disruption standards can also affect the economics of a recycling program. Although neither of these issues are a direct function of the recycling program, they can nonetheless contribute to its cost.

For some campuses, the appearance of trash containers or recycling containers is not an issue. For others it is a significant issue. For example, many campuses are perfectly satisfied with high-quality, twenty-three gallon plastic containers. These containers typically cost about \$30-40, and come with restrictive lids to designate clearly whether the container is for paper or bottles and cans. Some campuses will accept the appearance of less-attractive, lower-quality plastic containers, which are slightly cheaper.

However, other campuses require a much higher aesthetic or durability standard. They may require a container made of metal, fiberglass or plastic lumber. These high-end containers often cost \$400-500 or more. However, these bins are typically more durable, secure, and aesthetically pleasing.

Rescheduling pickups to minimize disruptions can also add to collection costs. For example, some campuses may require their waste or recycling hauler to pick up before 8 AM. This is done to minimize any noise or emissions that might disrupt

classes or work. However, such a schedule may require additional overtime or shift-differential salary to get workers on the job that early in the morning.

### **Connectedness to academic departments**

There's another important benefit to consider—one that may outweigh any other costs involved. An efficient recycling program can assist with a university's educational mission. Colleges and universities exist to teach students, and a recycling program can help to support that mission by working closely with appropriate academic departments. This very valuable benefit should definitely be factored into any thorough cost-benefit comparison.

# Chapter 13. Standards and Reporting Requirements

## Why keep tonnage and recycling rate records?

The most obvious reason that you might keep tonnage or recycling rate records is for reports that you are required to complete for a government authority. However, there is another, often more important, reason for keeping and tracking your tonnages and recycling rate: getting administrative and budget support for your program.

Every new campus recycling program must request a budget. And after the newness of the program has worn off, each program finds that it must justify its existing budget and staffing levels. Without any sort of tonnage records to show past progress or the need for future improvements, the program may encounter difficulty keeping long-term budget and administrative support. Budget administrators need data and tonnage reports to justify the need for additional funding, or even to justify continued funding.

## Types of tonnage reports

Overall, there are two types of reporting or data tracking that may be necessary for your program.

- *Intercampus reporting* compares your recycling program against the recycling programs at other campuses or universities.
- *Intracampus reporting* compares individual areas within your campus, or compares your entire campus against itself over a period of time. Many reports sent to government agencies are intracampus annual reports, such as the AB 75 report sent to the California Integrated Waste Management Board in 1999.

Whether you are doing an intercampus report or an intracampus report, you will need to select a period of time over which to conduct the comparison.

Probably the most common type of report is the annual report. Annual reports are usually done either by Calendar Year (January – December) or by Fiscal Year (usually July – June, depending on your budget cycle).

Reporting, however, should not just be done on an annual basis for an administrator's report or a government agency's report. A thorough report evaluates your recycling rates during different parts of the year, showing seasonal fluctuations. Once these seasonal fluctuations are identified, steps can be made to correct any problems.

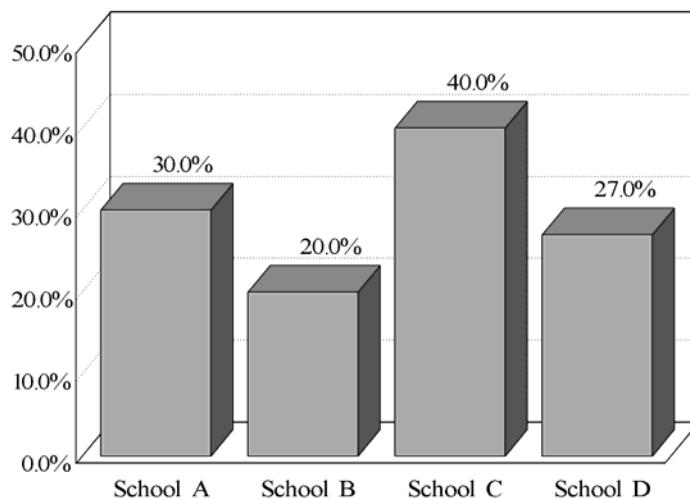
Typical seasonal time periods include:

- Fall semester/quarter (usually September – December, when students return)
- Winter break (usually January, with little campus activity)
- Spring semester/quarter (usually February – April, when students return to campus)
- Closing of school (usually in May or June, when students move out)
- Summer (usually June – August, during summer conferences)

The advantages of seasonal recycling reports can be considerable. To take a fictitious example, assume that School B has a low diversion percentage in comparison to the schools that surround it. School B might produce a report that looks similar to Table 1.



## % Total Discards Recycled



**Table 1**

Smith, a private liberal-arts college in Massachusetts, found itself in a similar situation as School B. When using annual intercampus reports to compare itself to other surrounding colleges, Smith was consistently not doing as well. After viewing the disappointing results in these annual intercampus reports, Smith's administration felt frustrated. Staff members were committed to recycling and felt that they were doing a good job of it.

Creating a seasonal recycling report helped to pinpoint the problem. Smith was doing a good job of recycling, but only during the fall and spring semesters. During

these times, over 20 percent of its solid waste was being diverted for recycling. (Note: This diversion does not include their diversion of animal bedding from the equestrian center, asphalt and concrete or tires.) Smith's recycling problem occurred during other times of the year, particularly winter and May, where the recycling diversion percentages typically dropped down to less than 10 percent of the solid waste. Once the recycling report identified this discrepancy, it became possible to find the root of the problem.

At the time the seasonal recycling report was performed, Smith College was collecting recyclables in plastic bags using a dump truck. The recycling crews would manually lift bags of recyclables and throw them into the back of the dump truck. This system was labor intensive and often exhausting for the recycling crews. During the fall and spring semesters, extra labor could be added to the grounds crew when necessary. However, in the winter (typically January or December), the grounds crew worked additional hours to plow snow and sand roads on campus. After working these exhausting hours, the grounds crew often failed to keep up with their labor-intensive recycling duties. As a result, recyclables within the buildings would pile up until they became a nuisance, after which they would typically be tossed into trash—usually by a custodian, or someone who thought it was a favor to the exhausted grounds workers.

In May, similar demands on the grounds crew's time prevented the recycling program from operating effectively. In this case, the grounds crew was busy preparing Smith's campus for commencement. Thus they were unable to respond to the additional levels of recyclables that were left behind when the students moved out at the end of the year.

The data that resulted from performing a seasonal recycling report was critical for helping the Smith Physical Plant obtain the budget for containers and a new semi-automated recycling truck. Recyclables at Smith are now collected in semi-automated Toter carts, which are dumped hydraulically into the recycling truck. As a result, the recycling crews at Smith can now keep up with recycling, even during other busy times of the year such as winter snow season and the spring commencement.

## Why create standards?

One of the most important parts of any tonnage report is a consistent standard that shows how data is reported. This consistent standard ensures that the data has a uniform meaning from year-to-year, month-to-month or school-to-school (if comparing intercampus data).

For example, consider two schools comparing their intercampus “recycling rates.” If one school is including all of its grounds and landscape “green” waste in its recycling percentage, and the other school is not, it is difficult to compare the two schools fairly because the recycling percentages do not correlate. This is why the College and University Recycling Council (CURC) of the National Recycling Coalition (NRC) developed a national reporting standard. For more information on this standard (known as the CURC reporting standard), visit the CURC Web site at

[www.nrc-recycle.org/councils/CURC](http://www.nrc-recycle.org/councils/CURC) or visit the NRC Web site at [www.nrc-recycle.org](http://www.nrc-recycle.org).

This standard has been modified for the California College Recycling Council (CCRC), a technical council of the California Resource Recovery Association (CRRA), by Roger Guzowski at CSU Sacramento and Lin King at UC Davis. The original CURC standard is patterned largely after Roger's work with Five Colleges, Incorporated, a consortium of schools in Massachusetts. Both Roger and Lin were involved actively in the CURC standards committee, and helped to complete the final CURC standard. The CCRC reporting form is almost identical to the CURC reporting form, but has been expanded to include source reduction activities as well as construction and demolition (C&D) recycling. By including source reduction and C&D recycling, the form becomes useful to California schools when they submit their AB 75 Waste Management Reports to the CIWMB..

Having a uniform tonnage reporting system allows schools to compare their intercampus "recycling rates" in a meaningful way. This should not done for bragging rights, to prove "whose school is best," but rather to learn from other programs so that each school can implement real changes and improvements. In the absence of data, every school thinks it's doing a good job of recycling. However, comparison reports often reveal areas in which schools can show significant improvement.

Another benefit of uniform intercampus recycling comparisons is that they can supplement or often replace a waste audit. A waste audit is an important exercise for showing what your specific waste stream looks like. (See Chapter Eight for more information on conducting a waste audit.) However, a waste audit only gives you a brief "snapshot" of your waste during a limited period of time. Most waste audits use a sampling method, choosing several "representative" buildings and/or sorting through their waste only a few times per year. Waste audits typically do not capture all the seasonal fluctuations or special cleanouts that occur on a campus.

Therefore, schools can supplement or to some degree even replace a waste audit by evaluating recycling tonnage data and recycling percentages from other similar schools. Over a period of one to five years, a campus tonnage report will capture and show almost all of the seasonal fluctuations and campus cleanouts—including the ones that a waste audit often will not reveal.

## How CCRC and CURC reporting forms work

### Different types of forms

The College & University Recycling Council's and California Collegiate Recycling Council's reporting forms are very similar. The CURC form should be used when you wish to compare your recycling program to other programs at colleges and universities across the country. The CCRC works better for comparing and reporting waste diversion activities within California, since the form includes additional categories for waste reduction. These waste reduction categories allow California schools to measure their total diversion rates, which are more consistent with their AB 75 or AB 939 recycling and diversion requirements. The California Integrated

Waste Management Board also has a form, which California schools and stage agencies can use to report AB 75 tonnages to the CIWMB.

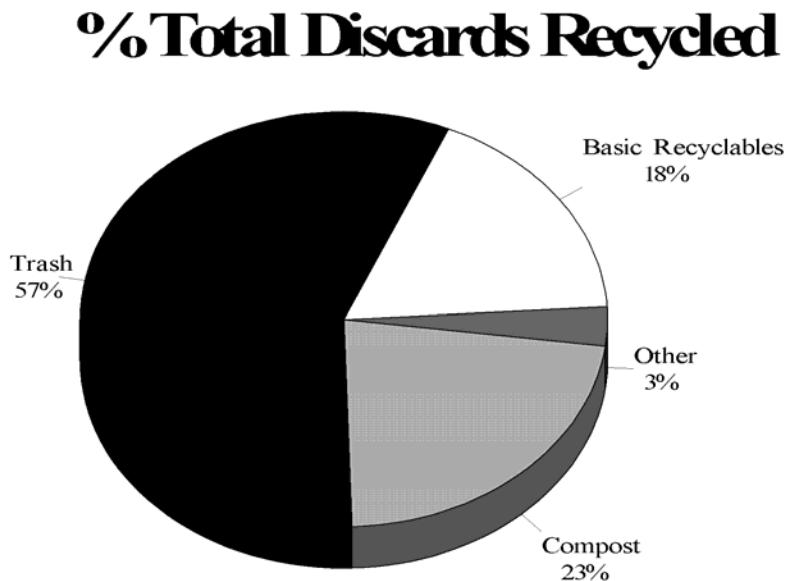
### Profiles

Both the CURC and the CCRC forms contain a “profiles” page. These profiles require you to enter demographic information about your school, such as whether your school is public or private, or located in an urban or rural area. Using this information, you can compare your schools to other schools with similar demographics. For example, if you are a large urban university, you may not care about recycling programs at small rural colleges. By using the profile information, you can compare your recycling rates to other schools whose demographics most closely match your own.

### Categories

The first column of the both of the CURC and CCRC forms show several different categories of recyclables that each campus is likely to encounter. These categories include “Basic Recyclables,” “Compostables,” “Other Recyclables,” and “Trash.” The CCRC form also includes a category for “Quantified Source Reduction” and “Estimated Source Reduction.”

Table 2 illustrates the different categories in the CURC reporting form.



**Table 2**

Each of these general categories includes several sub-categories. For example, under the category of basic recyclables, there are sub categories for “Paper,” “Corrugated Cardboard,” and “Bottles and Cans.” These sub-categories are deliberately general, so that comparisons do not get bogged down in unnecessary specifics.

For example, each campus has a different combination of paper grades that it collects or sorts on campus. The same is true with bottles and cans. Some campuses comingle their bottles and cans and ship them to a processor or materials recycling facility (MRF) for sorting. With all these different options, schools could get sidetracked trying to compare each subcategory of recyclables. By creating uniform general subcategories, comparisons are much easier to understand.

If you are confused by any of the categories in this column, both the CURC and CCRC forms have a tab that includes definitions of what to include in each category. You can find this tab at the bottom of the page in the Excel workbook in which these forms are saved.

A category called “Total Discards” is located at the bottom of the form. Think of this category as your total waste, the sum of all the recyclables and trash that you have collected.

### **Tonnages**

The second column on the CURC/CCRC form is “Tonnages.” For each subcategory of material, enter the amount of tons that you have recycled. If you are using the electronic CURC or CCRC form, which is saved as an MS Excel spreadsheet, the sheet will automatically add up each subcategory to calculate the tonnage totals for each category and for your total discards (or total waste).

Wherever possible, try to get accurate scale weights for your materials. One easy way to get scale weights is to buy a truck scale. However, a truck scale is prohibitively expensive for most schools. It is much more likely that the mill, processor, or landfill to which you ship your waste has a truck scale. If you contract with an off-campus hauler, be sure to request weight records for all the materials they pick up as part of your contract.

As helpful and important as accurate scale weights are, sometimes they are impossible to obtain. If this is the case, performing a volume-to-weight measurement may be necessary. Volume-to-weight conversions take a known volume (such as a four-yard dumpster) and multiply it by a volume-to-weight ratio. The California Integrated Waste Management Board (CIWMB) has a variety of volume-to-weight ratio conversions available. In addition, the CURC reporting form includes volume-to-weight ratios for several materials that are commonly recycled at colleges and universities. Some of these ratios are based on CIWMB data; others are based on data from the U.S. Environmental Protection Agency or based on aggregate data from many CURC members.

For example, to use the CURC form to calculate the weight of a four-yard dumpster of mixed paper, you would start with the volume-to-weight ratio for mixed paper (484 pounds per cubic yard, a number that is based on CIWMB data), and multiply it by the number of cubic yards of material that you have. In this case, your weight would be:

$$484 \text{ lb/cu yd} \times 4 \text{ cu yd} = 1,936 \text{ lb}$$

If you've never converted pounds into tons, simply remember that there are 2,000 pounds in a ton. Using the above example, 1,936 pounds of mixed paper divided by 2,000 pounds-per-ton would equal .97 tons of mixed paper.

However, the above example illustrates a common problem with volume-to-weight ratios. A full four-yard dumpster of mixed paper may weigh almost a ton, but most dumpsters are often not full when they are emptied—in fact, many campus dumpsters are only one-half to three-fourths full when emptied. Thus, even if you have ten four-yard dumpsters for paper, you would probably not be recycling 9.7 tons of paper per week. You can see how using volume-to-weight ratios as a source of data can lead to inaccurate assumptions.

### **Percentages**

The third column on the CURC and CCRC forms is “Percentage.” This percentage shows each category of recyclables as a percentage of the total discards (the total of both trash and recyclables collected).

This is reflected by the following formula:

$$\% \text{ Total Discards Recycled} = (\text{Tons for that recycling category}) / (\text{Tons total discards})$$

This percentage is calculated for each category and subcategory of recyclables included in the CURC & CCRC forms. By calculating a separate recycling percentage for each category, schools can compare their recycling rates for each category separately. This allows different schools at different stages in their development to compare and contrast their recycling rates effectively.

To illustrate this concept, assume you are a recycling coordinator who has just begun a recycling program for basic recyclables (paper, cardboard, and bottles and cans). After a while, you want to see how you are doing. The schools most similar to you may be advanced programs that are recycling all kinds of different materials, including computers, construction and demolition wastes, and composting of landscape and food wastes. If you compare only your total recycling rates, you and your new program members may become overwhelmed quickly with how little you've accomplished. However, if you compare only the line item for basic recyclables, your program can evaluate—for the items it is already collecting—its effectiveness in diverting those materials. The total recycling rate illustrates that there are still whole categories of wastes that your program needs to divert, but the line-item for basic recyclables can still measure your program's success to date.

### **Conclusion**

The CURC reporting form is available to members of the National Recycling Coalition and their College and University Recycling Council. It is free to CURC members and can be downloaded from the CURC web site:  
[www.nrc-recycle.org/councils/CURC](http://www.nrc-recycle.org/councils/CURC)

For a copy of the form that was modified for the CCRC, contact Roger Guzowski at CSU, Sacramento at [guzowskir@csus.edu](mailto:guzowskir@csus.edu) or contact Lin King at UC Davis at [ltking@ucdavis.edu](mailto:ltking@ucdavis.edu). They can e-mail you a copy of the Excel spreadsheet as an attachment.

You can download a copy of the CIWMB form that California schools use to report their AB75 waste diversion figures. To download this form, go to the CIWMB Web site, [www.ciwmb.ca.gov/ProjRecycle](http://www.ciwmb.ca.gov/ProjRecycle)

Every campus recycling program should take the time to calculate and evaluate its recycling percentages. Sometimes the results are a lesson in humility and sometimes they are a cause for celebration. Either way, they are critical for getting your program the support it needs—and the tools to evaluate its progress objectively.

# Chapter 14. Recycling Collections and Processing Operations

## Introduction

This chapter addresses the implementation of recycling collection and processing operations conducted by in-house efforts. With current information about available markets and end-destinations from your solid waste audit (see Chapter Eight), you can now plan the format of your recycling program with some knowledge of what is possible in your region. This will provide important information about what materials to target and collect. In general, recycling operations will target materials with high volumes and economically feasible end-destinations.

## Recycling program formats

An effective in-house recycling program is typically comprised of a few different collection systems. These collection systems target different elements of the collegiate solid waste stream that are regionally divertable or have strong local markets. The most prevalent collection systems target green waste, corrugated cardboard, bottles and can containers, paper, and perhaps food waste. Most physical plant operations already have roll-off containers for scrap wood, scrap metal, and maybe pallets. Although the actual systems adopted by a recycling program reflect available markets and end-destinations, community demand, legislative mandates, waste stream composition, logistics, and economic issues will also play a large role in determining the number of collection systems that an institutional recycling program may contain. Legislation will soon extend the scope of mandated on-campus resource recovery activities, so try to plan your resource recovery operations for the long term.

There are numerous options for in-house recycling program formats, and some of the most common ones are discussed below.

### Source separation collection formats

A source separation program contains collection points at which community members deposit recyclables in containers designated for individual commodity types such as white ledger, newspaper, cardboard, office paper, and bottles and cans. This final category is often further broken down into glass, plastic, and metal cans. For the source separation format, the main recommended categories are bottles and cans and paper.

The number of containers for source separation programs, which will collect different grades of materials, will depend on local markets and available space at various collection points. The benefits of this format can include reduced sorting and cleaning up of grades when these materials are collected and loaded for off-site transport. Pure grades of recovered commodities also command a higher price. In addition, separation programs can help people understand what materials are appropriate for recycling.

There are drawbacks to source separation programs:

- The program requires a great deal of space at each collection point, where multiple containers are dedicated to specific materials. As a result, user-separation formats usually have fewer collection locations than comingled programs. The space factor can also make it inconvenient for the campus community to recycle, creating large holes in your program's collection net.
- It increases the start-up costs because more containers are required for each collection location.
- Service frequency can be a problem. Individual containers collecting specific materials fill at noticeably different rates. This can create a service nightmare, and drive up collection costs when your available labor faces the problems caused by containers becoming full at uneven rates.
- Service frequency can also be an issue because the overall size of multiple containers in user-separation formats tends to be smaller than those in comingled formats. The smaller capacity of these multiple containers will require increased service frequency, which in turn contributes to higher labor costs.

### **Comingled collection formats**

Comingled collection combines many different grades of recyclables into one or two containers intended for community use. Separating bottles and cans from paper fibers can avoid contamination issues, and two uniformly sized containers can comprise a collection point. It is wise to have these containers properly labeled at each location, and making each container a different color (perhaps even your campus colors) will prevent confusion about which container is intended for bottles and cans and which is intended for paper fibers. Doing so will greatly enhance community participation by creating a higher degree of user convenience. Comingled collection locations only require two containers, which means the size of these units can be increased even though the collection point itself will still remain relatively small.

There are also operational benefits from having uniformly sized containers. More containers can be deployed in colored pairs at high-volume collection points, without confusing the campus community. This is an advantage over source separation formats, which can create confusion at collection points where more than one container of a particular grade is being deployed.

Keep in mind that a comingled collection format will require additional educational efforts from your program, so that your campus community understands what items are acceptable in each container. Even when they do understand the comingled

format, people may still deposit materials in the wrong bins. Such contamination will require you to sort the materials into grades prior to transporting, or risk losing partial revenue from the recyclable materials.

Choosing between the source separation and comingled formats should be based on local market options for recovered bottles and can containers and paper fibers, along with other logistical considerations. Container choices should not be considered without first making the major operational decision between comingled or source separation collection methods. After you have chosen a format, however, you're ready to decide which collection containers are best for your program.

## **Collection containers**

The variety of recycling collection containers available today is truly staggering. Deciding which unit best complements your campus recycling program can be a difficult task. This section may make the decision easier by pointing out some useful considerations. Collection containers can be divided into two general types based on operational characteristics: stationary containers and mobile containers.

### ***Stationary containers***

Stationary containers are permanently stationed at specific collection locations and many are equipped to use bag liners or rigid plastic inserts. Most stationary containers have external housings, such as barrel clusters, steel cabinets, and even formed concrete. Some are bolted to the deck, while others are secured by their weight alone. They come in many styles and levels of convenience; for example, a number of these container types are locked, and require a key to access the contents for servicing.

There are several advantages associated with stationary containers:

- Stationary containers can help people remember where collection points are located, since they often remain in the same location for their entire service life.
- They protect bins and recycled materials from students, vandals, and stray animals.
- Stationary containers are often considered to be aesthetically pleasing, and they blend well with campus surroundings. For this reason, administrators and architects tend to prefer them.

There are also disadvantages:

- Unless they receive a regularly scheduled powerwashing, they can become very unsanitary in terms of dirt and odor.
- They may require maintenance, such as the replacement of access door hinges and periodic painting.
- Often, they cannot be moved easily to accommodate unusual special events in the area in which they are deployed. At the same time, they cannot be deployed easily to provide recycling coverage at other locations.

- Despite their size and weight, these units have liners and rigid inserts that are too small to avoid excessive servicing. While the containers may function well for members of the community, service staff may struggle with unwieldy bagged liners or heavy rigid inserts when these containers become full.
- Finally, many of these containers are extremely expensive. Campus-wide deployment could cost more than a year's worth of total solid waste expenditures.

### ***Mobile containers***

Mobile containers have several advantages:

- They are generally replaced at the time of servicing with clean, powerwashed units.
- They usually don't require liners or inserts, since the entire leak-proof container is exchanged at the time of servicing with a clean, empty replacement.
- They usually have wheels as in the case of rollcarts, and they can be secured with padlocked cables to concrete mounted poles, eyebolts in walls, or fences. They can also be left unsecured.
- Mobile containers allow for new collection locations to be established, or the reduction of old locations to suit community needs. They also work well in special event situations because of their mobility.
- They are often designed to interface with cart dumpers and other instruments used to process recovered resources.
- During high profile special events, they can be withdrawn or deployed to less obtrusive secondary locations.
- Mobile containers can be very affordable when purchased in quantity from the manufacturer, and can have hot-stamped lid signage denoting their targeted materials.

Mobile containers carry disadvantages as well:

- They tend to not be the most aesthetically pleasing units on the market. You may be able to alleviate this concern through the use of custom colors to match your campus and hot-stamped program logos, but your campus aesthetic committees may still have reservations.
- Security concerns exist as well. Improperly secured containers can be easily stolen and result in high replacement costs.
- Finally, there are safety concerns. Most mobile containers are made out of plastic, meaning that they are not protected by external housings in case of fire.

## **Collection operations**

Your choice of container hardware will in turn affect your recycling program's collection operations.

### ***Collection staff***

Be creative when filling out your collection ranks. Enlist the Resident Housing Association in your student housing area; have resident directors and resident advisors promote participation in the recycling program. Community promotion and education are areas for unlimited creativity on the part of the Recycling Coordinator, and periodic electronic mail and promotional materials can help your program become a daily part of the campus infrastructure.

Most programs utilize service staff comprised of full-time staff members, part-time student workers, or a combination of the two. Volunteers can play a large role, but many of these efforts may be confined to campus surveys, visual audits, community education, special event promotion, and staffing.

Facility managers have often been cautious about the use of part-time workers because of their lack of training and knowledge. However, several techniques can be used to help alleviate these concerns.

- On some campuses, Environmental, Health, and Safety (EH&S) offices work closely with facility managers to develop the training for specific skills and certification required for program employment. These training courses can develop your recycling team's operational proficiency and safety awareness.
- Training courses can also promote familiarity with operating procedures, equipment, and specific site features of the institution. Recycling team candidates that cannot drive small gas/electric utility vehicles can be identified, and others can be taught techniques such as backing up with trailers and loading. They can also attend short classes on specific routes, communication, safety, and ergonomics. The entire training can occur in an annual two or three-day paid course for selected applicants.
- The best of these course graduates can then be offered a position on the recycling team. Non-hired applicants who successfully pass this training can be placed on an "alternate" list in case of personnel turnover.
- Initially, team newcomers should always ride and work with veteran team members, and the recycling coordinator should heavily supervise all recycling operations.

While the size of the collection staff varies from campus to campus, a common rule of thumb is to have at least twenty part-time labor hours for every 500 on-campus residents. However, by starting small and growing in very definable ways, you will begin to understand what staff complement you will need to meet your program diversion goals.

### ***Collection equipment***

Collection equipment for collegiate recycling efforts has come a long way over the past two decades. Some universities are using smaller, more mobile non-street legal

utility vehicles, allowing part-time student employees to participate in recycling programs.

A fleet of small utility vehicles and trailers can be purchased for less than the cost of one large-ticket item such as a municipal curbside collection vehicle. These small vehicle formats have an advantage over large disposal vehicles in that they can service several collection routes simultaneously. With staff or part-time students running routes of this kind, collection efforts are able to maximize finite labor resources to achieve maximum diversion.

Some colleges and universities have their own municipal disposal vehicles for in-house disposal, but the majority of universities contract with solid waste disposal vendors for refuse removal. There are certain drawbacks with vendors that use front-loading systems:

- Such a system can be expensive.
- Large vehicles will have trouble accessing central recycling locations along paths and roads restricted to pedestrians.
- Disposal vehicles tend to increase campus noise and traffic.

To avoid these issues, some institutions use smaller conventional trucks and vans with hydraulic liftgates to service collection locations. Other programs employ ramp gate trailers pulled by small utility vehicles to either exchange mobile containers or service stationary collection points.

There are also certain advantages using the front loading systems:

- The capacity of the front-loaders lets them stay out on longer routes and take their loads straight to the landfill.
- Some campuses require programs to use only street legal vehicles.
- Older, depreciated front loader trucks can be used for recycling collections.

### ***Collection frequency***

The trick is to have a sufficient density of collection points to allow for weekly servicing. Although some collection locations may always be high volume and require a high degree of service frequency, by increasing your deployment at key collection locations (perhaps two bottles and can containers and two paper containers), and increasing the number of collection locations, the need for weekly servicing can prevail. Keep in mind that bottles and can containers can remain free of odors for about seven days, depending on the weather, and that collection containers deployed in the field need to be at least 65-105 gallons. With the proper distribution, a balance between rate of collection and sanitation can be achieved.

### ***Planning your collection route***

Routing your collection operations is best done in geographically divided sections. A very useful tool for this endeavor is the “warboard.” A warboard is a current blueprint of the entire campus mounted under glass, with each recycling collection location denoted by adhesive dots or dry erase markers. These dots can be different

colors to reference various types of containers, indicate the number of containers at given locations, or even denote the days of the week collection locations are scheduled for servicing.

Route sheets can also be helpful for recycling team members. These route sheets can be organized to represent the most efficient collection routes for a given area. Notes should be routinely taken when running service routes, indicating container volumes, pedestrian and vehicle traffic, unusual conditions in the field, and the status of solid waste containers in the adjacent area. All route sheets should have areas for staff to provide these comments.

Information collected while performing routine service routes can be used to constantly update collection activity. Next to your program's warboard should be a dry erase board with every collection location that your program services, broken down and listed by campus service sectors. Next to these location listings should be a line for date entries. After every route, enter a date next to the locations that have been serviced. With this method, any recycling team member can see at a glance where the program is operationally weak. If, for example, you have a route on Friday that remains unserviced due to access, scheduling, or field conditions, you can identify the troubled route and figure out the best way to solve its problems.

Low-tech yet visual tools such as the warboard can help your entire recycling program deliver a high level of service to your campus community. This pays off when your program wants to earn the trust of campus policymakers and expand into other areas of campus.

#### ***Use of various containers***

Cardboard containers next to solid waste dumpsters should be different colors so they can be easily identified. In addition to using regular dumpsters, programs should use towable, trainable containers that leverage the direct exchange philosophy employed at recycling collection locations. For decades, airlines have used this small utility vehicle approach with trainable containers in their tarmac luggage operations. If you were to look out an airport window, you would see tons of luggage being transported by this method.

By exchanging a full container with an empty towable container at the time of servicing, recycling workers need only visit this location once during a collection route. Trainable front-loading containers can allow a collection vehicle to safely service up to six locations in a single route. Eight-inch, silicon-filled pneumatic casters will make these containers easy to pull, while rolling very quietly. This is important for early morning operations, or for service routes that travel very near to student classes or staff offices. This novel approach can help stretch finite labor resources and increase the service capability of your entire recycling program. Special containers of this nature can even have rear access doors for easy unloading of materials.

Most in-house recycling programs utilize roll-off containers of 30-40 cubic yards in capacity to transport recovered resources in bulk quantities. While solid waste and recycling vendors still usually haul these containers, the unit price for transporting them is much more affordable than the smaller front-loading containers. Some recycling vendors ask campus programs to deposit collected material in three or four-

yard containers, then exchange these full containers (usually equipped with casters) with empty containers at the time of transfer using large conventional trucks. Successful on-site collection programs can often use this methodology (full containers exchanged for empty clean units) to maximize available labor resources.

## Processing and sorting operations

Ideally, the in-house recycling program will have a central location for the consolidation of collected material. At large sites, or at institutions with more than a single campus, there may be a few locations for material consolidation. In either case, having a single base location will greatly reduce the need for the duplication of equipment and roll-off containers. Such a site should contain a wash rack or portable power washer, electrical power, level surface, easy access for rail trucks, and a central location with sufficient space (at least 40' by 140' in a perfect world, but less room can also work). The central location is where roll-off containers can be parked to receive collected material.

Roll-off containers are much more cost-effective than front-loading containers. Front-loading disposal vehicles that interface with front-loading containers, or that are equipped with a hydraulic arm to interface with roll-carts, require a longer service time to load smaller quantities of material.

Whether your program follows a user-separation or a comingled collection format, at some point you will need to load this collected material for off-site transport. Loading roll-off containers can be accomplished in a few different ways. The best method is to have a portable conveyor belt that can be rolled from one roll-off container to the other. This is helpful when space is an issue and only one or two roll-off containers are available.

Roll-off containers do have moveable dividers if you need to put multiple materials into one or two containers due to space considerations. Mobile roll-carts also have auto loaders that raise these containers and dump them into large roll-off units. A common method is to use forklifts with tilthoppers to dump material into these containers. Tilthoppers are triangular containers designed to complement a forklift and facilitate the dumping of material in quantities that reflect their size. Tilthoppers can typically be two, three, or four yards in capacity.

Roll-off containers can help your recycling program reduce expenditures significantly by transporting material efficiently. Often, diverted material will have no tipping fees or reduced tipping fees. (Tipping fees are the price of disposal per ton at end-destinations.) A lack of tipping fees, along with efficient transportation of materials in large quantities, can be great advantages to your program.

If your solid waste hauler or recycling vendor is charging rental fees for roll-off containers, check with other regional vendors; hauling and disposal should be the primary source of revenue for these contractors. You can also eliminate rental fees by buying roll-off containers, and these new or used units can then be painted in program or campus colors, or even painted with a mural by your campus art department.

## **Sorting material into marketable grades**

Sorting materials may be necessary in order to maximize the revenue from collected resources. This processing operation is often a feature of comingled collection systems. However, even user-separation programs need some way to remove trash and other contaminates incorrectly deposited into recycling containers. Low-cost yet effective equipment can be used for separating recyclables and decreasing the amount of time needed for sorting.

### ***Sorting equipment***

You need to have an overall vision of your program so you will know what kind of equipment purchases to make. Many components such as containers, container dumpers, and sorting conveyors can work well together even though they may be purchased from different manufacturers. There are certain industry norms for various solid waste and recycling equipment; some are highly incompatible with processing equipment while others are not. Having a vision of your program's developmental stages will make procurement choices much easier.

Some of the most successful recycling programs incorporate the sorting of materials with the loading process. This can reduce double and triple handling of collected materials, thus maximizing available labor resources.

The conveyor sorting table and cart-dumper pictured here cost under \$12,000, and can sort over one hundred 105-gallon containers in a four-hour sorting shift with at least four staff people. The material is sorted back into the same roll-carts used at field collection points. Next, the same cart-dumper that places collected material on the sorting conveyor is used to feed this sorted material into a horizontal baler. When sorting bottles and can containers, it is possible to allow trash to fall off the end of the table into a pan; the trash is then forklifted into a roll-off container for refuse.

When sorting paper fibers, mixed paper is allowed to go through and fall off the conveyor into the same pan to be forklifted into a roll-off for mixed paper fibers. Sorting material will greatly increase the value of recovered beverage containers and paper fibers, and can even reduce transport expenditures if this material is then baled to industry specifications. Sorting operations can also allow a recycling program to generate additional revenue that can be earmarked for future growth and equipment procurement.

### ***Balers***

Baling collected material has become a popular option undertaken by many advanced collegiate recycling programs. There are basically two types of balers: downstroke and horizontal.

Downstroke balers, while very affordable, usually require more labor to process a given volume of material. These units can become obsolete as your program grows, due to the time it takes to manually feed downstroke balers. In addition, many downstroke balers are not designed to bale hundreds of tons annually.

Bales formed by downstroke balers are typically smaller in size and weight. Retail establishments often use downstrokes to bale cardboard, because they have the luxury of baling as they accumulate individual empty boxes. Along with being highly affordable, downstroke balers can also require very little floorspace, and the small

footprint of these units allows them to be installed in areas where they are most needed. For this reason, some campuses have purchased multiple downstroke balers for use in widely different areas.

Horizontal balers are typically employed at institutional sites to address larger volumes of collected material. As your campus-wide recycling program grows, you may want to investigate the possibility of purchasing these units. Horizontal balers are often equipped with conveyor feed mechanisms to maximize available loading time. For example, forty yards of loose cardboard can be fed into these units in a fraction of the time it takes to load a 40-yard roll-off container.

Horizontal balers can also produce an “export-size” or “mill-specification” bale, terms that refer to a bale weighing over one thousand pounds. Trains, trucks, or ships can transport these heavier bales more efficiently by maximizing their cargo space capacity. This can make recovered material highly marketable and increase your revenue by as much as 25 percent. It takes the equivalent of three parking spaces to store forty of these bales, and most regional recycling companies will include free trucking if forty bales can be shipped at once (the equivalent of a full flatbed semi-truck). In contrast, smaller bales from downstroke balers usually need to be re-baled by commercial recyclers after purchase for efficient transport and mill preparation. Many recycling vendors can transport the one-thousand pound bales to area mills or shipping docks directly from institutional sites, and this also contributes to higher returns on baled material. This is especially true if your site develops a reputation for bales that contain few contaminants.

Before 1993, a horizontal baler could typically cost somewhere in the neighborhood of a quarter million dollars. However, manufacturers saw the marketability of horizontal balers for low to medium-volume generators, and the price has dropped to around \$30,000.

Although they are unable to bale the large volumes of material required by large material recovery facilities (MRFs), and they do have slower cycle times, these new units are in fact perfect for low-volume campus settings—and they can still produce an export-size bale. In fact, these new horizontal balers allow recycling programs to maximize their material return by producing a more valuable mill-specification bale; they also stretch finite labor resources with timesaving loading conveyors. In addition, they can reduce the roll-off fees required to transport loose material. When a flatbed semi-truck load of these one-thousand pound bales are shipped, the transportation fee is often waived. Therefore, the \$30,000 cost of the horizontal baler is often paid for in a year or two through avoided roll-off container transport fees and an increase in material revenues.

### ***Fiber types***

There are many ways to sort material, but keeping it simple can really help the overall performance of your recycling team. Therefore, only four grades of paper fibers will be considered in this section.

1. White ledger (WL) and computer print-out (CPO) paper are combined and marketed as white ledger. These valuable grades can generate revenue, and while CPO paper is indeed more valuable than white ledger, recent advances in laser printing technology have greatly decreased the volume of CPO. However, several

vendors do buy this grade at a slightly higher price than regular white ledger grades because they recognize that the WL does contain some CPO.

2. The second grade is Office Pack (OP). This grade includes color ledger (CL), high-grade envelopes, and other fibers free of groundwood. Newspaper and items such as manila envelopes are examples of groundwood fibers.
3. The third grade is Newspaper #8, which is sorted newspaper with no glossy inserts. These grades are further explained in a publication called the *Scrap Specification Circular*. You can also investigate local markets to find out what grades may be appropriate for your site.
4. The final grade is the balance of paper fibers that are picked free of contaminates as they pass over the conveyor-sorting table. This grade of mixed paper is loaded into a roll-off container and transported loose, while the other grades are baled to increase their value and to eliminate transport fees.

This format for paper fiber processing has several advantages. If newspaper or other grades fall below fifty dollars a ton, it can be passed through along with the mixed paper and be included with this grade—transported loose (unbaled) in a roll-off container. If this program faces unusually high volumes, or experiences manpower shortages due to illnesses or other reasons, all paper fibers can still be removed from campus as mixed paper in roll-off containers. Such flexibility allows this program to avoid large backlogs of recovered material. Furthermore, if grades such as magazines suddenly jump up to seventy or eighty dollars a ton, they can be easily recovered for baling to exploit such market fluctuations.

#### ***Bottles and can containers***

The sorting of bottles and can containers will depend upon whether your state has a bottle bill. While some materials may be the same grade, items such as milk containers (H.D.P.E. #2 Natural) may have no redemption value, thanks to bottle bills that have prevented these products from being taxed. While all bottles and can containers of the same type can be sorted and sold for the scrap value of the material, it is often in your program's interest to isolate containers with no redemption value.

#### ***Things to consider***

All sorting efforts will be influenced by local markets for various materials, and the return on pure grades of recovered commodities needs to be weighed against the cost of the labor involved to separate collected material. In some cases, recovered material transported unsorted will still require some tipping fees to cover the commercial recycler's cost of processing this material into marketable grades. When this is the case, avoided expenditures from in-house sorting should be added to the increased value of pure grades of sorted material for a complete fiscal picture. Doing so will often strengthen the case for on-site sorting.

## **Certifications for institutional recycling programs**

In California, beverage container legislation encourages the certification of recycling programs with the Department of Conservation's Division of Recycling. This state agency is responsible for addressing issues pertaining to bottle bills. Becoming

certified allows a recycling program to collect a portion of the redemption value from beverage containers subject to California redemption value (CRV).

The most prevalent rating for collegiate programs is as a Community Service Program (SP). This rating is designed for charitable and non-profit organizations with tax-exempt status. Cities, counties, and other public agencies may also qualify for this certification. The practical benefits of becoming certified include being able to exceed individual consumer limits, in terms of returning beverage containers with redemption value to recycling centers. These limits are 500 pounds of aluminum, 500 pounds of plastic, and 2,500 pounds of glass. Recycling centers are not allowed to pay CRV to any consumer entity that sells more than these amounts per day.

As roll-off containers can easily exceed these daily limits, a program that is not certified by the Division of Recycling is forced to sell this material for scrap value. The redemption value can only be collected by a program certified by the Division of Recycling. Although the full individual consumer CRV price is not paid to a collegiate recycling program, a program can affect the revenue it does receive by participating in a comingled rate study available through the Division of Recycling. More information about these state programs can be obtained by contacting the Division of Recycling at the Department of Conservation.

## **Outsourced versus in-house collection services**

You will need to consider the positives and negatives of in-house efforts versus outsourced collection services. Partnerships with outsourced vendors can prove beneficial to campus solid waste and recycling programs; however, outsourced recycling programs can sometimes represent an additional expenditure. By exploring the many options open to you, you will be able to investigate various examples of collection systems that may be suitable for your campus, possibly using a combination of off-campus or on-campus staff. See Chapter Six for tips on developing appropriate contracts to use with outsourcing vendors.

Some in-house programs combine a true partnership of full-time staff and part-time student workers to provide recycling services for the campus community. This approach may outperform contract programs, at least in economic terms.

In-house efforts also allow an institution to tailor its recycling programs to meet specific needs. This allows a measure of control and flexibility when addressing campus concerns, which may not be possible with contract formats.

Collection operations are a perfect venue for creative experiments designed to maximize the performance and capabilities of a campus recycling program. All new programs should start out on a small scale, so they can discover the best methodology for their individual campuses. These explorations should include an investigation of the positive and negative benefits of in-house and outsourcing systems.

## **Conclusion**

Vision becomes an important factor as your program grows in scale, and most mature programs go through definite stages. The first stage of a campus recycling program

is very much an experimental period. Questions of format and methodology are investigated, and pilot programs are conducted with an eye to establishing collection points. Major container and hardware decision are made, and public education efforts begin. This initial stage should be embraced as a period to explore what kind of operations will work best at your institutional site.

The intermediate stage of recycling program development is often an exciting time for recycling team members. It is during this period that the recycling program format takes shape, and standard operating procedures are established. At this stage, a program may decide to employ some preliminary sorting operations as a means of maximizing revenue from the sale of recovered resources. If educational and promotional materials are distributed to the campus community, and user convenience properly respected, program participation rates can be very high.

This intermediate phase of a recycling program involves gearing up for the increased scale of collection efforts required by legislative mandates. By this time, some avoided disposal expenditures have already been achieved. The program is slowly expanding into new areas of the campus, and the operational format is fine-tuned to increase efficiencies. Usually more hauls of diverted material occur, and more containers dedicated to specific recyclables arrive. Regional markets for recovered materials are probed and vendor relationships are established. On-site collection routes are refined and the recycling program entrenches itself as a daily part of campus life. This intermediate stage of collection and processing operations can be a time of discovery for program methodology, but the evolution toward campus-wide scale should remain philosophically consistent with the original program goals and vision.

These refinements in collecting, processing, and transporting are hallmarks of the mature program. Successful campus programs arrive at this final stage of operational development by using recycling as a tool for cost-effective, solid waste management—one that benefits both the campus and its community.

# Chapter 15. Construction and Demolition Waste

## Why target C&D waste?

Construction and demolition (C&D) waste accounts for a large amount of landfill waste. For example, it accounts for at least 28 percent of the total tonnage in California landfills (CIWMB *C&D Debris*, online). As colleges and universities grow and evolve, new construction projects will increase and bring construction and demolition waste with them. In addition, as colleges and universities get older, buildings will need to be rebuilt or refurbished. Reusing and recycling this waste stream can significantly reduce the amount of waste sent to the landfill by college and university campuses.

## Types of material

C&D is any material generated by a construction or demolition project. The composition can vary depending on whether the material is generated by a new construction project, a remodeling, or a demolition project. Generally C&D includes asphalt, concrete, cardboard, drywall, metals, organic material, reusable items, and wood.

Demolition material includes asphalt, brick, concrete, dirt and other rubble. Concrete and asphalt are crushed into aggregate that can be used as road base, road surface material, base for building foundations, and fill for utility trenches (CIWMB *Recycled Aggregate*, online).

Large quantities of cardboard are generated from the packaging of products, especially at the end of the project when furniture is unwrapped. Office paper is produced inside the contractor's office trailer.

Drywall is made out of gypsum. It can also be called "gypsum board," "wallboard," and "plasterboard." Approximately 12 percent of new construction drywall is wasted during installation (CIWMB *Drywall Recycling*, online). Gypsum can be recycled into new drywall or made into a soil amendment, and other uses continue to be researched.

Metal from construction sites includes aluminum or steel scrap, brass, cast iron, copper, non-insulated and insulated wire, rebar, piping, and appliances. These are usually separated according to value, and recycled.

Landclearing debris such as sod, brush, and small trees can be taken to a compost facility. Large trees can be removed and then replanted. If trees cannot be saved, they can be chipped and used as mulch.

Reusable items come from remodeling and demolition projects. Efforts should be taken to remove all reusable items from the building and either donate them or reuse them on campus. Businesses exist that deconstruct buildings, removing all valuable and reusable parts such as plywood, flooring, and floor joists. Reusable items include but are not limited to appliances, awnings, doors, fixtures, hot water heaters, sinks, toilets, and windows.

Wood accounts for 25 percent of the C&D waste (CIWMB *Lumber Waste*, online). Wood waste includes doors, lumber, pallets, particle board, and plywood. Scrap wood can be processed into a variety of products including compost, mulch, particle board, sawdust, wood flour, wood chips, and fuel pellets. Deconstruction increases the amount of reusable lumber.

## Finding vendors

Businesses that handle construction and demolition material can be found in the phone directory under categories such as

- “Appliances”
- “Building Materials” (such as “architectural,” “antique,” and “used”)
- “Demolition Contractors”
- “Hauling”
- “Lumber—Used”
- “Plumbing Fixtures—Parts and Supplies—Used”
- “Recycling Centers”
- “Rubbish Containers and Hauling”
- “Salvage Merchandise”
- “Scrap Metals”
- “Steel—Used”
- “Waste Reduction and Disposal Service—Industrial.”

Also look for reuse building supply businesses or non-profits. Online material exchanges such as CALMAX, operated by the California Integrated Waste Management Board, can also be good tools to use to find new homes for reusable items.

More and more cities and counties are becoming aware of the need to educate the community about recycling construction and demolition debris. Look for city and county brochures and guides to the industry. The California Integrated Waste Management Board has researched this topic extensively, and can offer assistance. Visit and tour facilities to learn more about how each material is handled, as well as the issues surrounding reuse and recycling of the material. Trade magazines and the Construction and Demolition Council of the California Resource Recovery Association can offer resources as well. The more knowledgeable you become, the more you can help your planning, capital improvement, facilities departments, and contractors.

Finally, contact your peers at other colleges or in the reuse and recycling field. Investigate the possibility of membership in the California Collegiate Recycling Council and the state recycling organization, the California Resource Recovery Association. Both have email listservs that conveniently allow members to ask questions and receive solutions and membership directories.

## Getting compliance

Once markets and vendors have been determined, you will need to get compliance from contractors and facilities on campus. It is always beneficial to develop a relationship with the project manager to help you achieve compliance. There are two ways of getting compliance: Contract Language and Pricing.

### Contract language

For new construction, remodeling, and/or demolition, you can require all contractors to submit a waste management or minimization plan that includes the maximum reuse and recycling of all materials, as well as reporting requirements. Require that all salvageable materials be removed. Deconstruction often involves higher labor costs, but such costs can be offset through the sale of the salvaged material, avoided disposal costs, avoided cost to transport of heavy machinery, and increased diversion. Have contractors give references from past projects where they recycled construction and demolition waste.

Contractors need to be responsible for their waste and their sub-contractors' waste. The waste management plan should describe how the contractors will handle each type of material, explain their sorting and recycling methods, and indicate their vendor—including the name and location of their recycling operations. Help educate contractors about the recycling streams; tell them about local vendors where C&D materials can be processed.

When evaluating bids, consider the percentage of material planned to be reused and recycled. After the contract has been awarded, meet with the contractors to discuss the operation and give them feedback. Follow through during the project as well; require quarterly and summary reports of all activities, including locations where material was taken and the material's weight. This way, it can be counted as part of the university's diversion program.

For long term projects where contractors set up an office on campus for two to three years, make sure the contractors have a recycling bin for paper and bottles and cans.

At Eastern Indiana University, for example, the recycling coordinator visits the contractors to tell them about the program and to give them a recycling bin (Rathe, online).

## Pricing

If you have control over the price of debris boxes or containers through in-house services or contracts, and the cost per ton is less to recycle the material, reduce the price for debris boxes that have clean source separated material. For example, at Stanford University, contractors pay \$495 for a 30 cubic yard debris box full of garbage, but only \$329 for a box full of clean wood. That's an easy savings of \$166. The tipping fee is less for the wood, so the savings are passed on and the diversion amount increases. This method speaks to contractors because it directly impacts their budgets.

## Mixed C&D

Sometimes space or lack of sufficient materials hinders C&D recycling. This problem can be alleviated if a mixed C&D recycler can be located in the area. These businesses take mixed loads of construction and demolition material, then sort the material themselves. They may charge a higher tipping fee than source separated loads, but it won't go to the landfill and at least partial diversion credit can usually be calculated.

## Starting a C&D recycling program

To start a C&D recycling program, one should:

- Obtain a project list from the planning department.
- Have language for C&D reuse and recycling and reporting written into contracts or policies.
- Allow time for deconstruction. Remember: haste makes waste.
- Determine the type, quantities, and frequencies of wastes generated.
- Determine in what stage the target materials are generated.
- Research recycling options in your area.
- Target materials that are generated in significant quantities, have high market value, and are fairly easy to segregate from waste.
- Calculate positive savings on disposal.
- Identify employees responsible for on-site recycling, promoting and monitoring the program, educating staff and subcontractors, and keeping good records of salvaged and recycled materials.
- Make sure all employees and sub-contractors know what can be recycled.
- Determine where and how materials will be stored.

- Clearly label and secure the bins to keep recyclables from being contaminated. Clean loads are the key to a successful program.

## Common problems

Here are some common problems that afflict C&D recycling programs:

- Subcontractors are sometimes only on site for a short period of time and are not educated about the recycling program. In these cases, it may be possible to create an educational brochure for them when they arrive to do the work.
- Contamination of source separated materials is a challenge; it can be difficult to determine who added the incorrect material. If the bins are checked regularly, contamination can sometimes be extracted safely.
- Lack of concern by the contractor or the sub-contractor can be a barrier. But they will show more concern if reuse and recycling are written into their job specifications or if it affects their budget. As you can see, it's helpful to develop a waste management plan in advance.
- Space for containers for the different material can be difficult to find. It is important to know when the materials will appear during the project timeline, so that containers are ordered only when they are needed. Piles of source separated debris can be created until there is enough for a container.
- The Fire Marshall may have storage restrictions. Work with the Fire and/or Health and Safety officials to create a safe and efficient collection system.
- Poor access from point of generation to the recycling container area can be an obstacle. The recycling containers need to be accessible to the job site, and the garbage box needs to be further away. Just as people can be hard pressed to walk to the recycling bin, contractors may not have time to walk over to the bin if it is placed too far away.

## Provisions for disaster clean up

### **California State University, Northridge**

In 1994, California State University, Northridge was struck with an earthquake and a large parking structure collapsed. Rather than simply sending the broken concrete structure to the landfill, the CSUN Physical Plant, the Associated Students Recycling Program, the Purchasing and Procurement Office, and the City of Los Angeles worked together to ensure that the demolition contract included provisions to divert as much of the material as possible. The contract language stated under 1.02 Description, Base Bid, and Alternatives, Scope B "...The recycling of all demolished materials off site [will occur, and] the value of recycled materials will accrue to the contractor" (CSUN Bid Number 1254-5001).

The school was able to divert all of the steel and concrete from the site in four months. The totals are as follows:

- 35,996 tons of concrete
- 220 tons of steel
- Total: 36,216 tons of diverted material.

This is a very large amount of material, and shows the importance of including contract provisions for recycling in case of a disaster (Brennan, online).

## Case studies

### **Stanford University**

I, the University's hauler, offers discounted rates for clean loads of wood, metal, cardboard, and yard waste. As contractors call for service, they are told about the recycling boxes and are faxed a price sheet that displays the savings for separating the recyclable materials.

Although many contractors on campus took advantage of the discounted rates, space limitations on the job site and the small size of some of the remodels prevented them from diverting recyclable materials all of the time. In 1999, a mixed C&D recycler was located in the area and PSSI started to haul all loads from construction sites to the recycling facility. Presently, the C&D recycler carries a list of items that it does not want included in the loads such as water or fire damaged furniture, and fire damaged drapes. The drivers inspect the loads and remove these items to a garbage box.

The C&D recycler keeps track of on-site diversion and reports the results to the governing agencies. In the first year of operation, Stanford University was able to claim a 70 percent diversion by weight for each mixed C&D box brought to the site. Because of better sorting technology, the rate increased to 80 percent in the second year. In fiscal year 1999-2000, 2240 tons of the 2800 tons of mixed C&D material sent to the recycler were diverted, while 560 tons were landfilled. Without this program, all 2800 tons would have been landfilled.

### **University of Oregon**

The University of Oregon developed contract language for all construction projects that require a Waste Management Plan. All construction contracts state the following:

“Waste Management Plan:

Contractors shall submit for review, prior to the start of work, a written document describing the following:

1. Proposal of what materials are to be recycled, including but not limited to, wood, glass, ferrous metals, non ferrous metals, toilet fixtures, light fixtures, doors, windows, and hardware.
2. Report of amounts of materials recycled, including name and location of recycling operation.” (*University of Oregon C&D Recycling Resource Guide* 1)

In addition, the Campus Recycling program gives contractors a booklet called *Construction and Demolition Recycling Resource Guide*. This guide gives step-by-step instructions on how to develop a waste management plan, tips for the different type of new construction, remodel and demolition projects, a list of vendors, and waste generation and economic worksheets. A copy can be found at [darkwing.uoregon.edu/~recycle/main.htm](http://darkwing.uoregon.edu/~recycle/main.htm)

### **University of California, Davis**

UC Davis developed the following contract language for construction and demolition waste management:

#### **“REQUIREMENTS**

Perform all work necessary to reuse or recycle the following materials: corrugated cardboard, clean dimensional wood, pallet wood, concrete/brick/concrete, block/asphalt, scrap metal/copper/steel/aluminum, glass, paint, trees and shrubs.

At a minimum, waste management goals and issues shall be discussed at the following meetings: Pre-bid Meeting, Pre-construction “kick-off” Meeting, and Regular Job-site Meeting(s).

#### **Waste Management Plan**

Within 10 calendar days after receipt of Notice of Award of Contract, or prior to any waste removal, whichever occurs sooner, the Contractor shall submit to the University’s Representative a Waste Management Plan.

The Plan shall include a list of anticipated types and quantities of waste materials generated from the project site. The plan shall be updated monthly. Attach to the updated plan all weigh bills, invoices and other documentation confirming amount and location of waste/recycled materials.

#### **WASTE MANAGEMENT IMPLEMENTATION**

Proceed with the following actions to implement waste management plan.

Distribute copies of the Waste Management Plan to the Superintendent, each Subcontractor and the University’s Representative.

Designate an on-site person responsible for instructing workers and overseeing sorting and recording of waste/recyclable materials.

Lay out and label a specific area to facilitate separation of materials for recycling and salvage. Recycling and waste bin areas are to be kept neat and clearly marked in order to avoid contamination of materials. The requirement for separation on site may be waived if the Contractor can demonstrate that there is insufficient space to accommodate it.

Submit with each Application for Progress Payment an updated Waste Management Plan, which includes a summary of waste materials (recycled, salvaged, reused, disposed, etc.) by the Project. The Plan shall contain the amount of material (in metric tons, preferably, or cubic yards) and the destination (landfill facility, material

recovery facility, transfer station, used building materials yard, etc.)” (UC Davis Section 01505 – Construction & Demolition Waste Management).

## Additional resources

The California Construction & Demolition Recyclers Database contains a list of companies located in California that process and/or recycle construction and demolition debris. The information on this list is updated annually, and can be found at [www.ciwmb.ca.gov/ConDemo/Recyclers/default.asp](http://www.ciwmb.ca.gov/ConDemo/Recyclers/default.asp)

The California Integrated Waste Management Board’s Web site contains sample documents (ordinances, contract language, and permit conditions) used by California cities or counties to encourage the diversion of C&D materials from landfills. It can be found at [www.ciwmb.ca.gov/ConDemo/Ordinances/default.htm](http://www.ciwmb.ca.gov/ConDemo/Ordinances/default.htm)

CalMAX is a free service designed to help businesses find markets for materials they have traditionally discarded, or obtain materials from other businesses that would normally be discarded: [www.ciwmb.ca.gov/CalMAX/](http://www.ciwmb.ca.gov/CalMAX/)

Construction & Demolition Debris Publications provides information on alternatives to disposal. It can also save money in avoided disposal fees, and potentially generate income from the sale of salvageable materials:

[www.ciwmb.ca.gov/ConDemo/Pubs.htm](http://www.ciwmb.ca.gov/ConDemo/Pubs.htm)

The Construction Demolition Council, which is a technical council of the California Resource Recovery Association, promotes the advancement and enhancement of construction and demolition waste material recovery principles, and it strives to expand C&D recovery infrastructure and markets: [www.crra.com/cdc](http://www.crra.com/cdc)

How to Deconstruct Buildings: [www.gyrd.bc.ca/waste/bro/dlcgde.html](http://www.gyrd.bc.ca/waste/bro/dlcgde.html)

Institute for Local Self-Reliance (ILSR) Deconstruction:  
[www.ilsr.org/recycling/builddecon.html](http://www.ilsr.org/recycling/builddecon.html).

University of Oregon Construction and Demolition Recycling Resource Guide:  
[darkwing.uoregon.edu/~recycle/cd.htm](http://darkwing.uoregon.edu/~recycle/cd.htm)

# Chapter 16. Special Waste

## Definition

“Special Waste is waste that does not fall into the categories of hazardous or nonhazardous waste” (*USEPA Special Waste*, online). It may have a hazardous component, but is usually not specifically regulated or classified. It is not wanted in Municipal Class 3 Landfills. Sometimes the definition includes difficult-to-manage waste such as tires and mattresses, but definitions vary from state to state and may change with context. For more information on accepted definitions, visit [www.epa.gov/epaoswer/osw/special.htm](http://www.epa.gov/epaoswer/osw/special.htm)

Special waste includes “universal wastes,” such as batteries, agricultural pesticides, thermostats, lamps, cathode ray tubes (CRT) including computer monitors and televisions, and consumer electronic devices (CED). The “Universal Waste Rule is designed to reduce the amount of hazardous waste items in the municipal solid waste (MSW) stream, encourage recycling and proper disposal of certain common hazardous wastes, and reduce the regulatory burden on businesses that generate these wastes” (*USEPA Universal Waste*, online). For more information, visit [www.epa.gov/epaoswer/hazwaste/id/univwast.htm](http://www.epa.gov/epaoswer/hazwaste/id/univwast.htm), [www.ciwmb.ca.gov/Electronics](http://www.ciwmb.ca.gov/Electronics) and/or contact your local hazardous materials agency.

Examples of special waste include ballast, batteries, cathode ray tubes, cement kiln dust, computer monitors, consumer electronic devices, fluorescent light tubes, lab waste, mercury thermometers, sharps, tires, toner cartridges, batteries, and used oil.

## Special waste on campus

Special wastes are found all over campus including student housing, facilities operations, and campus departments. For example, lead acid batteries can be found in service vehicles and in each of the building’s emergency lighting systems. The facilities department will know where these wastes are being generated. Since these materials can be difficult to deal with, they may be deemed illegal for campus dumping.

## Handling special waste

Special waste is normally handled in the environmental health and safety departments at each campus. Regulations vary from state to state on how to handle special waste. Your local US Environmental Protection Agency or local hazardous waste agency will have more information.

It is important to handle these materials in a safe manner; protective equipment may be required. Many health and safety professionals train relevant departments on proper labeling and handling techniques.

Generally, cities and counties have household hazardous waste collection programs or drop off centers for residents. Private companies in the community, such as oil change facilities, often help the public dispose of automotive fluid such as used motor oil and antifreeze. Departments handling this kind of material on a regular basis, such as fleet service, likely have collection programs in place with private vendors.

## Educating the campus

Grant money may be available for collection and education. If so, policy, procedure, and service brochures should be given to campus departments. It's particularly important to educate the areas of campus that generate the material. Material collection drives are a good way to focus attention and education on a specific material type.

## Case studies

### Battery recycling

Batteries can be recycled for their zinc, nickel, cadmium, mercury, manganese and steel. Although in parts of the United States it is not illegal to dispose of batteries in the landfill, the potential exists for the metals inside of the battery to leak into the groundwater or soil. If not properly disposed, batteries can be swept into the storm drain systems and waterways, polluting the habitat and endangering animals.

There are generally three types of batteries found on campus:

- Alkaline batteries (household)
- Lead-acid auto batteries
- Ni-cad rechargables

To start a battery recycling program, first find a vendor and ask for a list of accepted battery types and costs. Design your outreach to meet the vendor's specifications. Sometimes the vendor will have educational materials that can be used. Determine collection locations, bins, and methods. Finally, determine storage and transport requirements.

Harvard University collects batteries for recycling in a couple of different ways. People on campus can send small quantities of batteries through inter-office mail. They also distribute small mini-bins labeled "Batteries Only" to most departments, or place a five gallon bucket in departments that generate a large quantity of batteries (such as media services and telephone services). For larger quantities or for any lead-acid batteries, departments can request a special pick up. Once the collection bins are

full, the recycling crew empties the bins into plastic containers with lids and requests a pick up from the vendor (Gogan, online).

Northern Arizona University has a similar program as Harvard's, except that it sorts Alkaline and Ni-cads at a special warehouse. The company that collects their florescent bulbs and ballast also picks up their batteries; the university sells its lead acid batteries to a local scrap dealer. As for education, NAU paints five gallon buckets to look like a household battery (Leonardis, online)—ensuring that faculty and students know precisely what to do with their used batteries.

For more information regarding battery recycling, visit the following Web sites:

- [www.rbrc.com](http://www.rbrc.com)
- <http://interstatebatteries.com>

## Electronic Waste

Computer monitors and televisions contain picture tubes, also called CRTs, which convert an electronic signal into a visual image. Because each cathode ray tube contains approximately five-to-seven pounds of lead as well as other hazardous constituents, discarded monitors and televisions are subject to California hazardous waste regulations administered by the Department of Toxic Substances Control (DTSC).

Lead is a toxic substance that can cause lead poisoning in individuals and can be especially harmful to young children. If lead-containing products are disposed of in landfills, the lead can potentially contaminate the water supply.

On March 20, 2001, the DTSC wrote a letter to the Materials for the Future Foundation clarifying the regulatory provisions governing the handling and disposal of used CRTs. According to this letter, monitors, televisions, and other electronic equipment containing CRTs cannot be disposed of in non-hazardous solid waste landfills.

On September 24, 2003 the Governor of California signed landmark legislation establishing a funding system for the collection and recycling of certain electronic wastes. The Electronic Waste Recycling Act of 2003 requires a retailer selling a device containing a cathode ray tub or panel screen greater than four inches in size to collect an electronic waste recycling fee from the consumer. The fee will be used to operate a free and convenient system for collecting, consolidating, and transporting covered electronic wastes.

Many universities collect electronic waste through their recycling programs, surplus or property departments, or environment health and safety programs. These universities work with electronic recycling non-profits or companies to assist with the safe and legal recycling and/or disposing of the electronic waste.

For more information:

[www.ciwmb.ca.gov/Electronics](http://www.ciwmb.ca.gov/Electronics)

[www.dtsc.ca.gov/HazardousWaste/CRTs/HWM FS CRT-EmergencyRegs.pdf](http://www.dtsc.ca.gov/HazardousWaste/CRTs/HWM%20FS%20CRT-EmergencyRegs.pdf)

[www.epa.gov/wastewise/pef/wwuda14.pdf](http://www.epa.gov/wastewise/pef/wwuda14.pdf)

# Chapter 17. Creating Academic Links to a Green Campus

## Academic links to campus operations

### Why add academics to the picture?

Institutions of higher learning are in a unique position to play a crucial part in developing environmentally sound practices at the local level. Through the cooperative process of students, faculty and staff, universities can find innovative solutions to environmental problems. But the academic community needs to rethink its relationships to local and regional environmental and economic communities. New curriculums can and should encourage interdisciplinary courses and projects that provide the framework for our future, demonstrating that institutions can thrive while still operating in environmentally responsible ways.

Faculty members have the capability to inspire other staff and students, as well as become involved with campus operations, provide leadership, and implement changes in the campus status quo. For example, the Shasta College Environmental Advisory Committee (EnvAC) proposed the hiring of two faculty members to complete a stated-mandated recycling plan based on students' projects, with the help of a student environmental club called Living Environmental Action Forum (LEAF). However, time constraints eventually led to the hiring of a staff member to complete the plan, one who had previously been President of LEAF and a student intern. Based on this staff member's thorough analysis, EnvAC developed a proposal for the hiring of a full-time staff position to spearhead the implementation of the recycling plan.

By November 2000, EnvAC developed a job description and justification for a Pollution Prevention Coordinator. The Coordinator would deal with the campus-wide issues related to pollution prevention including, but not limited to recycling, solid and hazardous waste, purchasing, new construction, and education. The administration, however, wanted to hire a person who would be head custodian 50 percent of the time and the recycling coordinator 50 percent of the time. This individual would essentially be a custodian who would recycle "on the side." The EnvAC committee continues to push for a dedicated recycling position, and is seeking support for the proposal through the Faculty Association, the Faculty Senate, and the Associated Student Body and Classified Employees.

Clearly, a little academic strength can make a huge difference in important campus environmental issues. But how does one get academia involved?

## **Who is the campus community?**

The first step to gaining academic support is to define the campus community and cultivate the right campus partnerships. Professors and staff must feel like they are part of the environmental community before they will feel responsible for its actions. Complete buy-in does not occur overnight; therefore, be patient and focus your efforts where they will do the most good.

## **Find the strength and resources**

Empower yourself and those around you, including the students, with the information needed to solve the problems associated with waste minimization, recycling and creating a green campus. An excellent resource that should be shared with faculty in all disciplines is *Greening the College Curriculum*, published by Island Press. It can help provide the rationale for increasing eco-literacy while still teaching discipline-specific concepts.

Encourage the students to provide the critical mandate for change. The student voice can be very persuasive on campus, and their activism can make a difference. A manual published by the UCLA Environmental Study Group and Earth Day, *Campus Environmental Audit: A Student Guide to Campus Environmental Change*, is a comprehensive guide for students interested in researching environmental issues on campus. It addresses areas and issues that are common to many campuses, and also provides suggestions and general strategies for implementing environmental improvements.

## **Ignorance is not bliss**

Share information with the rest of the campus community so faculty and students can make educated choices about their daily activities. It is important to remember that campus communities are different, even though they do share many common issues. Unique conditions create the basis for each university's environmental problems. By viewing each problem as an opportunity for change, participants can design a successful linkage between academics and campus operations.

In the Appendix, you'll find sources of information that can help integrate course curriculum into operations management. These sources include organizations, books, manuals, and Web sites. Faculty can use these references to develop individual assignments, modules, or courses, and students can use them as a means of developing research topics for their own academic work. Staff can use them to provide information to faculty about issues related to campus operations.

## **Why should there be an academic link to recycling and sustainability?**

Traditionally, campuses have not been heavily involved in the areas of waste minimization, recycling, and greening the campus. Except for courses taught in environmental science and environmental technology, the subject and practice of greening of the campus is limited to small programs that usually only focus on basic recycling. Few general education courses include practical information on how to truly "green" the campus. In addition, the campus community generally has only minimal knowledge of the subject, and does not practice greening techniques on a daily basis.

There are many examples of campuses that have implemented far-ranging greening programs. These models can be used to help generate a model for any campus. However, fundamental differences between institutional types must also be taken into account when producing models for campuses.

Campuses in general provide an excellent venue for modeling recycling and sustainability. The campus can be seen as a training ground, one that provides real-world application opportunities for recycling and sustainability concepts. Numerous opportunities exist for interactions between the campus and the surrounding community, as well as the dissemination of information and practical learning experiences for campus and community members alike. The greening of the campus is interdisciplinary by nature, and in terms of a holistic learning paradigm it can be used to facilitate active learning, student engagement, interest, applicability, and retention.

In California, the system of two-year public institutions, composed of 107 statewide colleges organized into 72 districts, serves more than 1.5 million students and represents the largest system of higher education in the world. The University of California system includes nine existing campuses with a new one under construction. In 1998 the total undergraduate and graduate enrollment of all of the campuses was 173,643 and the extension enrollment was over 433,300. The UC system employs over 141,225 individuals to fill academic, management, and staff positions. Additionally, there are 18,000 individuals employed by three UC managed laboratories. The California State University system has 23 campuses, a statewide of comprehensive and polytechnic universities, plus the California Maritime Academy, which employs 40,000 faculty and staff and serves some 360,000 students. Together, the campuses provide tremendous impact on the state and have the overwhelming potential to become a working model for students to use in their education.

In essence, the "campus" is a community that operates or facilitates some activities related to industry and business sectors found in any town or city, and which may also have a residential component or agricultural component. Each individual campus is considered to be autonomous in terms of its business operations, including budgeting and physical plant operations. Key members of the campus, the students, are generally transient as far as their participation in community activities. Therefore, it is important that the faculty and staff provide a solid framework for supporting the greening of the campus activities, and provide an active example of environmental stewardship.

## **Curriculum related to source reduction and recycling**

A "green campus" should be teaching a "green curriculum." Ideally, campuses should approach this mandate from a global perspective, and include concepts and practical experience that help complete ISO 14001 certification. An example would be to offer an interdisciplinary credit class on "Operations Management for Environmental Efficiency." Small groups could complete efficiency audits of campus energy, water, chemical use, paper use, solid waste, and building design. Quantitative analysis of options would be a major part of the process and of each group's grade.

Generally, only institutions that provide a four-year degree in engineering or waste management support such courses. Most academic institutions, including those at the community college level, are not able to offer these courses. Nevertheless, with a little planning source reduction and recycling concepts can easily be woven through the fabric of any general education environmental science, general biology, zoology, botany, natural resources, environmental ethics, business or marketing curriculum. Other learning activities can include cases studies, web page design, business, and marketing plan development, individual, and group projects.

### **Successful curriculum projects**

Humboldt State University (HSU) boasts several examples of integrating projects related to recycling, waste minimization and sustainability into course curriculums. For example, all engineering majors are required to take Engineering 435, a solid waste management course, as well as a “Sustainable Campus” class offered by the Environmental Sciences Department. In yet another course, “Environmental Science Practicum,” students are presented with a formal, problem-solving framework, and work in small teams to solve, or begin to solve, environmental problems.

In a recent example, Dr. Ron Chaney’s engineering students were required to complete projects that examine the waste stream associated with the construction of a five-to-six story office building. The projects include identifying the potential impact on HSU’s waste diversion program, identifying economically and logically viable options for recycling or diverting construction waste, and developing recommendations for a proposed building on campus.

In the “Sustainable Campus” class, conducted by Professor Dick Hansis, students are divided into four groups that focus on a specific aspect of the university’s maintenance. Each group then find “greener” alternatives for that area of campus maintenance. For example, a group might investigate the possibility of replacing single-sided copiers on campus with double-sided copiers. Alec Cooley, Solid Waste Reduction Manager at HSU, submits project ideas to both instructors and then meets with the student groups to discuss the projects. At the end of the semester he is given a copy of the project papers and any recommendations that the students devise. As a result of this process, Cooley has compiled a list of over 25 integrated waste management documents completed for HSU since 1992.

At Shasta College (SC), instructors and staff developed several curriculum projects and course enhancement packages for use in the Center for Science Industry and Natural Resources, as well as the Center for Business and Technology. Funding for these packages came from the California Community College Chancellor’s Office, and affected courses included Environmental Science, General Biology, Environmental Ethics, and Marketing. Students were involved in grant and contract requirements for the Shasta College Applied Sustainability Collaborative (SCASC), which was an Economic Development Initiative. Student projects helped small businesses utilize innovative, value-adding processes to divert materials from the waste stream and make new consumer products. Curriculum developed for this initiative included Applied Sustainability Certificate, Pollution Prevention Module for Environmental Science Lab, Organic-waste, Reclamation and Economic Opportunity (O.R.E.O.) Curriculum Project, and the Living WEB Learning Community.

Here are more details about these new curriculums:

1. *The Certificate in Applied Sustainability.* This curriculum includes 11 units of course work that provides an informed understanding of the concept of sustainability through exploration of selected physical science, social science, and business perspectives. Students are shown how sustainability practices can enhance economic profitability and development, and how principles of sustainability can impact human activity and commerce. Additionally, the students participate in activities that illustrate how embracing the concepts of sustainability will offer people, communities and businesses new ways of thinking and being in their respective environments. All of the courses in the certificate qualify for general education transfer to the CSU and UC systems.

2. *The O.R.E.O. Curriculum.* This curriculum, of which the Pollution Prevention Modules are a component, was initiated during the fall 1999 semester. A student intern was employed for two semesters to complete the appropriate construction, siting, and maintenance of vermicomposting bins near the horticulture unit at the Holistic Research Laboratory. Professor Morgan Hannaford and several students completed studies to determine the feasibility of using vermicomposting to enhance the traditional composting initiatives already being carried out by campus staff and agriculture students. Additionally, small vermicomposting bins were maintained in several classrooms as demonstrations, as well as sources of worms for student projects.

3. *Pollution Prevention Modules.* Recent California legislation has resulted in students from General Biology, Environmental Science, and Environmental Ethics coming involved in an ongoing environmental audit of the campus to produce reports and case studies. Environmental Lab students using the Pollution Prevention Modules are required to complete several projects based on evaluation of their own personal consumption and waste production habits. In four separate mini projects, students are required to produce reports that include graphs, tables and comparisons of personal consumption, or waste production rates and a plan to reduce those rates. Students are then required to work on a group project that relates to an environmental issue on campus or in the community. Each semester students are given projects to choose from, or they may design their own final project with the approval of the instructor. This system allows for flexibility to meet the current needs of the campus or local community.

For example, this process resulted in the compilation of a 41-page document by the Environmental Lab class and the completion of a project centered on finding alternatives to styrofoam products used by food services by the Living WEB class during the Fall of 1999. These documents were used as the basis for a presentation to the Board of Trustees during February 2000. Both groups of students cooperated with the student environmental organization to survey the campus on environmental awareness, complete studies on the composition of the solid waste stream of the campus, and provide a three-tiered plan for reduction in the use of styrofoam on campus. In addition, the students evaluated energy use, wildlife friendliness, and bike transportation issues related to the campus. The initiative of the instructors involved, with their knowledge of recent state legislation, has provided an opportunity for the students to gain valuable skills. It has also enabled the college administration to obtain greatly needed information for making management decisions.

## **Other curriculum ideas**

Students enrolled in "Environmental Ethics" voiced a desire to see the course investigate issues focused on sustainability and personal responsibility, but realized that they could not receive credit for retaking the course. With the encouragement of their instructor, they developed a community education course offering called "Sustainable Living." This four-hour seminar demonstrates how an individual's lifestyle impacts the environment; it also provides the tools for living in a more environmentally friendly way. Each individual calculates the "ecological footprint" of his or her home, and determines what steps can be taken to decrease the use of natural resources. This not only decreases the impact on the environment, but also results in spending less money.



Information and examples of curriculum discussed may be accessed through links on the SCASC Web site at [www2.shastacollege.edu/sustainability](http://www2.shastacollege.edu/sustainability), or the instructional Web site for Christine Flowers at [www2.shastacollege.edu/cflowers/](http://www2.shastacollege.edu/cflowers/).

## **Internships and community service**

Both internships and community service can be a vital component of general education curriculum. Each type of service learning has its own merits, and can be tailored to fit an individual instructor's evaluation process.

### **Internships**

Internships for students can include both credit and "for pay" options. The students may work in a variety of jobs that provide learning opportunities while accomplishing employer objectives. For example, work site learning students at Shasta College may enroll in Environmental Studies 94 for 1 to 4 units per semester. Each unit of credit requires 54 hours of actual on-the-job activity. It is the instructor's prerogative to determine if the work site activity is "worthy" of one or more units of credit. All work site learning activities must be related to the academic discipline of the course in which the student is enrolled. The student, faculty advisor, and employer sign a contract describing the job duties and course objectives that will be completed, as well as the assignments and method of evaluation. The employer provides a certification of hours completed and an evaluation form for the student.

Students have been placed in a variety of jobs related to waste minimization, recycling, and campus greening—including assisting in case studies, solid waste surveys, environmental technology surveys, researching diversion opportunities, and acting as cabin counselors for Whiskeytown Environmental School (WES). Education majors from CSU Chico also receive credit for participation as cabin counselors at WES. Students who qualify for the Cal-Works programs have assisted faculty and staff by helping complete clerical duties, data base management, and other job related to their skills. They also perform training on projects related to waste diversion and recycled content products, including supporting *Recyclestore.com*, the online marketing cooperative funded by the California Integrated Waste Management Board (CIWMB). These internships provide the students with interpersonal skills as well as information acquisition; such skills will give them an edge in the job market.

Student projects within the framework of a course provide excellent opportunities for integration of campus greening concepts and active learning. Students enrolled in Biology10 at Shasta College sign grading contracts that include community service, group presentations, and individual project requirements. The students' individual "A" projects can take the many forms. Examples include internships with the City of Redding Solid Waste Division, completing research for the North State Institute for Sustainable Communities Indicators Project, or working on one of the instructor's own projects. Internships or projects completed by students for the City of Redding Solid Waste Division have included research projects initiated by faculty and students. Examples include:

- Presentations on alternative household cleaning products
- Presentations on alternative wrappings for presents
- Production of videos
- Completion of the preliminary solid waste audits for the waste management plan
- Design and maintenance of composting bins for campus use
- Organizing a campus cigarette butt cleanup and information booth
- Researching alternatives to the use of styrofoam on campus

### **Community service**

Community service in the context of academia is not a punishment, but an opportunity for a student to complete an educational activity while supporting the local community. Such service can take the form of simple one-time activities or extended, ongoing projects.

One-time events for extra credit within a course can be used to energize the students and provide valuable support to the campus and surrounding community. Students at Shasta College (SC) can participate in campus cleanups, recycling, straw bale construction projects, a science olympiad, a "Science Bowl," a "Pumpkin Tour," a Christmas tree sale, and an "Ag Field Day."

The benefit to the students is far more than a few points added to their grade. For example, Professor Christine Flowers has developed the concept of utilizing Community Service Learning Projects (CSLP) as a required part of the grade evaluation for each student in General Biology. Community Service Learning Projects are designed to provide a hands on, interactive learning experience for the students while helping to provide services for the surrounding community. The CSLP projects center [ ] biological and environmental themes. Each student chooses which project he/she wishes to participate in by week two of the semester. At this point the student is responsible for attending any training sessions associated with the CSLP and completing the required hours. Students complete a two page summary report of their activities, and attach the completed CSLP form signed by the appropriate supervisor. (See Appendix for three examples of the CSLP forms.)

## Student organizations

We've seen many examples of how to integrate campus greening techniques into a university's official curriculum. But it's important not to underestimate the potential of student organizations themselves.

Historically, student organizations have been the grass roots of environmental stewardship at four-year campuses. For example, Humboldt State University students have developed the Campus Center for Appropriate Technology (CCAT), which combines theory and practice. Headquartered on campus at the Buck House, CCAT is a live-in, working demonstration home, in which students may complete class projects and internships. Information on the CCAT may be found at [www.humboldt.edu/~ccat/](http://www.humboldt.edu/~ccat/).

It is more difficult to keep the students motivated and active as a cohesive group in the community college setting. But faculty can encourage the students to participate in the shared governance process. For example, a small group of faculty and administrators at Shasta College visited the University of Oregon to gather information on their Campus Environmental Issues Committee and the student run recycling program. This, as well as the efforts of other interested instructors and staff, led to the March, 1999 formation of the Environmental Advisory Committee (EnvAC), at Shasta College. A subsequent visit to Humboldt University by the Living WEB Learning Community, to see first hand the Campus Recycling Program and Campus Center for Appropriate Technology, resulted in projects by the students and faculty that have continued the support of the EnvAC at Shasta College.

This committee is comprised of students, staff, faculty and administrative representatives who are developing guidelines and recommendations related to the operations and management of the campus facility. The students have voting rights and are appointed by the Associated Student Body. Several members of the Living Environmental Action Forum (LEAF), which is the student run/faculty mentored environmental club on campus, are on the committee. EnvAC and LEAF maintain a Web site to share information with the rest of the campus:  
[www2.shastacollege.edu/envac](http://www2.shastacollege.edu/envac)

## Conclusion

Universities can and should take the initiative for integrating the techniques of waste minimization, recycling, and campus greening with traditional academic curriculums. It's an ambitious goal, but it can be accomplished. The excellent book *Ecodemia: Campus Environmental Stewardship at the Turn of the 21 Century*, published by the National Wildlife Federation, highlights the successful changes that many campus administrators, staff and students have made in day-to-day campus operations. It provides case studies of various universities that have responded to the need for better environmental stewardship. This resource also includes samples of policies, strategies and networking resources that help lay the foundation for a campus environmental stewardship plan.

*Ecodemia* is a good start, but the true test will lie in your own campus' ability to reach your students, faculty, and staff. They should feel as though they belong and

contribute to a larger environmental community. Once they recognize this community and its attendant responsibilities, they will participate in it—and more importantly, they will work to improve it.

# Chapter 18. Recycled Content Products

## Recycled content product procurement legislation

### National legislation

In response to Section 6002 of the 1976 Resource Conservation and Recovery Act, President Clinton issued Federal Acquisition, Recycling and Waste Prevention Executive Order 12873 in 1993. This order established procurement obligations for federal agencies, and procurement guideline requirements for the Environmental Protection Agency (EPA). The Comprehensive Procurement Guidelines (CPG), codified as Part 247, Title 40 of the Code of Federal Regulations, applies to all procuring agencies and all procurement actions involving items designated by the EPA. Federal agencies, state, and local agencies and their contractors must comply when they buy designated products with appropriated federal funds.

In 1998 President Clinton signed executive order 13101. In March of 1999, the Task Force on Greening the Government through Waste Prevention and Recycling was formed to further expand the federal government's commitment to recycling and buying environmentally friendly products. The task force was charged with monitoring agency purchases of printing and writing paper containing 30 percent post-consumer fiber.

The most current information on new legislation and procurement may be found at [www.epa.gov/cpg/index.htm](http://www.epa.gov/cpg/index.htm), maintained by the EPA. The site also provides the required information for CPG's and the EPA's Recovered Materials Advisory Notices (RMANs), which recommends recycled content levels for CPG products.

### California state legislation

Recycled product procurement legislation in California originally affected state paper purchases. Subsequent amendments extended the requirements to local agencies, the legislature, universities, and the university system. They also expanded the law to include all types of products. For example, the California Education Code Title 1, Section 19, Chapter 3 has a section regarding recycling paper (code 32371-32376). This code encourages the establishment of recycling programs and buying recycled paper at school districts, county offices of education, or in California State and University of California campuses.

California also has mandatory recycled content legislation for newsprint, plastic trash bags, fiberglass building insulation, glass containers, and rigid plastic containers. The California Integrated Waste Management Board (CIWMB) monitors state agency recycled product procurement compliance through their State Agency Buy Recycled

Campaign (SABRAC). CIWMB also provides a listing of all current and proposed legislation regarding solid waste management: [www.ciwmb.ca.gov/Law.htm](http://www.ciwmb.ca.gov/Law.htm).

The EPA web site offers comprehensive guidelines for procurement via an online directory. This directory includes a database of sources for recycled content, and covers eleven product categories listed in Public Resource Code 12205. The categories listed in the code are:

- Paper products other than copy
- Fine printing and writing paper
- Newsprint
- Compost
- Glass
- Oil
- Plastic
- Solvents and paints
- Tires
- Tires derived products
- Steel—flat rolled

A list of specific sub-categories under each category can be found on the CIWMB Web site: [www.ciwmb.ca.gov/BuyRecycled/StateAgency/Download/ProdCats.doc](http://www.ciwmb.ca.gov/BuyRecycled/StateAgency/Download/ProdCats.doc)

According to the California Resource and Conservation Act, any agency that spends more than \$10,000 per year on the above listed products is required to purchase recycled or environmentally friendly products in place of virgin counterparts. This mandate holds as long as the utility and quality of the eco-friendly products are equal, and as long as they aren't more expensive. For example, recycled paper must be used in printing contracts. The definition of "agency," as defined by the California Public Resources Code, section 40100-40201, includes California community and state colleges.

Therefore, if a university spends more than \$10,000 a year on carpet, and part of that money is from appropriated federal funds, then the university must purchase carpet made from recovered materials. The buy-recycled requirement does not include purchases that are unrelated or incidental to the purpose of federal funding, however.

## **Getting started**

To begin any "buy recycled" procurement program, you should

1. Equip yourself with knowledge on case studies and legislation.

2. Learn to do a complete life-cycle cost analysis.
3. Find a source for vendors.

*Ecodemia*, by Julian Keniry, provides excellent case studies for “buy recycled” procurement programs, as well samples of policies and resource information obtained from representative universities. All administrators and staff responsible for the campus operations should be familiar with this resource.

Another valuable resource is the *Buy Recycled Training Manual*, which provides information on existing “buy recycled” efforts, available products and techniques to improve buy recycled programs for any institution, and complete information on how to complete life-cycle cost analysis. The manual is published by the Maryland Environmental Service (MES), a state agency and non-profit corporation that provides services such as operating materials recovery facilities, marketing recyclables, designing new recycling programs, and conducting buy recycled training.

For legislation, product updates, and vendor lists, the Federal EPA Comprehensive Procurement Plan (CPG) products page listing is a great starting place: [www.epa.gov/cpg/products.htm](http://www.epa.gov/cpg/products.htm). The products page is linked to the main site at [www.epa.gov/cpg/index.htm](http://www.epa.gov/cpg/index.htm), which provides a one-stop shop for a variety of information concerning the CPG.

The key component of the CPG program is the EPA's list of designated products, as well as its recommendations for recycled content. The products are grouped into eight categories, each one with a list of designated products. Each category also has a downloadable fact sheet available in the *2000 Buy-Recycled Series*. This sheet included information regarding case studies, vendors, and legislation. The categories are:

- Construction products
- Non-paper office products
- Park and recreation products
- Vehicular products
- Landscaping products
- Paper and paper products
- Transportation products
- Miscellaneous products

## Products

The following section represents information gathered and compiled by research analyst Linda Kehoe during the writing of Shasta College's waste management plan. It provides sources for finding vendors during the procurement phase, as well as more detailed product descriptions.

*Copy paper.* A paper recycling program helps address the issue of product disposal, and "buying recycled" closes the loop. Since the demand for paper with 30 percent recycled content has steadily increased, improvements in de-inking technology have resulted in a kind of copy paper that meets typical office standards. The federal task force on Greening the Government found that paper containing 30 percent post-consumer content tested positively in performance evaluations, and was subsequently recommended for use by the U.S. government Printing office. An excellent two-page support document/flyer can be downloaded at [www.ofee.gov/html/30paper.pdf](http://www.ofee.gov/html/30paper.pdf).

Additional performance evaluations were conducted in 1988 by major office equipment manufacturers such as Hewlett Packard Company, Lexmark International Inc., and Canon U.S.A. Inc. Three brands of paper with 30 percent post consumer content were tested for physical properties and performance on copiers, ink jet printers and laser printers. Altogether, over two million sheets were tested for paper feeding, reliability, brightness, and curl. It was determined that copy paper with 30 percent post-consumer content performed as well as paper with a 20-25 percent post consumer content and virgin paper.

Cooperative purchasing pools are an effective way to make the transition to purchasing paper with recycled content. There are several advantages to buying paper through a cooperative or joint purchasing pool:

- *Volume discounts.* Leverage for competitive prices.
- *Increased availability.* Vendors can afford to stock larger quantities.
- *Standardized definitions and recycled content percentages.* Vendors can stock products with the same recycled content requirements.

There are several cooperative purchasing pools available for colleges and universities. For example, Shasta College is a member of the Joint Purchase Pool-Community College League of California. The Recycled Products Purchasing Cooperative (RPPC), sponsored in part by the U.S. Environmental Protection Agency, Region 9, handles university memberships. The RPPC is able to provide high-quality recycled paper at equal to or below the price for virgin fiber paper. Solano Recyclers, a non-profit environmental organization, coordinates the purchasing pool.

To join the cooperative, an interested party makes contact with a sales representative to discuss volume requirements, delivery arrangements, and pricing. A purchasing number is assigned to the member, which guarantees the cooperative pricing discount. The same number is used to purchase paper directly from the supplier for all future orders.

*Tissue and toweling products.* Available from a variety of sources, most tissue and toweling products are available with recycled content—including core-less toilet paper with 100 percent recycled content.

*Disposable dishware.* Durable dishware should be the first choice over disposable dishware. However, when it's not possible for dining halls to institute such agreements in their food contracts, they should use recycled content trays, bowls, and plates. Recycled paper dishware is available that is coated with a layer of either virgin or pre-consumer recycled content; Pactiv Corporation of Red Bluff, CA has a full line of such dishware suitable for campus needs.

Give ceramic mugs to staff or encourage them to bring their own. Sell reusable mugs and cups in the food service area, and offer a discount price for refills.

*Newsprint.* This item is usually the second largest component of campus waste paper. A careful analysis of faculty and library subscriptions, as well as local publications left in common areas, will reveal which publications are printed on recycled newsprint. Vendors should be notified that only publications containing an agreed-upon percentage of recycled content may be left in campus common areas.

*Re-refined oil.* Re-refined oil, retreaded tires, and recycled engine coolant are being used successfully in many institutional transportation hubs, and mechanical and industrial technology centers. EPA issues a non-regulatory *Recovered Materials Advisory Notice* that recommends levels of recycled content for these items.

Use 25 percent or more re-refined oil for lubricating oils, hydraulic fluids, and gear oil. Re-refined oil is subject to the same stringent refining, compounding, and performance standards as virgin oil. In fact, the National Institute of Standards and Technology has conducted extensive laboratory testing and field studies, and found that re-refined oil can outperform virgin oil.

The American Petroleum Institute has licensed qualified re-refined oil products that display the API starburst symbol (see Figure 1). This symbol also known as the “donut” to signify the oil’s performance level (top half), the oil’s viscosity (center), and whether the oil has demonstrated energy-conserving properties in a standard test in comparison to a reference oil.



**Figure 1**

You can find more information at the API's Web site, [www.recycleoil.org](http://www.recycleoil.org). In addition, the CIWMB is an excellent source for information on re-refined oil including legislation, vendor lists, and case studies. Information may be found at [www.ciwmb.ca.gov/UsedOil/](http://www.ciwmb.ca.gov/UsedOil/).

*Retread tires.* Purchase retread tires whenever feasible. Retread tires have been safely used for years on school buses, trucks, and other commercial and public fleets. Shasta College claims a waste tire diversion rate of nearly two tons annually from the use of retreads.

In addition, products derived from recycled tires are becoming increasingly available as waste tire shredding and grinding technology becomes more efficient and affordable. [RecycleStore.com](http://RecycleStore.com) advertises three Northern California manufacturers who produce a variety of useful, tire-derived products, all with nearly 100 percent recycled content:

- Threshold ramps for wheelchair access
- Tree ties for landscaping projects
- Mouse pads
- Floor mats

The CIWMB site at [www.ciwmb.ca.gov/Tires/](http://www.ciwmb.ca.gov/Tires/) provides additional information, including sources of products made from recycled tires. Another good source is Barco Products at [www.barcoproducts.com/speed.html](http://www.barcoproducts.com/speed.html), which offers paving accessories such as speed bumps from 100 percent recycled crumb rubber, wheel stops with 100 percent recycled content from plastic milk jugs, and landscape timbers.

*Engine coolants.* Reclaim coolants on site or contract for offsite reclamation services. Recycled engine coolant, like virgin coolant, meets the same performance specifications as established by the American Society for Testing and Materials and the Society of Automotive engineers. Filtration or distillation systems are available for on-site operations, and can be used as a teaching tool in classroom settings.

*Non-paper office products.* Available non-paper products include recycling containers, waste receptacles, and binders made of various materials. They also include plastic envelopes, clipboards, file folders, clip portfolios, and presentation folders. More information can be obtained from the *2000 Buy Recycled Series Non-Paper Office Products Fact Sheet*.

*Trash can liners.* Mandatory percentages of post consumer content in bags are based on bag thickness. Care should be taken to order liners by service category, as thickness does not necessarily mean strength. Evaluate your specifications and order liners to match can size; liners and can size should match. Waste occurs when the bag is too large for the container. The liners should be thin enough to reduce unneeded material, but strong enough so that maintenance workers do not have to double-line cans.

*Rigid plastic containers.* California's Rigid Plastic Container Act, passed in 1991, requires that every rigid plastic packaging container (RPPC) meets one of several criteria designed to reduce the amount of landfilled plastic. Therefore, all plastic containers used to package products sold in California must meet at least one criterion unless exempted or waived:

- Made with at least 25 percent post consumer material
- Have a recycling rate of 25 percent (or 45 percent or 55 percent for specific types)
- Be reusable or refillable as defined
- Be source reduced as defined

Most plastic containers are purchased as product packaging by campus food service and custodial staff. Products should be purchased in bulk whenever possible, and the containers should be reused. Most campus departments will gladly accept one-gallon jars, #10 tin cans, five-gallon buckets and fifty-five gallon barrels for reuse. This is a valuable source reduction activity and can boost diversion rates.

More information on plastics may be found at [www.ciwmb.ca.gov/Plastic/](http://www.ciwmb.ca.gov/Plastic/).

*Copy toner containers.* Many toner cartridges and containers are manufactured with 25 percent post consumer resin since they are classified as rigid plastic package containers. Contracts with the copier service can specify that toner cartridges and bottles have recycled content, and also include a provision for recycling. Don't worry about scaring off the vendor; a growing number of copier manufactures are eager to comply with emerging environmental standards in order to compete for business. Some service contractors will even supply a recycling box for used cartridges and bottles, and retrieve the empties when replenishing toner supplies.

*Ink jet/laser print cartridges.* Refilling used printer cartridges has become more commonplace for home office PC printers, but this process can be difficult to manage in large business operations. *Recharger*, a monthly recycling publication, maintains a directory of toner and printer cartridge remanufacturing centers to assist businesses in locating local centers. Often, a representative from the remanufacturing center will pay regular visits to the site, retrieve empty cartridges, and replenish them with refilled, tested cartridges at a lower cost than new cartridges. Remanufacturing centers can offer the following advantages:

- Lower cost for printer supplies
- Remanufacturers are able to offer unconditional guarantees and optimum product performance
- On-call emergency service.
- Cartridges can be remanufactured up to four times before being discarded.

*Plastic lumber.* Outdoor benches and tables constructed from plastic lumber are likely to withstand the forces of nature for fifty years or more, whereas chemically treated wood counterparts typically last four-to-ten years. Plastic lumber does not need painting, and thus reduces maintenance costs. Plastic parking stops also have a longer lifetime than concrete parking stops.

The *Buy Recycled Training Manual* offers a cost comparison of a traditional concrete stop and a recycled plastic stop. The comparison indicates that a recycled stop can save \$9,501.00 over the space of ten years for a 100 space parking lot.

*Paint.* Most municipal, solid waste recovery/transfer centers collect paint as part of their household hazardous waste collection program. The paint is usually made available to local government agencies at a reduced cost or free of charge. Household latex paint is collected in single containers and often dispensed to local governments for use in graffiti abatement programs. The mix of colors results in one of the variations in the “recycled beige” color palette.

*Green building products.* “Green building” is an integrated approach to site and product planning for optimal resource conservation within the construction and interior design industry. Green building products tend to cost more initially, but often result in overall savings because of reduced maintenance and high performance values.

The goal of the green building philosophy is to reduce the overall impact to the environment, while providing worker or resident safety and comfort. At [Oikos.com](http://Oikos.com), recycled content is specified next to the material, which makes it easy to identify products with recycled content. For example, several interior wall system products utilize rice or grain straw as their primary component in the manufacturing process. Grain straw is typically burned in the fields and is considered an agricultural waste. The California Air Resources Board has worked with manufacturers to try and encourage markets for straw-based construction materials, hoping to reduce and eventually eliminate field burning and its attendant pollution. [RecycleStore.com](http://RecycleStore.com) features rice straw interior wall panel systems for BioFab of Redding, CA; the

interior wallboard system can be used like gypsum board for finishing walls, or it can be used for room partitions.

Pacific Gold Board can also be used in workstation assemblies, and it even has superior acoustical properties. In addition, the straw ceiling panels have exceptional sound absorption capabilities, and are becoming increasingly popular for use in sound studio design applications. Grain straw can also be used in the rice straw hardboard that creates shelving or storage closets.

Finally, buildings can be built with straw bales themselves, with plaster on the interior walls and stucco on the outside. Straw bales create an aesthetically pleasing structure that is economical to build, and has a high R-value (or the measure of a material's ability to resist flow) for energy conservation and lower utility bills.

*Workstations* ([www.studioeg.com/](http://www.studioeg.com/)). Studio Eg, a private company based in West Oakland CA, produces "Ecowork" workstations. These highly functional and aesthetically pleasing office workstations use recycled materials and boast a low energy manufacturing process.

*Carpet and Flooring.* Several manufacturers offer carpet and flooring products made with a percentage of recycled content, usually from two liter plastic soda bottles. Some flooring products include ceramic tiles containing recycled glass, and can be purchased at competitive prices. Recycled products have to meet the same industry performance standards as their virgin counterparts. In addition, many of these products carry the same manufacturer warranties for high traffic wear, fire rating (Class I), stain resistance, and color fade properties.

Carpet may be installed with low volatile organic compound (VOC) adhesives to reduce the impact on air quality. Carpet carries a relatively short life span, and leasing arrangements are becoming more popular as the manufacturer bears responsibility for replacing worn sections of carpet and recycling the used carpet.

Here are some recommendations for carpet:

- Natural linoleum is made from softwood powder, linseed oil, pine tree resins, cork, chalk, and jute backing. Linoleum and natural carpets use renewable resources and offer durability without compromising aesthetics. The cork used in linoleum is harvested from the cork tree without harming the tree itself.
- Bamboo is an environmental floor product due to its renewable growth and forest management practices.
- Natural carpets can be made from grasses, cotton, and wool, and require minimal treatment. Wool carpet is made from a renewable resource and is durable and biodegradable.
- Recycled-content tile is made from waste glass such as light bulbs and auto windshields, as well as a byproduct of feldspar mining.
- Ceramic tile offers outstanding durability and maintainability, and offers a high aesthetic value.

- Resilient flooring is available such as Eco-Surfaces (100 percent recycled rubber), Stratica (non-vinyl, chlorine-free flooring), and Solenium (a product that fills the gap between carpet and resilient flooring).
- Wood salvaged from existing buildings, or from a forest certified as sustainably harvested, provides an excellent option.
- The look of wood can be replicated in laminate flooring. Environmental choices are available such as Performance Flooring laminate (containing Wilsonart, which offers a 100 percent post-consumer recycled plastic core, and ProFX Core, a synthetic waterproof core). Perstop Flooring is another laminate made almost entirely of renewable materials.

## **RecycleStore.com**

In 1990, the California Integrated Waste Management Board established 40 Recycling Market Development Zones (RMDZ) throughout California to provide a market for recycled materials. The goal was to stimulate the manufacturing of recycled content products (RCPs). Low interest loans, information on financing, marketing, and technical assistance were made available to businesses located within RMDZs.

In order to foster sales of RCPs, the CIWMB developed an Internet data interchange site called [www.RecycleStore.com](http://www.RecycleStore.com). At this site, rural California manufacturers can post a product page at no charge. Currently, a wide range of recycled content products is available from the [RecycleStore.com](http://www.RecycleStore.com) web site at wholesale quantities and competitive prices.

# Chapter 19. Obtaining Grants

## Why should I apply for grant funding?

On the one hand you've got people with great plans and great concepts—but little or no money to implement their ideas. On the other hand you've got companies, government agencies and non-profit organizations with money and a commitment to use it. Grants can help bring together these perfectly matched parties.

Grant funding is a way to form partnerships with outside agencies for the purpose of establishing new and innovative programs. Grants are often given for pilot programs, which eventually become model programs for the university.

## How do I find grants?

### Looking for the money

Keeping in mind that grant sources differ widely in regards to what they will fund—and that almost every grant agency has a different timeframe for the application and funding process—here are some excellent places to look for funding.

- *The California Department of Conservation (DOC).* Call 1-800-RECYCLE or visit DOC's Web site at [www.consrv.ca.gov](http://www.consrv.ca.gov). Here, grants are given for beverage container recycling.
- *Environmental Grantmaking Foundations.* Acting as the “phone book” of grant organizations for environmental issues, this listing is available through Resources for Global Sustainability, Inc., 800-724-1857, or at the Web site for Environmental Grantmaking Foundations, [www.environmentalgrants.com](http://www.environmentalgrants.com).
- *The U.S. Environmental Protection Agency.* The EPA regularly sends out grant announcements via e-mail. For example, California EPA grants include the EPA Region 9 Solid Waste Assistance Funds Solicitation, which promotes source reduction, product stewardship, reuse, market development and job creation for recycling and composting, or the procurement or manufacturing of products with post-consumer recycled content. More details can be found on the EPA Web site, [www.epa.gov/region9/waste/solid/funding.htm](http://www.epa.gov/region9/waste/solid/funding.htm)
- *The Home Depot.* This retailer gives grants for programs focusing on forestry, recycling, and green building. The grant period is November – December 15. More information on Home Depot grants can be viewed at

[www.Homedepot.com](http://www.Homedepot.com); go to the “Company Info” section, then “Environment” and scroll down to find the grant information.

- *The Taft Group.* This leading publisher produces reference works on the philanthropic activities of wealthy individuals, corporations, and foundations. More details can be found at [www.taftgroup.com](http://www.taftgroup.com)
- *The California Integrated Waste Management Board.* While the CIWMB doesn’t always have grants available, their Web site, [www.ciwmb.ca.gov](http://www.ciwmb.ca.gov), is a great source of information and will give details on available grants:

In addition, the community foundation in your area may be a wealth of information on locally available grants. Visit the League of California Community Foundations at [www.lccf.org](http://www.lccf.org) to locate the foundation nearest you.

## Standing out in the crowd

After you’ve identified which grant you’re going to pursue, take some time and get to know the organization that is offering the funding. Discuss your ideas with the organization officials and give them an opportunity to learn about you. Your goal here is to build a relationship. Grant makers like to know that their recipients are reliable, thorough, and capable.

Read the funding instructions. Then read them again. Then take a short walk, come back, and read them one more time. In short: *follow the instructions to the letter.*

When applying for grant funding, use the forms that the organization provides and carefully follow the outline that describes what they want to see. For example, the instructions may state, “The project description should discuss the following: how the project will be conducted; key elements that will make the project self supporting; qualities that make the project unique and innovative; and planned education and promotion to encourage awareness and use.” These are very specific instructions, and should be followed precisely. Answer each question in the same order as the instructions indicate, and make sure your responses are clear and concise.

For example, you might respond: “This program will be conducted using the new space technology to beam recyclables out of the collection locations directly into storage containers that feed into the baler. This project is self supporting, and is innovative because we can modulate the frequencies to transport only one material at a time. This eliminates the need to sort materials, and it reduces the labor costs. We will educate the campus population through targeted emails and downloadable files.”

If the grant application offers no specific instructions, you can use a basic proposal outline. Your goal is to convey the “who,” “what,” “why,” “where,” “when,” and “how,” and “how much” about your program.

- *Who.* Introduce your organization and build credibility. Introduce your project managers and briefly describe their experience in the field. Do you have partners in this project? Now would be the time to introduce them as well.

- *What.* Present your project outline, the title, the goals, and the primary objectives. What is your vision? What is your projected outcome from the project?
- *Why.* What problems will your project solve? Why are they significant? Why is this the right time to fix them?
- *Where.* Describe your region to the review team. Remember that they don't know any more than what you tell them.
- *When.* What's the timeframe for the project?
- *How.* Describe exactly how you will accomplish your goals, step by step.
- *How much.* Disclose the budget. Be specific—explain how much you're asking for and why. Try to include the cost estimates from the vendor if possible.

To be effective in your proposal, you need to have worked through the details beforehand. Know what you want to accomplish, both how and why. It's helpful to walk through the entire application with people who don't know anything about the project. Give them a copy of the grant description and funding priorities, and ask them for an honest assessment. Find out if you're really answering all the questions. Ask them if you're using the right tone to describe your project; you want to be clear and concise, while still respecting your audience's intelligence.

## Grantwriting resources

Many grant writing resources exist that can help you with your writing style. Several community foundations offer low-cost grant writing classes and have solid local leads for grants. Research your own campus; it may have a department that keeps grant writers on staff. It is also a good idea to seek out successful grant applications and use them as a reference.

Web searches will also reveal several resources for grant writing. An excellent example of this is at [www.svatic.tec.ut.us/UCGI/Propwrtg.htm#top](http://www.svatic.tec.ut.us/UCGI/Propwrtg.htm#top), which is hosted by the Utah Center for Grants Information.

## Conclusion

Grant writing takes time, but it can help your program purchase necessary yet expensive items when funding isn't available. If you get a grant, celebrate your success and publicize it through campus publications. If you do not get the grant, contact the grant organization and find out what you can improve upon—then try again. Also remember that grant writing is a competitive process; you may need to submit applications several times before meeting with success.

# Chapter 20. Case Studies

## Introduction

The following information is a compilation of six different facility recycling program descriptions. Each description provides general information, a history of the recycling program, details regarding collections and operations, grant award information, educational programming, and programmatic short and long-term goals. The goal of this section is to provide you with a variety of examples, as well as demonstrate how recycling programs can work within a multitude of different facilities.

## California State University, Chico

### General description

Institutional system: California State University

University location: Rural northern California

Land size: campus - 119 acres, university farm - 1,050 acres

Total population: 17,500

Population breakdown: 15,500 students, 2,000 faculty and staff

Student on-campus housing: 1,230 students in 645 rooms

Faculty and staff housing: Not provided

Multi/single-family housing: Not provided

Recycling tonnage: 200 tons per year of white ledger, mixed paper, office pack, newspaper, cardboard, shredded paper, magazines, telephone books, aluminum cans, glass (clear, brown, green), plastic bottles (#1-and #2), tin/steel cans and scrap metal.

Estimated diversion rate: 44 percent (diversion percentage includes all materials recycled on campus, including the following: construction and demolition debris, surplus furniture, organic recycling, pallets and other recyclable materials).

Commuter school: No, the majority of students live within 3 miles of the campus.

Web site: [www.csuchico.edu/as/recycle/](http://www.csuchico.edu/as/recycle/)

### History

Interest in recycling issues began in the 1970s as volunteer students from the Butte

Environmental Council (BEC) initiated recycling collections on campus and within the community. This program was later purchased by a local hauler and became the local community recycling center. Heightened interest in recycling grew in the 1990s when the Associated Students Environmental Affairs Council began the compost collection program, and the Associated Students, Chico Inc. received the contract to provide recycling services to CSU Chico in May, 1996. Funding for the Associated Students Recycling Program (ASRP) was then secured through a student fee increase referendum that passed in April 1998. Since 1996, students have continued to be the driving force behind developing, expanding, and improving recycling collections and education on campus. With the passing of recent state legislation, University Facilities Management and Administration have assumed an increasingly active role in supporting recycling and waste reduction activities.

### **Collections and operations**

Recycling and waste reduction practices are overseen by two organizations, the ASRP and Facilities Management and Services. The ASRP is a student developed, organized, and funded program, which provides a variety of recycling collections services on the CSU, Chico campus. Under the coordination of one full-time Recycling Coordinator, approximately fifteen students service approximately 550 office pack, bottles and can container, newspaper, magazine, compost, and cardboard recycling sites. Additional items collected include toner cartridges, textbooks, phone books, tapes, CDs, office reusables, floppy disks, and alkaline batteries. Additional services include on-campus special events and bottles and can container residence hall collections, as well as a Saturday Recycling Donation Center.

ASRP collection vehicles consist of a 1999 Isuzu one-ton flatbed truck with a lift-gate, a flatbed Electruck, and an Eco-Trike (a single person, human-powered vehicle). Collections involve a large amount of physical labor, with little. The ASRP is funded through a student union fee, as well as the revenue received from bottles and cans, toner/inkjet cartridges, and other material sources.

The Isuzu flatbed is used to collect paper. Department offices, labs, and faculty have a variety of bin size choices for paper recycling, from 13-gallon deskside bins to 96-gallon wheel carts. Size depends upon space in the area, convenience, site volume, and bin availability. Students work in pairs, enter each office/room, and empty small bins into 96-gallon wheeled carts. They service 40-60 sites in a four-hour period during each shift. The final step is dumping the paper from the 96-gallon carts into three-yard bins from the end of the truck lift gate. A local hauler collects the three-yard bins on a regular schedule for processing.

Student staff uses the Electruck for bottles and can collections. These collections are comingled with aluminum, plastic, glass bottles and bi-metal cans, with the exception of the housing areas, which provide separate aluminum can receptacles and comingled plastic and glass. There are approximately 100 indoor beverage container receptacle locations; they consist of blue 32-gallon plastic bins with locking lids, or personal office bins. Student staff wheels a 44-gallon plastic bin to each collection site and removes the recyclables. These locations are generally serviced twice a week.

The bottles and can beverage container locations consist of 25-gallon cluster style

collection sites and sixty-four 32-gallon square aggregate bins placed beside round aggregate trash bins. These areas are serviced one-to-three times a week, depending upon the amount of usage. Bags of bottles and cans are driven to an outside sorting area, placed onto a waist-high table and sorted into 96-gallon roll carts and other can container sizes. When the carts are full, aluminum and #1 PET plastic are dumped into separate three-yard bins, while glass, #2 HDPE plastic, scrap plastic, and bi-metal cans are driven to the local recycling center. A local hauler empties the aluminum and #1 PET plastic three-yard bins on a call-in basis.

Pre-consumer food scrap collections occur daily during the academic year. One staff person services five locations, two of which have one-to-three 20-gallon yellow plastic bins with lids. Coffee grounds are collected in buckets at three coffee cart or cafe locations. The pre-consumer food scraps and coffee grounds are then transported to the on-campus Compost Display Area where they are fed to the worm bins twice a week. Three times a week, the compost is driven in a pickup truck to the university farm and dumped into a windrow. University farm staff periodically turns the windrow, which is later used by the “Sustainable Agriculture” class on farm crops. Approximately ten tons of food waste is collected each year.

Facilities Management coordinates the collection of green waste, construction and demolition debris, surplus equipment, scrap metal, sensitive documents, farm animal waste, grasscycling, and hazard waste disposal on campus. The Director of Facilities Management also chairs the Campus Conservation Committee, which serves to provide feasible and comprehensive conservation programs that promote campus-wide awareness and participation. These programs encourage all faculty, staff, and students to be active in matters of procurement, waste reduction, education, environmental management, and conservation awareness.

### **Grants**

The ASRP has received two grants from the Department of Conservation, which have helped increase outside building beverage container recycling locations. The first grant was for twenty-five recycling and trash clusters, as well as a Toyota Electruck and cleaning materials. The second DOC grant was for approximately forty outside aggregate container recycling receptacles in on-campus athletic areas. An additional grant for nineteen outside aggregate bottles and can recycling bins was awarded in 2001 by the California Collegiate Recycling Council. Approximately ten other small grants (\$330-\$2,500) have helped fund educational programs, lecturers, and promotional items.

### **Education**

The ASRP serves as the main source of recycling, waste reduction and compost information for campus and community members. Information sheets, pamphlets, and books are available for the general public. Students are also actively involved in educating others about the importance of waste reduction through letter writing, tabling, e-mail announcements, and one-on-one communication. Annual programs, compost workshops, community special events, campus fairs, trash clean-ups, and events such as Second Chance Week, Recycle Week, housing move-outs, and America Recycles Day are organized and coordinated by several paid interns, as well as approximately fifteen-to-twenty student interns who receive academic units.

### **Goals**

Currently, the ASRP and Facilities Management and Services recycling collection programs divert approximately 44 percent of their waste, with a goal to recycle 50 percent by 2004. Other ASRP goals include increasing automation within the collections system, establishing formalized waste reduction policies and procedures, promoting “buy-recycled” products, and continuing to be a voice for student advocacy, action, and learning.

## California State University, Northridge

### General description

Institutional system: California State University

University location: Urban southern California

Land size: 350 acres

Total population: 32,200

Population breakdown: 29,000 students, 3,200 faculty and staff

Student on-campus housing: Yes

Faculty and staff housing: Not provided

Multi/single-family housing: Not provided

Recycling tonnage: 142.55 tons per year of white ledger, mixed paper, office pack, newspaper, cardboard, shredded paper, magazines, telephone books, aluminum cans, glass (clear, brown, green), plastic bottles (#1 and #2), tin/steel cans and scrap metal.

Estimated diversion rate: Not provided

Commuter school: Yes

Web site: In development

### History

The Associated Students (A.S.) and California State University, Northridge (CSUN) joined in a cooperative effort to begin the University Recycling Services (URS) program in the spring of 1991. To initiate the program, members of the AS and the Business and Finance Division formed an ad-hoc committee, which included the Vice-President for Business and Finance, Physical Plant Management, Purchasing, and Admissions and Records. Initial collections began with a white paper collection pilot program. After the success of the pilot program, beverage container recycling was instituted in ten campus locations. The intention of the URS program is to divert recyclable materials from the landfill, as well as promote the benefits of recycling on campus.

### Collection and operations

The Associated Students, CSUN, Inc. provides budgetary funding for the full-time Recycling Coordinator position, as well as part-time staff, equipment, and general

programmatic expenses. The duties and responsibilities of the Coordinator include implementing and managing collection and educational components of the recycling program. In addition, the Coordinator oversees the details of bin exchanges, material contamination, vendor agreements, daily facilities communications, and educational components.

Currently, four part-time students collect recycling on campus with an electric cart. Materials collected on campus include white ledger office paper in department areas and computer rooms, mixed paper, comingled beverage containers, cardboard from fifteen locations, newspaper, laser toner cartridges, and pallets. Collection programs include office clean-out projects, residence hall move-outs, and other annual recycling projects.

The CSUN office paper recycling program is a joint effort between the A.S. and the University Physical Plant Management (PPM) department, and includes approximately 156 departments, computer rooms, and faculty offices. Campus staff and faculty take their recycling to indoor centralized recycling locations; custodial staff then deposits the paper into outdoor three-yard containers. The three-yard bins are emptied by a hauler on a weekly basis, or as needed. Comingled beverage containers (aluminum, glass, and plastic bottles) are collected in twenty-seven campus locations. Containers are then sorted at a central recycling yard by A.S. student staff.

A local waste hauler provides services for comingled beverage containers, newspapers, and yard trimmings for on-campus family housing areas. During annual residence move-in, the URS provides additional cardboard recycling services.

With the passing of Assembly Bill 75, PPM has begun the development and expansion of additional green waste and construction and demolition debris recycling programs. Green waste collections are coordinated by the Housing Department, and consist of two thirty-yard dumpsters located in the student and faculty/staff housing areas. 

The URS program attributes its success to the strong communication, cooperation, and coordination between the A.S. Recycling Coordinator and the campus community.

## **Grants**

The URS has received two grants from the Department of Conservation (DOC). One grant was for beverage container collection receptacles, and the other was for recycled content plastic fencing that surrounds the housing recycling collection areas. On campus, the CSUN Student Projects Committee also provided funding for the purchase of comingled beverage container collection receptacles for the housing areas. Most recently, PPM, The University Corporation, and the University Student Union jointly provided funds for the purchase of new comingled beverage container collection receptacles.

## **Education**

The A.S. Recycling Coordinator coordinates and organizes recycling education on campus, along with the assistance of one part-time student who concentrates on educational programming. The main goal is provide continual and on-going

education to all areas of the campus community through educational campaigns, activities, and promotions. Programmatic examples include new student orientation, residential life, donation drives, Recycling Week, campus contests, lecturers, Earth Day, community fair booths, and composting events. Additional elements include on-campus tabling, one-on-one communication, flyers and newsprint advertising.

## **Goals**

The ultimate goal of the URS is to inform, educate, and encourage the campus community to recycle. By developing a comprehensive program, the fundamentals of recycling will spread via active campus participation.

The URS program is in the process of developing an online campus listserv to help promote and educate department personnel. Once these individuals are educated about the URS, they will then be able to pass on recycling information to faculty and staff in their respective departments. URS staff is in the process of developing a Web site for educational and promotional purposes.

URS staff would like to expand collection programs for compost and construction and demolition debris, as well as implement cardboard collections in all buildings. Ultimately, the goal of URS is to meet the AB 75 waste diversion mandate, as well as the goals of the CSUN Integrated Waste Management Plan.

## **Humboldt State University**

### **General information**

Institutional system: California State University

University location: Rural northern California

Land size: 139 acres

Total population: 8,200

Population breakdown: 7,000 students, 1,200 faculty and staff

Student on-campus housing: 1,358 students in 700 rooms

Faculty and staff housing: Not provided

Multi/single-family housing: Not provided

Recycling tonnage: 190.14 tons per year of white ledger, mixed paper, office pack, newspaper, cardboard, shredded paper, magazines, telephone books, aluminum cans, glass (clear, brown, green), plastic bottles (#1 and #2), tin/steel cans, and scrap metal.

Estimated diversion rate: 59 percent (diversion percentage includes all materials recycled on campus, including the following: construction and demolition debris, surplus furniture, organic recycling, pallets and other recyclable materials).

Commuter school: Yes

Web site: [www.humboldt.edu/~recycle/](http://www.humboldt.edu/~recycle/)

## **History**

Initial recycling collections began in 1974 when the non-profit Arcata Community Recycling Center began high-grade paper and cardboard recycling collections in departments on campus. The Campus Recycling Project (CRP) was then initiated by a group of students involved with the Campus Center for Appropriate Technology (CCAT). With a focus on recycling collections and education, the CRP became an Associated Students (A.S.)-funded program in 1989. University administration created the three-quarter time Solid Waste Reduction Manager staff position in 1992. This position was formed to implement waste reduction practices throughout campus, and has helped to solidify university recycling practices.

## **Collections and operations**

The recycling and waste reduction program at HSU is divided into two administrative areas: Plant Operations and the A.S. The Solid Waste Reduction Manager, funded through the general operations budget, works under the purview of the Plant Operations Department. Manager responsibilities include coordinating and supervising recycling and waste reduction efforts on campus, including waste reduction, education, legislative compliance, and grant writing, as well as programmatic expansion and implementation.

The Campus Recycling Program (CRP) is a student-supported program through the A.S. The CRP is divided into three areas: recycling collections, compost education, and waste reduction education. In accordance with a Memorandum of Understanding between the CRP and HSU, approximately ten collection and office staff, ten stipend interns, and ten volunteers service approximately 300 locations on campus. Staff is paid an hourly wage, and work-study students are utilized when possible. HSU gives the CRP ownership of the recyclables, which are processed by a private recycling organization. Materials collected on campus include high grade and mixed papers, cardboard, beverage and food containers, scrap metals, plastics #1 PET and #2 HDPE, compostable food scraps, and yard waste. Additional items collected include packing peanuts, books, and toner and ink jet cartridges. Material revenues fund approximately half of the CRP budget; student fees support the other half.

CRP collection vehicles consist of a one-ton flatbed truck with a lift-gate, as well as a two person recumbent bike with a trailer called the “Eco-Cycle.” Collections involve a significant amount of manual labor with no automation—but they do use a large degree of creativity.

A majority of the beverage container receptacles are located outside buildings, with several placed inside. After use, beverage containers are deposited into 25-35 gallon receptacles with rigid liners and placed throughout campus. Receptacles are separated into two sorting category types: cans and glass, and plastics #1 and #2. Student crews ride the Eco-Cycle through campus, pick up beverage containers, and empty the receptacles into 55-gallon plastic drums. In high volume areas, 55-gallon plastic drums are used and are serviced by the one-ton truck. Sorting takes place at a central outside area, which is approximately 2000 square feet. Another partially covered 400 square foot area is used for bin storage, vehicle maintenance, and unsorted materials. Beverage containers are dumped down a sloping ramp and land on a table, where they are sorted by hand.

Paper materials are source separated and collected inside buildings using 27-gallon metal receptacles. Custodians consolidate this material into centralized 96-gallon wheeled carts outside each building. Once the carts are full, they are switched out with empty carts by crews on the one-ton truck.

Custom-built one-yard metal and wood carts are placed outside buildings for custodians to deposit cardboard. The carts are then picked up by the one-ton truck and taken to the university's contracted processor for baling.

All on-campus housing residents are provided with recycling buckets in their rooms. Residents deposit recyclables in a centralized outside location, which are then serviced by CRP staff. Materials are separated into metals, glass and plastic, but are comingled according to material color and resin type.

HSU recently received a grant to purchase and implement a vermicomposting system to compost food waste. Additional organic composting practices include grasscycling, chipping, and general landscape composting. Approximately 300 tons of material is composted each year.

Construction and demolition (C&D) debris material is a large component of the recycled waste. All contractors are required to implement C&D recycling within their projects. The Solid Waste Reduction Manager assists the contractors in developing the C&D program for their projects.

Waste reduction and reuse are also strongly emphasized on campus. Additional programs include an office supply exchange, phone book recycling, and the-end-of-the-year residence hall move-out drive.

## **Grants**

The CRP received one-time funding from the administration in order to purchase a new truck, upgrade recycling collection receptacles, and purchase new equipment. In addition, two grants have been awarded to the program. The Department of Conservation granted funding for the purchase of beverage container receptacles and promotional items. The California Integrated Management Board provided funding for the purchase and installation of a large vermicomposting system, which will be used to divert food waste on campus.

## **Education**

Education is an important element of the CRP, which participates in general information tabling, campus fairs, community special events, soliciting articles from campus newspaper, and publishing a waste reduction newsletter. Additional items of interest include holiday waste reduction tips, compost workshops, promotion of reusable flatware and mugs, giveaways of school supplies, educational displays, guerrilla theater, trash mountain displays, Web site information, and elementary school presentations. In addition to being environmentally friendly, the Eco-Cycle is also an excellent promotional tool for drawing attention and attracting campus volunteers.

Faculty and staff are educated about the importance of waste reduction and recycling through the staff and faculty waste reduction guide, bulk e-mails, one-on-one discussions, and waste reduction workshops.

## **Goals**

Currently, HSU's diversion rate is 59 percent, approximately 10 percent of which is construction and demolition debris (C&D) from an ongoing infrastructure improvement project. HSU's current goal is to reach 60 percent diversion, without the inclusion of C&D materials, by 2002. Additionally, HSU would like to establish formalized waste reduction policies and procedures, and expand the use of recycled content materials. Areas of growth include compost collections and educational programming.

## **Loyola Marymount University**

### **General description**

Institutional system: Private university

University location: Urban southern California

Land size: 160 acres

Total population: 6,986

Population breakdown: 6,161 students, 635 faculty and staff, 200 contract workers

Student on-campus housing: 2,839 students

Faculty and staff housing: Not provided

Multi/single-family housing: Not provided

Recycling tonnage: 2,290.43 tons per year of white ledger, mixed paper, office pack, newspaper, cardboard, shredded paper, magazines, telephone books, aluminum cans, glass (clear, brown, green), plastic bottles (#1 and #2), tin/steel cans, and scrap metal.

Estimated diversion rate: 54 percent (Diversion percentage includes all materials recycled on campus, including the following: construction and demolition debris, surplus furniture, organic recycling, pallets, and other recyclable materials).

Commuter school: Yes

Web site: [www.catsbn.com/recycle/](http://www.catsbn.com/recycle/)

### **History**

The Loyola Marymount (LMU) Recycling program began in 1989 and developed into a partnership between Operations staff and part-time student workers. Facilities Services staff in the housing areas initiated the program in response to the passing of AB 939.

### **Collection and operations**

Recycling and waste reduction practices are organized by the Solid Waste Management and Recycling Coordinator within the Office of Environmental Control under the Department of Operations and Maintenance. LMU Recycling employs seven part-time students who collect beverage containers (glass, plastic, aluminum

cans), paper (all grades), cardboard, scrap wood, scrap metal, pallets, toner cartridges, green waste, and furniture. Student staff service approximately 700 recycling collection sites throughout campus.

LMU Recycling collects, processes, and markets over 2,000 tons of recovered resources annually, with an estimated savings of \$300,000 in avoided disposal fees. LMU has a highly automated and innovative collections, sorting, and processing system that utilizes a variety of mechanical equipment.

Collection vehicles include four John Deere 6x4 Gators and two Toyota mini-trucks. Recyclables are comingled and sorted with the assistance of loading and sorting conveyors. Hydraulic cart dumpsters tip recycled materials from wheeled carts; the materials are then hand sorted along the conveyor belt. Additional processing equipment includes a baler and a forklift. Space provided for the recycling operation sorting, equipment, and storage includes 720 square feet of outside space. Equipment provided for solid waste and recycling services are included in the solid waste disposal contract.

Staff salary funding is provided by the university at a cost of less than one-third of the funds saved through avoided disposal fees. The revenue of recovered materials provides program operational funding.

### **Grants**

Due to the difficulty of finding grant funding available to private educational institutions, the LMU recycling program has not received any grants to date.

### **Education**

The campus community is educated through a variety of means. E-mail announcements and information are sent out to students, faculty, and staff on a regular basis. Student groups, such as the Sierra Club and Student Government, also play a vital role in sharing information about recycling and waste reduction. Earth Day and other special events are also excellent opportunities for interested individuals to receive information. LMU Recycling promotes the message of eco-stewardship activities throughout campus life.

### **Goals**

LMU staff would like to continue its success and share its methodology with other institutions; it intends to help create additional, economically viable recycling programs.

## **Stanford University**

### **General description**

Institutional system: Private university

University location: California Bay Area

Land size: 8,180 acres

Total population: 33,000

Population breakdown: 16,000 students, 17,000 faculty and staff

Student on-campus housing: Stanford is unique in that 92 percent of its undergraduate students and 45 percent of graduates are housed on campus.

Faculty and staff housing: 866 faculty and staff live in on-campus residences

Multi/single-family housing: 252 multi-family dwellings, 614 single-family dwellings

Recycling tonnage: 4,128.67 tons per year of white ledger, mixed paper, office pack, newspaper, cardboard, shredded paper, magazines, telephone books, aluminum cans, glass (clear, brown, green), plastic bottles (#1 and #2), tin/steel cans, and scrap metal.

Estimated diversion rate: 53 percent (diversion percentage includes all materials recycled on campus, including the following: construction and demolition debris, surplus furniture, organic recycling, pallets and other recyclable materials).

Commuter school: No

Web site: [recycling.stanford.edu](http://recycling.stanford.edu)

### **History**

Recycling collections at SU began in the 1970s as a student effort to reduce waste on campus. As collections grew, students became apathetic about recycling on campus, so SU asked its private waste hauler, Peninsula Sanitary Service, Inc. (PSSI), to assume recycling collection responsibilities and to expand the program. Currently, recycling services are housed in the Facilities Operations Grounds Department.

### **Collections and operations**

The recycling and waste reduction program at SU is operated by PSSI, an independent garbage and recycling hauler, which, through a contractual agreement, only services Stanford University. Areas serviced on campus include inside all academic, athletic, housing and dining buildings, Stanford Hospital, the Stanford Linear Accelerator Center (SLAC) and a public drop-off center. PSSI dedicates fifteen non-student employees and management staff to recycling who service over 3,800 campus recycling receptacles. Materials collected or recycled on campus include paper, newspaper, cardboard, glass, tin cans, aluminum cans, plastics #1 PET and #2 HDPE plastic film, yard waste, concrete, wood, mixed construction, demolition debris, and electronic scrap. PSSI grinds logs into chips on campus, and the Grounds Department chips brush into mulch as well as grasscycles. Funding for the recycling program is provided through collection rate values developed during the annual rate process between the University and PSSI. Funding for garbage and recycling collections is provided by Stanford's general fund, as well as the salvage revenue—which is given back to the university's solid waste operation budget.

The PSSI collection vehicles consist of two converted two-compartment front loader trucks for paper and bottles and can containers, two converted front loader trucks for cardboard and yardwaste, and one roll-off to transport recyclables to market. The majority of the recycling equipment is old garbage trucks. PSSI also uses a semi-automated sorting system for bottles and can container and paper recycling material

sorting. Recycling collection containers include plastic wheeled carts, Rubbermaid, and “Slim Jim” containers.

Paper (all paper that tears and is not contaminated by food or oil) is comingled into plastic carts with wheels. These are collected by a one or two person crew, and deposited into one of the two compartments (the other compartment is used for newspaper and bottles and can containers) of the converted truck. After collections, mixed paper is taken to the PSSI collection facility, weighed on an in-ground scale, and sorted across the semi-automated sort line. Paper is sorted and processed in order of grade type. Commodities are then hauled with a roll-off truck to local recycling markets.

Bottles and can containers are also comingled on campus. Aluminum cans, aluminum foil, bi-metal and tin cans, glass jars and bottles, and plastics #1 PET , #2 HDPE , and aseptic containers are collected in plastic wheeled carts, Rubbermaid, or “Slim Jim” containers. After being emptied into the three-compartment front loader trucks and delivered to the PSSI collection facility, beverage containers are dumped onto the sort line by PSSI staff. A magnetic head pulls off the steel cans, an air blower pushes off aluminum cans, and three-to-five staff members sort different colors of glass, plastics, and trash. Aluminum cans, steel cans, and plastic are flattened or perforated and then baled or held in roll-off bins. Glass is sorted by color and collected in fifteen cubic yard roll-off bins. When the bins are sufficiently full, they are hauled to local recycling markets.

Corrugated cardboard is deposited into front loader dumpsters by faculty, staff and students. Dumpsters are strategically placed beside the garbage dumpsters outside most campus buildings. Cardboard is collected one-to-five times per week with a front loader truck, and hauled directly to a local mill.

Single-family, on-campus residences are provided with curbside recycling services. In addition, all student housing and multi-family housing receive 64 and 96-gallon plastic carts for mixed paper, newspaper, and beverage containers. The recycling carts are located outside next to the garbage dumpster. A cardboard receptacle is also located next to most on-campus housing garbage dumpsters.

SU does not compost on site; however; yard waste is collected from the Grounds Department, Athletics, and Faculty/Staff Housing and taken to a compost facility. Food waste collection from dining halls started in January, 2003. Finished compost is later backhauled to the campus for landscape projects. University grounds staff uses a chipper to grind woody debris into mulch, and also employs grasscycling. PSSI collects logs and large tree limbs from the Tree Crew and rents a tub grinder to turn the organic waste into chips for campus use. The chipped material is then used on campus as mulch or composted at the compost facility. PSSI also collects horse manure from the on-campus stables. The manure is allowed to sit for several months and then sold to landscapers.

During construction and demolition (C&D) projects, PSSI gives on-campus contractors a discounted rate for source separating cardboard, metal, green waste, wood waste, concrete, and/or asphalt into roll-off boxes. PSSI is able to give a discount because it's less expensive to send building material to a C&D recycler or a compost facility than to the landfill. Contractors who cannot source separate C&D

material, due to limited space or small amounts of material, take the material to a C&D recycler who recycles at least 85 percent of the debris.

PSSI collects a variety of scrap metal items, such as metal desks, pipes, and stoves for recycling. PSSI also removes oil and refrigerants from air conditioners and refrigerators before sending them to a scrap metal vendor.

Outdated electronic capital equipment is collected by the University Property Administration and sold to local scrap dealers. During move-out, charitable organizations such as Goodwill bring trailers on campus to collect reusable furniture and usable goods.

Campus departments can request recycling bins for paper or bottles and can containers during special events on campus.

PSSI operates the on-campus public drop-off center for the surrounding community. Acceptable materials include clear, green, and brown glass, wine bottles, aluminum cans and foil, scrap metal, tin cans, corrugated cardboard, phone books, white paper, junk mail, magazines, newspaper, plastic #1 PET, plastic #2 HDPE clear, plastic #2 HDPE colored, plastic film, harback books, and aseptic containers. The Drop-off Center is open Monday through Friday from 8 AM-5 PM, and Saturday from 9 AM-5 PM.

### **Grants**

Due to the difficulty of finding grant funding available to private educational institutions, the SU recycling program has not received any grants to date.

### **Education**

Stanford University and PSSI is continually involved with educating the campus community about recycling services, as well as the many benefits source reduction, reuse, recycling, buying recycled, and composting have to offer. PSSI educates the campus community about the benefits of double-sided copying and using draft paper for printing. Recycling and waste reduction information is provided through newsletters, flyers, meetings, presentations given to students and department office staff, information boards, advertisements, a question and answer column in the campus newspaper, and on its Web site. PSSI staff and up to four interns participate in festivals and fairs where information and promotional items such as pens, pencils, and mugs are handed out. In addition, internships provide students with the opportunity to be actively involved and gain valuable hands-on experience in the solid waste and recycling field.

### **Goals**

The current SU diversion rate is 53 percent. Stanford University and PSSI intend to achieve and maintain a 50 percent diversion rate. The ultimate goal is to increase the amount of material diverted from the landfill to the highest possible level that is economically possible. In addition, Stanford University and PSSI would like to explore the expansion of the current plastic recycling program.

## **University of California, Davis**

### **General description**

Institutional system: University of California

University location: Suburban northern California

Land size: 5,200 acres

Total population: 35,141

Population breakdown: 25,092 students, 10,049 faculty and staff

Student on-campus housing: 1,704 students

Faculty and staff housing: Not provided

Multi/single-family housing: Yes

Recycling tonnage: Approximately 1,233 tons per year of white ledger, mixed paper, office pack, newspaper, cardboard, shredded paper, magazines, telephone books, aluminum cans, glass (clear, brown, green), plastic bottles (#1 and #2), tin/steel cans, and scrap metal.

Estimated Diversion Rate: 43 percent (diversion percentage includes all materials recycled on campus, including the following: construction and demolition debris, surplus furniture, organic recycling, pallets, and other recyclable materials).

Commuter school: No

Web Site: [r4.ucdavis.edu](http://r4.ucdavis.edu)

### **History**

Initial recycling program collections were started by students through a volunteer recycling program. As collections grew, the Associated Students, UC Davis formed Project Recycle, which was funded by student fees. In response to AB 939, UC Davis Facilities Management created the R4 Recycling Program. As a “responsible employer, educational institution, and good neighbor,” UC Davis chose to make a commitment to waste reduction and recycling practices, and began implementation of solid waste diversion programs.

### **Collection and operations**

Recycling and solid waste reduction services are organized by the R4 Recycling Program, which is overseen by the Grounds Division under Facilities Services. Indoor collection services are provided by students working for the R4 Recycling Program and Grounds Division provide outdoor collections. The R4 Recycling Program Manager coordinates recycling services for the entire campus, including ten part-time student staff and seven full-time non-student staff. The student staff is responsible for indoor collections, planning, research, education, and programmatic promotions. Approximately 600 indoor recycling locations, 60 outdoor locations, 120 centralized collection locations, and 80 cardboard locations are serviced on a regular basis. Materials collected and/or recycled on campus include mixed paper, cardboard,

glass, cans, bottles, metal, plastic (#1 and #2), green waste, straw and manure, metals, and C&D.

R4 Recycling collection vehicles include two curbside collection trucks, one front loader, one gas carts, one truck with a lift gate, one fork lift, and four electric carts. Additional automated equipment includes two recycling curbside collections trucks.

Centralized locations are serviced by the curbside trucks for mixed paper, glass, cans, and bottles. Mixed paper is delivered to the City of Davis, while beverage containers are dumped onto a roll-off and sold to a vendor. Materials are currently comingled and unsorted. Sorting, processing, and baling of all commodities is being planned. Recyclables are also transported on campus via gas carts and the front loader truck.

The front loader truck is utilized for cardboard collections. Cardboard is picked up from centralized locations, dumped into a baler, and baled on site.

UC Davis is a very large agricultural campus with a huge amount of organic material. The current compost program is very limited; however, composting activities do take place at the student farms where a small amount of pre-consumer fruits and vegetables are composted. Organic waste producers who generate waste such as agricultural straw and manure have been diverting their waste stream.

A C&D recycling policy has been implemented and took effect in 2001.

### **Grants**

UC Davis received three grants from the Department of Conservation for the purchase of indoor and outdoor building beverage container recycling receptacles and an automated collections truck.

### **Education**

The R4 Recycling Program serves as a source of waste reduction and recycling information and education activities for the campus community. R4 Recycling provides updated information on its Web site, and is actively involved in a variety of recycling education programming. Annual programs include a surplus property sale, youth presentations, a Whole Earth Festival booth, the R4 "Eco-olympics," America Recycles Day, Service Fair booths, and Thank Goodness For Staff Day.

### **Goals**

In order to increase diversion rates and program participation, the R4 Recycling Program would like to convert all building offices to deskside recycling collections. Additional long-term growth includes developing the R4 Recycling into its own department with funding provided by revenue, recharges, and general funds.

### Itemized program breakdown

| Recycling Program Elements                              | CSUC | CSUN | HSU | LMU | SU  | UCD  |
|---|------|------|-----|-----|-----|------|
| Dedicated Recycling Coordinator or Manager              | Yes  | Yes  | Yes | Yes | Yes | Yes  |
| In-House Recycling Collection Program                   | Yes  | Yes  | Yes | Yes | No  | Yes  |
| Outsourced Recycling Collection Program                 | No   | Yes  | No  | No  | Yes | No   |
| Dedicated Recycling Collections Staff                   | Yes  | Yes  | Yes | Yes | Yes | Yes  |
| Use of Custodial or Grounds Staff in Collections        | Yes  | Yes  | Yes | Yes | No  | Yes  |
| Formal Administrative Recycling Policies & Procedures   | No   | No   | Yes | Yes | No  | No   |
| Outdoor Recycling Locations, Less than 20               | No   | No   | No  | No  | No  | No   |
| Outdoor Recycling Locations, More than 20               | Yes  | Yes  | Yes | Yes | Yes | Yes  |
| Centralized Indoor Recycling Collections Program        | Yes  | Yes  | Yes | Yes | Yes | Yes  |
| Deskside Indoor Recycling Collections Program           | Yes  | Yes  | Yes | Yes | No  | Yes  |
| Sorting Recyclables                                     | Yes  | Yes  | Yes | Yes | Yes | Yes  |
| Processing of Recyclables                               | No   | No   | No  | Yes | Yes | Yes  |
| Baling of Recyclables                                   | No   | No   | No  | Yes | Yes | Yes  |
| Transport Recyclables Loose in Roll Off                 | No   | Yes  | No  | Yes | Yes | Yes  |
| Vendor picks up Recyclables in 2 to 6 cubic yard bins   | Yes  | Yes  | No  | No  | No  | No   |
| Source Reduction Programs                               | Yes  | Yes  | Yes | Yes | Yes | No   |
| Centralized Recycling Collection Sites at all Buildings | No   | Yes  | Yes | Yes | Yes | Yes  |
| Responsible for on Campus Housing Materials             | Yes  | Yes  | Yes | Yes | Yes | Yes  |
| Responsible for Student Union Materials                 | Yes  | Yes  | Yes | Yes | Yes | Yes  |
| Responsible for Off- Campus Materials                   | No   | No   | No  | No  | No  | No   |
| Buy Recycling Program                                   | Yes  | Yes  | Yes | Yes | No  | Yes  |
| Campus-wide Composting Program                          | Yes  | No   | Yes | No* | Yes | No** |
| Green Building Initiative                               | No   | No   | No  | No  | Yes | No   |
| Construction & Demolition Debris Program                | Yes  | No   | Yes | Yes | Yes | Yes  |
| Education, Training, and Promotion Programs             | Yes  | Yes  | Yes | Yes | Yes | Yes  |

\* limited on site composting for soil amendments; total diversion of all green waste to commercial composter.

\*\* Compost occurs on the student farmland also shipped off campus.

#### Key

CSUC = California State University, Chico  
 CSUN = California State University, Northridge  
 HSU = Humboldt State University  
 LMU = Loyola Marymount

SU = Stanford University  
UCD = University California, Davis

# Chapter 21. Internet Resources

## Introduction

The Internet has become one of the most valuable tools for recycling information and networking. The creation of national and state listservs provides most professionals with easy-to-use information exchanges. Web sites also offer an easy way to access information quickly. Both tools have become an integral part of keeping up with recycling advances, technology, and general information.

## Listservs

Listservs are online bulletin boards. Once you are subscribed to the listserv, you may post messages to an entire group of people on the listserv. Listservs are used primarily to broadcast information or to serve as a question and answer forum.

RECYC-L is a national and international distribution list dedicated to the discussion of recycling programs at college and university campuses, and related topics of interest to persons responsible for planning and implementing such programs. To subscribe, send the following message:

Subscribe RECYC-L “your name” to **recyc-l@brownvm.brown.edu**. Include your name, title, address, phone, and fax numbers and a brief description of your program.

CALCRC-L is a California distribution list dedicated to the discussion of recycling programs at college and university campuses, and related topics of interest to persons responsible for planning and implementing such programs in California. To subscribe, send the following message:

Subscribe CALCRC-L “your name” to **ltking@ucdavis.edu**. Include your name, title, address, phone and fax numbers and a brief description of your program.

## Web pages

Web pages can offer a wealth of valuable information and services. Once connected, you can locate information virtually from any place in the world. By visiting various web pages, you can gather information on other recycling programs, get updated information on recycling news, or conduct research on various topics by just a simple “point and click.” Here are a few sites to check out:

### Buy Recycled Sites

1. EcoWise -- [www.ecowise.com/](http://www.ecowise.com/)

Non-Toxic, sustainable, educational store.
2. Buy Recycled -- [www.nrf.org.uk/buy-recycled/index.html](http://www.nrf.org.uk/buy-recycled/index.html)

Regularly updated database of recycled content products and materials.
3. A Happy Planet -- [www.ahappyplanet.com/](http://www.ahappyplanet.com/)

Natural and recycled products.
4. The Recycler's Exchange -- [www.recycle.net/recycle/RNet/RE\\_fp.html](http://www.recycle.net/recycle/RNet/RE_fp.html)

A free world wide information exchange for those companies and individuals who buy/sell/trade recycled materials.
5. Recycled Products -- [www.ecomall.com/biz/recycle1.htm](http://www.ecomall.com/biz/recycle1.htm)

A collection of web links to sellers of recycled products on the Internet.
6. Recycline, Inc. -- [www.recycline.com/](http://www.recycline.com/)

Products from Recycled Materials
7. The Real Earth Environmental Company -- [www.treeco.com/](http://www.treeco.com/)

Recycled Paper and other Eco-Products for Home & Office
8. Treecycle Recycled Paper -- [www.treecycle.com/](http://www.treecycle.com/)

Maker of recycled paper products.
9. Badger Paper -- [www.badgerpaper.com/printing/recycled\\_paper/](http://www.badgerpaper.com/printing/recycled_paper/)

Up to 100% post-consumer recycled paper made from chlorine-free pulp.
10. Conservatree -- [www.conservatree.com/](http://www.conservatree.com/)

Reports the most up-to-date news on environmentally sound printing and writing papers.
11. Eureka! Recycled Paper -- [www.eurekarecycled.com/](http://www.eurekarecycled.com/)

Maker of recycled paper products.
12. Ecosource Paper Inc. -- [www.islandnet.com/~ecodette/ecosource.htm](http://www.islandnet.com/~ecodette/ecosource.htm)

Maker of recycled paper products.
13. EnviroCare -- [www.envirocare.net/](http://www.envirocare.net/)

One-stop shop for recycling, composting and conservation products and programs.

14. Recyclestore -- [www.ciwmb.ca.gov/recyclestore/](http://www.ciwmb.ca.gov/recyclestore/)

A showcase for recycled-content products and puts you in touch directly with their manufacturers.

15. Sustainable Building Materials Database for Alameda County --  
[www.stopwaste.org/materials/carpet.html](http://www.stopwaste.org/materials/carpet.html)

A report on product distributors.

16. Packaging Online-- [www.packaging-online.com/](http://www.packaging-online.com/)

Forum for various packaging materials as well as packaging companies

17. Environmentally Responsible Carpet Choices --  
[www.metrokc.gov/procure/green/carpet.htm#8](http://www.metrokc.gov/procure/green/carpet.htm#8)

A program for King County, Washington for selling recycled-content carpet and backing, recycling old carpet, and carpet leasing.

**Composting**

1. Recycle.com -- [www.recycle.com/](http://www.recycle.com/)

The place to turn for recycling and composting expertise.

2. Rot Web -- [www.a-horizon.com/compost/compost\\_menu.html](http://www.a-horizon.com/compost/compost_menu.html)

Basic information about home composting.

3. Your Guide to Composting -- [go4green.sask.com/home/garden/compost5.html](http://go4green.sask.com/home/garden/compost5.html)

Beginner's guide to composting.

4. The Compost Resource Page -- [www.oldgrowth.org/compost/](http://www.oldgrowth.org/compost/)

A hub of information for anyone interested in the various aspects of composting.

5. Compost and Food Waste -- [www.recycle.net/recycle/Organic/](http://www.recycle.net/recycle/Organic/)

Guide to composting.

6. Landscape Management Outreach Partnership --  
[wastediversion.org/landscaper/index.html](http://wastediversion.org/landscaper/index.html)

Gives locations where green waste is creatively reused or recycled.

7. The U.S. Composting Council-- [www.compostingcouncil.org/](http://www.compostingcouncil.org/)

Provides a unified voice for the growing composting industry by involvement in research, education, and standard implementation.

8. Worm Bins: Vermicomposting Systems -- [www.wormwigwam.com/](http://www.wormwigwam.com/)

Easy to use system producing worm free vermicompost.

9. Worm Digest-- [www.wormdigest.org/](http://www.wormdigest.org/)

Forum for worm composting and other worm uses.

10. Worm Bins: Vermicomposting Information and Bins --[www.wormpoop.com/](http://www.wormpoop.com/)

Easy to use system using worms to compost

### **Waste Reduction**

1. The Mail Preference Service -- [www.thedma.org/consumers/offmailinglist.html](http://www.thedma.org/consumers/offmailinglist.html)

Assists in decreasing the amount of national non-profit or commercial mail received at home.

2. National Waste Prevention Coalition-- [dnr.metrokc.gov/swd/nwpc/index.htm](http://dnr.metrokc.gov/swd/nwpc/index.htm)

Helps reduce unwanted junk mail at your business.

3. Small Business Waste Reduction Guide -- [es.epa.gov/new/business/sbdc/sbdc.htm](http://es.epa.gov/new/business/sbdc/sbdc.htm)

Outlines ways to reduce waste.

### **Education**

1. Northwestern University Recycling-- [www.northwestern.edu/facilities-management/recycling/](http://www.northwestern.edu/facilities-management/recycling/)

Information on Northwestern University's model recycling program.

2. Cornell Composting -- [www.cfe.cornell.edu/compost/Composting\\_homepage.html](http://www.cfe.cornell.edu/compost/Composting_homepage.html)

This Web site provides access to a variety of composting educational materials and programs developed at Cornell University.

3. The International Institute for Sustainable Development -- [iisd1.iisd.ca/](http://iisd1.iisd.ca/)

Promote sustainable development in decision-making internationally and within Canada. Has information on environmental policies at various universities.

### **Events**

1. Earth Day Network -- [www.earthday.net/](http://www.earthday.net/)

Find out about Earth Day events and activities, plus eco-information.

2. Share the Technology -- [sharetechnology.org/](http://sharetechnology.org/)

A computer recycling project.

**Government**

**Federal**

1. U.S Environmental Protection Agency -- [www.epa.gov/](http://www.epa.gov/)

The federal government environmental research department.

2. EPA: Reduce, Reuse, and Recycling -- [www.epa.gov/epaoswer/non-hw/muncpl/reduce.htm](http://www.epa.gov/epaoswer/non-hw/muncpl/reduce.htm)

Recycling tips from the Environmental Protection Agency.

3. Recycle City -- [www.epa.gov/recyclecity/](http://www.epa.gov/recyclecity/)

Learn how to recycle, reduce, and reuse waste through a simulation.

4. Enviro\$en\$e -- [es.epa.gov/](http://es.epa.gov/)

Single repository for pollution prevention, compliance assurance, and enforcement information and databases.

**State**

1. California Integrated Waste Management Board-- [www.ciwmb.ca.gov/](http://www.ciwmb.ca.gov/)

The six-member Integrated Waste Management Board is responsible for protecting the public's health and safety and the environment through management of the estimated 60 million tons of solid waste generated in California.

2. California Department of Conservation -- [www.consrv.ca.gov/](http://www.consrv.ca.gov/)

This state department has various programs to safeguard ecological resources and promote recycling.

3. California Department of Conservation – [www.cansandbottles.com](http://www.cansandbottles.com)

New web site for the Division of Recycling and their efforts to increase beverage container recycling in California

4. Keep Montana Clean and Beautiful -- [recyclemontana.org/](http://recyclemontana.org/)

Recycling news, tips, and more.

5. Recycle, Ohio! -- [www.dnr.state.oh.us/odnr/recycling/](http://www.dnr.state.oh.us/odnr/recycling/)

Recycling information from Ohio's Division of Recycling and Litter Prevention program.

6. Pennsylvania's Recycling Page --  
[www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/recycle.htm](http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/recycle.htm)

Recycling works in Pennsylvania.

7. Chittendon Solid Waste District -- [www.cswd.net/](http://www.cswd.net/)

Providing environmentally sound waste disposal options to Vermont and beyond.

8. Rummaging Through Northern California -- [www.rummaging.com/](http://www.rummaging.com/)

News on secondhand, surplus and salvage items

### **University Programs**

1. Humboldt University-- [www.humboldt.edu/~recycle/](http://www.humboldt.edu/~recycle/)

Humboldt State Universities' Web site.

2. UC Berkeley -- [www.ocf.berkeley.edu/~compost/](http://www.ocf.berkeley.edu/~compost/)

Cal's worm composting project.

3. CSU Chico -- [www.csuchico.edu/as/recycle/](http://www.csuchico.edu/as/recycle/)

California State University, Chico's recycling Web site.

4. Loyola Marymount -- [www.catsbn.com/recycle/](http://www.catsbn.com/recycle/)

Loyola Marymount University recycling Web site.

5. UC Davis -- [r4.ucdavis.edu/](http://r4.ucdavis.edu/)

The University of California, Davis recycling Web site.

6. UC San Diego -- [pps.ucsd.edu/build/recyclemore.html](http://pps.ucsd.edu/build/recyclemore.html)

The University of California, San Diego recycling Web site.

7. UCLA -- [www.fm.ucla.edu/fm/html/sp\\_prg/recyc\\_frames.html](http://www.fm.ucla.edu/fm/html/sp_prg/recyc_frames.html)

The University of California, Los Angeles recycling Web site.

8. Brown University -- [www.brown.edu/Departments/Brown\\_Is\\_Green/](http://www.brown.edu/Departments/Brown_Is_Green/)

Brown University recycling Web site.

9. Office Supply Collection and Reuse Program--  
[www.uvm.edu/~uvmppd/solidwaste/oscar.htm](http://www.uvm.edu/~uvmppd/solidwaste/oscar.htm)

The University of Vermont's program to collect and redistribute office supplies among university departments.

10. Reusable Office Supply Exchange --[darkwing.uoregon.edu/~recycle/rose.htm](http://darkwing.uoregon.edu/~recycle/rose.htm)

University of Oregon's surplus supply exchange program.

11. The eXchange Files --[www.plant.bf.umich.edu/grounds/recycle/exchangefiles/](http://www.plant.bf.umich.edu/grounds/recycle/exchangefiles/)

University of Michigan's way of offering or requesting office supply items for reuse within departments.

12. Arizona State University Surplus Property Department --  
[property.asu.edu/surplus/](http://property.asu.edu/surplus/)

A system where maximum reutilization of used State of Arizona property is made available to university departments.

13. The Shasta College Applied Sustainability Collaborative --  
[www2.shastacollege.edu/sustainability](http://www2.shastacollege.edu/sustainability)

This program focuses on a waste diversion methodology through market development.

14. Environmental Advisory Committee -- [www2.shastacollege.edu.envac](http://www2.shastacollege.edu.envac)

Addresses issues impacting the natural environment in relation to Shasta College and its operations.

15. College and University Recycling Council -- [www.nrc-recycle.org/Programs/Councils/CURC/](http://www.nrc-recycle.org/Programs/Councils/CURC/)

Once a member of the State Recycling Organization or National Recycling coalition, this site offers profiles to most other universities.

16. California Collegiate Recycling Council -- [www.crra.com/](http://www.crra.com/)

California's recycling Web site for colleges and universities.

17. Stanford University – [recycling.stanford.edu](http://recycling.stanford.edu)

Stanford University Web site.

### **International Sites**

1. Bureau of International Recycling -- [www.bir.org/](http://www.bir.org/)

The international federation of the world's recycling industries.

2. RCO Online -- [www.rco.on.ca/](http://www.rco.on.ca/)

Homepage of the Recycling Council of Ontario.

3. The Asia Foundation – [www.asiafoundation.com](http://www.asiafoundation.com)

Explains the Asian program for recycling.

### **Media**

1. Earth Alert -- [www.discovery.com/news/earthalert/earthalert.html](http://www.discovery.com/news/earthalert/earthalert.html)

Discovery Online's environmental news resource.

### **Organizations**

1. Earth 911 -- [www.1800cleanup.org/](http://www.1800cleanup.org/)

A public and private sector partnership to empower the public with community specific resources to improve their quality of life.

2. EarthSystems.org -- [www.earthsystems.org/](http://www.earthsystems.org/)

Provides up-to-date environmental information. Includes a virtual shopping center that allows individuals and organizations to easily find recycling products and services.

3. Waste Watch -- [www.wastewatch.org.uk/](http://www.wastewatch.org.uk/)

A charity working to protect the environment by ensuring the sustainable use and disposal of scarce resources through waste reduction, re-use and recycling of materials.

4. Rotten Truth (About Garbage) -- [www.astc.org/exhibitions/rotten/rtintro.htm](http://www.astc.org/exhibitions/rotten/rtintro.htm)

An in-depth look at the complex issues surrounding municipal solid waste.

5. Container Recycling Institute -- [www.container-recycling.org/](http://www.container-recycling.org/)

A non-profit, research and public education organization studying container packaging recycling and reuse.

6. Friends of the Earth -- [www.foe.org/](http://www.foe.org/)

This nonprofit organization focuses on the economics of sustainable growth.

7. Greenaction -- [www.greenaction.org/index.shtml](http://www.greenaction.org/index.shtml)

A California-based environmental group.

8. Materials for the Future Foundation -- [www.materials4future.org/](http://www.materials4future.org/)

Helping Northern California communities create jobs in the recycling, reuse and remanufacturing industries.

9. National Recycling Coalition -- [www.nrc-recycle.org/](http://www.nrc-recycle.org/)

The National Recycling Coalition (NRC) is the national voice for the recycling industry throughout the United States and around the world.

10. California Resource Recovery Association -- [www.crra.com/](http://www.crra.com/)

The California state recycling organization

11. Californians Against Waste -- [www.cawrecycles.org/](http://www.cawrecycles.org/)

Newsletter, fact sheets, links and information on America Recycles Day.

12. The Recycling Team -- [www.recyclingteam.org/](http://www.recyclingteam.org/)

Leader in resource conservation and recycling.

13. Keep America Beautiful-- [www.kab.org/](http://www.kab.org/)

A nonprofit organization whose main goals focus on educating litter prevention, and ways to reduce, reuse and recycle.

14. Wilderness Society-- [www.wilderness.org/](http://www.wilderness.org/)

Wilderness protection agency.

15. Institute For Local Self-Reliance -- [www.ilsr.org/](http://www.ilsr.org/)

Non-profit research and educational organization that provides technical assistance and information on environmentally sound economic development.

**Publications**

1. Earthweek -- [www.earthweek.com/](http://www.earthweek.com/)

Provides weekly environmental issues news.

2. Recharger Magazine -- [rechargermag.com/](http://rechargermag.com/)

A monthly publication dedicated to the office products recycling industry.

3. Recycling Manager -- [www.amm.com/recman/](http://www.amm.com/recman/)

This recyclable materials price service, published every other week, provides U.S. materials prices by grade for aluminum and steel cans, scrap metals, paper, plastics and glass.

4. Recycling Product News -- [www.baumpub.com/publications/rpn/rpn\\_main.htm](http://www.baumpub.com/publications/rpn/rpn_main.htm)

Focuses on recycling & waste management equipment and applications.

5. Recycling World Magazine -- [www.tecweb.com/recycle/rwcont.htm](http://www.tecweb.com/recycle/rwcont.htm)

The United Kingdom's magazine for the recycling industry.

6. Paper Recycling Working Group -- [www.prwg.com/](http://www.prwg.com/)

A quarterly, peer-reviewed journal on the science, technology, and economics of using secondary fiber to make pulp, paper and paperboard products.

7. Recycling Laws International -- [www.raymond.com/](http://www.raymond.com/)

Provides news, analysis and forecasting on state and local recycling laws.

8. Resource Recycling -- [www.resource-recycling.com/](http://www.resource-recycling.com/)

Recycling news, links and trends.

**Sites for Children**

1. Roscoe's Recycle Room -- [www.recycleroom.org/html/launch.html](http://www.recycleroom.org/html/launch.html)

Fun games, recycling facts and educational activities.

2. Quest of the Ringleaders -- [www.ringleader.com/quest/intro.html](http://www.ringleader.com/quest/intro.html)

A cyber-adventure of the Ring Leader Recycling Program.

3. The Imagination Factory -- [kid-at-art.com](http://kid-at-art.com)

Creative ways for kids to recycle.

**Trade Associations**

1. American Forest & Paper Association -- [www.afandpa.org/recycling/recycling.html](http://www.afandpa.org/recycling/recycling.html)

Provides information on recycling wood and paper products. Includes resources for recycling coordinators and educational programs.

2. NAPCOR -- [www.napcor.com/](http://www.napcor.com/)

A national trade association that promotes PET recycling and the use of PET plastic. Includes information for starting a community PET recycling program.

3. Alucan Recycling -- [www.alucan.org.uk/](http://www.alucan.org.uk/)

Handy aluminum can recycling information.

4. Aluminum Industry WWW-Server -- [www.aluminium.net/](http://www.aluminium.net/)

Provides information about organizations and corporations active in or related to the recycling of aluminum and aluminum products.

5. AutoSteel Online -- [www.autosteel.org/](http://www.autosteel.org/)

Steel recycling news and information.

6. Institutes of Scrap Recycling Industries -- [www.isri.org/](http://www.isri.org/)

An international trade association of scrap metal, paper, plastic, glass, rubber and textile recyclers.

7. Steel Recycling Institute -- [www.recycle-steel.org/](http://www.recycle-steel.org/)

An industry association that promotes the recycling of all steel products and educates others about the benefits of steel's infinite recycling cycle.

## **Recycling Directories**

1. Handilinks --

[www.handilinks.com/index.php3/Science/Environment/PollutionPreventionandRecycling/](http://www.handilinks.com/index.php3/Science/Environment/PollutionPreventionandRecycling/)

Index of pollution prevention and recycling resources.

2. Friends of the Earth -- [www.foe.co.uk/pubsinfo/infosyst/other\\_services.html](http://www.foe.co.uk/pubsinfo/infosyst/other_services.html)

Directory of environmental links, including recycling and waste management.

3. Recycler's World -- [www.recycle.net/recycle/](http://www.recycle.net/recycle/)

A world wide trading site for information related to secondary or recyclable commodities, by-products, used and surplus items or materials.

4. EnviroLink -- [envirolink.netforchange.com/](http://envirolink.netforchange.com/)

EnviroLink environmental organization directory.

## **Recycling Information**

1. The Word's Shortest Comprehensive Recycling Guide

[www.obviously.com/recycle/guides/shortest.html](http://www.obviously.com/recycle/guides/shortest.html)

Great list of basic recycling tips and categories.

2. The Bag Bed -- [www.bagbed.com/](http://www.bagbed.com/)

Finally a useful way to recycle your mountain of plastic bags.

3. Reduce Garbage, Eliminate Landfills --

[www.geocities.com/RainForest/5002/index.html](http://www.geocities.com/RainForest/5002/index.html)

Reusing ideas, general recycling tips and more.

4. Recycling and Hazardous Waste Information -- [www.houston.tx.us/recycling/](http://www.houston.tx.us/recycling/)

Information on recycling locations and how to divert some material from landfills.

5. The Internet Consumer Recycling Guide -- [www.obviously.com/recycle/](http://www.obviously.com/recycle/)

A starting point for consumers in the USA and Canada searching the net for recycling information.

6. The Waste Book -- [www.recycle.mcmail.com/](http://www.recycle.mcmail.com/)

A guide to recycling and better waste management.

7. Virtual Recycling -- [www.virtualrecycling.com/](http://www.virtualrecycling.com/)

Paperless depot of recycling information.

8. RecycleXchange -- [recyclexchange.com/](http://recyclexchange.com/)

Information on recycling, waste management, the environment and more.

**Grants**

1. Environmental Grantmaking Foundation – [www.environmentalgrants.com](http://www.environmentalgrants.com)

A directory for nonprofit organizations looking for grants to support environmental activities and programs.

2.) Solid Waste Funding -- [www.epa.gov/region9/waste/solid/funding.htm](http://www.epa.gov/region9/waste/solid/funding.htm)

Administers a few of EPA's many grant programs to provide government agencies and non-profit organizations to promote waste reduction and the safe and effective management of solid waste.

3. Homedepot -- [www.Homedepot.com](http://www.Homedepot.com)

Has a list of grants available.

**Miscellaneous**

1. WWF Global Network -- [www.panda.org/](http://www.panda.org/)

A great environmental resource.

2. Environmental Systems of America -- [envirosystemsinc.com/factoidsnew.html](http://envirosystemsinc.com/factoidsnew.html)

Information on climate change, forests, energy reduction, recycling and solid waste.

3. Enviro-Bag -- [www.envirobag.com/](http://www.envirobag.com/)

Clean plastic grocery sacks received from schools by Enviro-Bag are utilized in the production of Enviro-Bag Trash Bags.

4. Earth Day Groceries Project, 2000 -- [www.earthdaybags.org/](http://www.earthdaybags.org/)

School project to recycle a billion paper grocery bags.

5. Video Project -- [www.videoproject.org/](http://www.videoproject.org/)

Non-profit source of educational programs for a safe and sustainable world.

# Chapter 22. Legislation, Regulations, and Requirements

## Why is legislation and wording so important?

Both the federal government and several states have issued various executive orders and legislation to promote or require the decrease of solid waste and the purchasing of recycled products. In California, for example, the passage of legislation has been key in driving recycling and waste reduction activities. Assembly Bill 939 (AB 939) initiated most or all of the state's city and county recycling programs. It has been a monumental piece of legislation that drove up the state's diversion rate to 50 percent.

However, there are many other pieces of legislation or executive orders that have done relatively nothing to divert waste. The success level depends highly on the wording and penalties of the legislation. Words such as "encourage" or "suggest" or "recommend" or "report" do not require the entity from complying with regulations. In addition, if penalties are not stipulated, the entity is less likely to implement the regulations. For example, California's Assembly Bill 75 does not stipulate any penalties if the state agency does not meet its diversion requirements, unlike AB 939 which contains fines if goals are not met.

The following are some federal and state executive orders or bills that relate to source reduction, recycling, and buying recycled. They are in written in summary form for reference purposes. Remember to look at the wording, phrasing, and content of the documents.

## Federal legislation and guidelines

[www.ofee.gov/](http://www.ofee.gov/)

### Executive orders

"Recycling is one of America's great environmental success stories. Across the country, families and businesses each day demonstrate their commitment to our environment through the simple act of recycling. By redoubling our efforts to 'green the government' we are demonstrating once again that the environment and the economy go hand in hand, and helping to promote a more sustainable future for America." - President William J. Clinton

"Recycling is everybody's business. From industry to government, from schools to our very own households, America's commitment to recycling has helped keep our communities clean and our economy strong. Working together, there is even more we can do. By bringing new partners to the recycling efforts of businesses and families across the nation, we will better protect our natural resources, improve our quality of life, and strengthen our economy." - Vice President Al Gore

### **Resource Conservation and Recovery Act (RCRA, 42 USC 6962) of 1976**

Section 6002, Congress provided a mechanism to increase government purchasing of recycled products. Federal government agencies must give preference in their purchasing programs to products and practices that conserve and protect natural resources and the environment. It applies to all Federal agencies and their agencies' contractors who use Federal appropriated funds to purchase Environmental Protection Agency (EPA) designated products.

#### Federal Acquisition Regulation Part 7 Acquisition Planning

Part 7.103(n) requires Agency heads to ensure "that agency planners specify needs and develop plans, drawings, work statements, specifications, or other product descriptions promoting the use of environmentally preferable products and services (e.g., promoting energy conservation and the use of recovered material content ...)"

Part 36 covers selection of Architectural-Engineer (A-E) firms for construction projects.

FAR 36.602-1 provides selection criteria for A-E firms, requiring specialized experience and technical competence in energy conservation, pollution prevention, waste reduction, and the use of recovered materials as appropriate.

### **Executive Order 13101**

On September 14, 1998, Executive Order 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition

The new E.O. is designed to further expand and strengthen the Federal government's commitment to recycling and buying recycled content and environmentally preferable products (including biobased products).

E.O. 12873 created the position of the Federal Environmental Executive (FEE). Fran McPoland, the first Federal Environmental Executive, was appointed by President Clinton to provide clear national direction for Federal agencies, track government's progress and to ensure agencies comply with the Executive Order. Under E.O. 13101, the White House Council on Environmental Quality (CEQ) chartered the Task Force on Greening the Government Through Waste Prevention and Recycling, with the FEE as its chair. The Task Force is directed by a Steering Committee comprised of the FEE, the Chair of the CEQ, and the Administrator of the Office of Federal Procurement Policy (OFPP) within the Office of Management and Budget (OMB).

### **Title 42- The Public Health and Welfare; Chapter 82- Solid Waste Disposal**

#### **Subchapter IV- State or regional solid waste plans**

Sec. 6941a. Energy and materials conservation and recovery; Congressional findings provides information on congressional findings on conserving materials to reduce waste, recycling, recovery of energy from waste, and federal assistance in planning and implementing energy and materials conservation and recovery programs to communities.

#### **Sec. 6942. Federal guidelines for plans**

Provides information on guidelines for the identification of those areas, which have common solid waste management problems and are appropriate units for planning regional solid waste management services. A portion of the guidelines mentions the consideration of the types of resource recovery facilities and resource conservation systems. In addition, the guidelines include new markets for recovered material and energy resources from solid waste, as well as methods for conserving such materials and energy.

#### **National Beverage Container Reuse and Recycling Act of 1999**

Introduced 4/22/1999. Amends the Solid Waste Disposal Act to prohibit the sale of beer, mineral water, soda water, wine coolers, or carbonated soft drinks in beverage containers by retailers and distributors unless such containers carry a refund value of ten cents. Provides for the adjustment for inflation of the refund amount at ten-year intervals. Requires: (1) distributors to collect from retailers the refund value for each beverage sold to retailers; and (2) retailers to collect from consumers the refund value for each beverage sold to consumers. Requires retailers and distributors to pay the refund on returned containers of brands (in the same kind and size of container) sold.

Directs distributors to pay annually to a State unclaimed refund amounts (the amount by which the total refund value of all containers sold by distributors exceeds the amount paid by distributors to persons in that State). Makes unclaimed refunds available to a State for carrying out pollution prevention and recycling programs.

Prohibits distributors and retailers from: (1) selling beverages in metal beverage containers with detachable openings; and (2) disposing of containers subject to this Act or any metal, glass, or plastic from such containers (other than the top or seal) in landfills or solid waste disposal facilities.

Makes this Act inapplicable to States that have adopted requirements similar to those under this Act or that have demonstrated achievement of a recycling or reuse rate for beverage containers of at least 70 percent. Prohibits States or political subdivisions that impose taxes on the sale of beverage containers from imposing any tax on the amount attributable to the refund value of such containers. Prescribes civil penalties for violations of this Act. Read twice and referred to the Committee on Environment and Public Works.

## **California legislation and guidelines**

[www.ciwmb.ca.gov/Law.htm](http://www.ciwmb.ca.gov/Law.htm)

### **Current Regulations**

Title 14, California Code of Regulations. Current regulations of the California Integrated Waste Management Board pertaining to non-hazardous waste management in California.

Chapter 3.1: Composting Operations Regulatory Requirements. Provides some useful definitions and regulatory tiers for composting operations and facilities.

Chapter 4: Resource Conservation Programs. Provides information on Recycling Market Development Zones, Recycling Market Development Zone Low- Interest Revolving Loan Fund, and Recycling Tax Credit Program. Provides information on the Rigid Plastic Packaging Container Program, Recycled Content Newsprint, and Recycled Content Trash Bag Program.

Chapter 9: Planning Guidelines and Procedures for Preparing, Revising, and Amending Countywide or Regional Integrated Waste Management Plans. Provides requirements on the Source Reduction and Recycling Element (SRRE), the Household Hazardous Waste (HHW) Elements, and the Integrated Waste Management Plan. These relate to more county and city requirements but are great sources of information and background.

Resolution Chapter 97 (Introduced as Assembly Concurrent Resolution 149) authored by Tom Hayden and signed by the Governor in 1990. Resolution was specifically written to promote recycling and buying recycled at the University of California campus.

**Electronic Waste Recycling Act of 2003 (SB 20):** On September 24, 2003 the Governor signed landmark legislation establishing a funding system for the collection and recycling of certain electronic wastes. Visit the legislation's Web site for the full history and text of [Chapter 526, Statutes of 2003](#) (Sher, SB 20).

### **Public Resources Code**

California Solid Waste Reuse and Recycling Access Act of 1991

Outlines the requirement for cities and counties to divert 50 percent of all solid waste by January 1, 2000, through source reduction, recycling, and composting activities (or see PRC 41780-41786).

State Agency Recycling Requirements (AB 75)

Outlines the requirements for state agencies to divert 25 percent of all solid waste by January 1, 2002 and 50 percent by January 1, 2004 (or see PRC 42920-42928).

Outlines the authorized recycling agent for collecting recyclables versus illegal collections or scavenging. (See PRC 41950-41956.)

Definitions of compost, recycling agent, large state facility, state agency, etc in the Public Resources Code. (See PRC 40100-40201.)

#### Division 12.1. California Beverage Container Recycling and Litter Reduction Act

Provides information on the “bottle bill”, program’s intent and purpose, and the California Redemption Value (CRV).

#### Division 12.2 Household Batteries

Provides information on the need to reduce or eliminate the quantity and toxicity of metals in dry cell batteries, to recycle or properly dispose of rechargeable batteries which contain toxic metals, and to educate the public concerning the collection, recycling, and proper disposal of those batteries.

#### Division 30 Waste Management

Provides information on the California Integrated Waste Management Board, Integrated Waste Management Plans, State Programs, Solid Waste Facilities, Enforcement, Appeals, other Provisions, and Garbage and Refuse Disposal. Especially interesting is in State Programs:

Metallic Discards: Outlines the requirements to recycle major appliances, vehicles, or other metallic discards (or see PRC 42170-42172).

Recycled-Content High Grade, Bleached Printing and Writing Papers Program: Defines the paper and specifications. Outlines the purchasing requirements for state agencies on paper.

Compost Market Program: Outlines that state agencies adopt specifications for the purchase of compost. The specifications shall be designed to maximize the use of compost without jeopardizing the safety and health of the citizens of the state or the environment.

Plastic Trash Bags: Outlines the requirement for manufacturers that plastic trash bags of .75 mil or greater thickness for sale in California shall ensure that at least 30 percent of the material used in those plastic trash bags is recycled plastic post consumer material (or see PRC 15013-15018).

Plastic Packaging Containers: Outlines recycling requirements and use of recycled plastic for rigid plastic packaging containers

Plastic Recycling Program: Outlines that the Office of Procurement to procure recycled secondary and postconsumer plastic products.

Recycled Battery Programs: Outlines the need to conduct a study on the disposal and recyclability of household batteries (or see PRC 15000-15001, PRC 42450, and PRC 15013-15018).

Telephone Directory Recycling: Outlines the requirement that all telephone directories distributed in California shall be made from materials that will allow for the maximum volume of directories to be recycled (or see PRC

42557).

Office Paper Recovery Program: Outlines the initiation of a high grade white office paper recovery assistance program for state and local agencies and private businesses.

Public Information and Education: Outlines the establishment of a statewide public information and education program to encourage participation by the general public, business, government, and industry in all phases of integrated waste management. Also includes the State Department of Education to shall develop and implement a teacher training and implementation plan, to guide the implementation of the integrated waste management educational program, for the education of students, faculty, and administrators on the importance of source reduction, recycling, composting, and integrated waste management in the schools (or see PRC 42600-42605).

Schools site Source Reduction and Recycling: Outlines that the board shall assist school districts throughout the state in establishing and implementing source reduction and recycling programs (or see PRC 42620-42622).

Research and Development Program: Outlines the board may conduct research and development programs...establishing cooperative research and development facilities at universities and colleges in the state.

Paving Materials: Outlines the review and purchasing of recycled materials by the Director of Transportation for paving materials, base, subbase, and pervious backfill materials.

Newsprint: Outlines the requirements for newsprint to be made from recycled-content newsprint.

### **Education Code**

Title 1. General Education Code Provisions

Division 1. General Education Code Provisions

Part 19. Miscellaneous

Chapter 3. Article 8. (32370-32376)

Each school district may, and is encouraged to, establish and maintain a paper recycling program in all classrooms, administrative offices, and other areas owned or leased by the school district.

Each campus of the California State University and Colleges may, and is encouraged to, establish and maintain a paper recycling program in administration offices and other areas owned or leased by the campus, including areas frequented by students, where a significant quantity of wastepaper is generated or may be collected.

The encouragement of purchasing recycled paper if not exceed 5 percent the lowest offer of non-recycled paper of comparable quality. Reasonable efforts to eliminate

the purchase of paper and paper products which are deemed potential contaminants of the paper recycling program.

### **Public Contract Code**

#### Chapter 2.1. University of California Competitive Bidding

10507.5. It is the intent of the Legislature to encourage the procurement of recycled paper products by the University of California by developing guidelines to encourage the procurement of recycled paper products where suitable for the uses intended and where the quality is equal and the price is equal or less than nonrecycled paper products. It is also the intent of the Legislature that the regents report annually to the Legislature, the Governor, and the California Integrated Waste Management Board commencing

January 1, 1991, on the percentage of the total dollar amount of recycled paper products purchased or procured under this article.

#### California State University Contract Law

10860. (a) The trustees shall revise the procedures and specifications for purchases of paper products to give preference, wherever feasible, to the purchase of paper products containing recycled paper products pursuant to Section 10855.

(b) The trustees shall give purchase preference to recycled paper products when both of the following apply:

(1) The products can be substituted for, and cost no more than, nonrecycled paper products.

(2) The products meet all applicable standards and regulations.

(c) To encourage the use of postconsumer material, the trustees' specifications shall require recycled paper product contracts to be awarded to the bidder whose paper product contains the greater percentage of postconsumer material if the fitness and quality and price meet the requirements in this section and Section 10855.

(d) The trustees shall set the following goals for the purchasing of recycled paper products:

(1) By January 1, 1992, at least 35 percent of the total dollar amount of paper products purchased or procured by the trustees shall be purchased as a recycled paper product.

(2) By January 1, 1994, at least 40 percent of the total dollar amount of paper products purchased or procured by the trustees shall be purchased as a recycled paper product.

(3) By January 1, 1996, at least 50 percent of the total dollar amount of paper products purchased or procured by the trustees shall be purchased as a recycled paper product.

If at any time a goal has not been met, the trustees and the Department of General Services, in consultation with the California Integrated Waste Management Board, shall review procurement policies and shall make recommendations for immediate revisions to ensure that each goal is met. Revisions include, but are not limited to, providing a purchasing preference and altering the goals. The trustees and the Department of General Services, in consultation with the board, shall present its conclusions and recommendations on these revisions of procurement policies to the Legislature and the Governor in the department's annual report pursuant to Section 12225.

# Chapter 23. Definitions

## Some commonly used terms

A Few Useful and Basic Recycling and Waste Definitions:

|               |   |
|---------------|---|
| Baler:        | Used to make bales of the commodity   |
| Bale:         | Large compressed bundle usually secured by wire   |
| Biodegrade:   | The process where materials break down or decompose by the action of living organisms.  |
| Comingled:    | Recyclables that are mixed together (i.e. glass and aluminum cans, paper and aluminum cans)   |
| Contaminates: | Harmful or unwanted substances not wanted in the commodity (i.e. glass in the paper stream)   |
| Conveyor:     | A continuous mechanical belt that carries materials from one place to another. Conveyors are used to sort out contaminates and recyclables.   |
| Cubic Yard:   | A measure of volume associated with volume of trash.  |
| Cullet:       | Crushed glass.  |
| Incinerate:   | A process in which trash is disposed by use of burning in an incinerator.   |
| MRF:          | Material Recovery Facility where only recyclables are sorted and separated.<br><br>Clean MRF: Material Recovery Facility where only recyclables are sorted and separated.<br><br>Dirty MRF: Material Recovery Facility where recyclables are sorted and separated out of the trash. |

|                   |   |
|-------------------|---|
| Recyclables:      | Materials that can be collected, separated, processed, and made into new products.  |
| Tipping Fee:      | Fee imposed at the landfill to charge for dumping the trash.<br>Usually charged by tons.  |
| Ton:              | A measure of weight associated with weight of trash or recyclables (equals 2000 pounds).  |
| Transfer Station: | Area where materials are collected and processed before being transferred to another area. (i.e. green waste sorted and sent to a compost facility) |

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