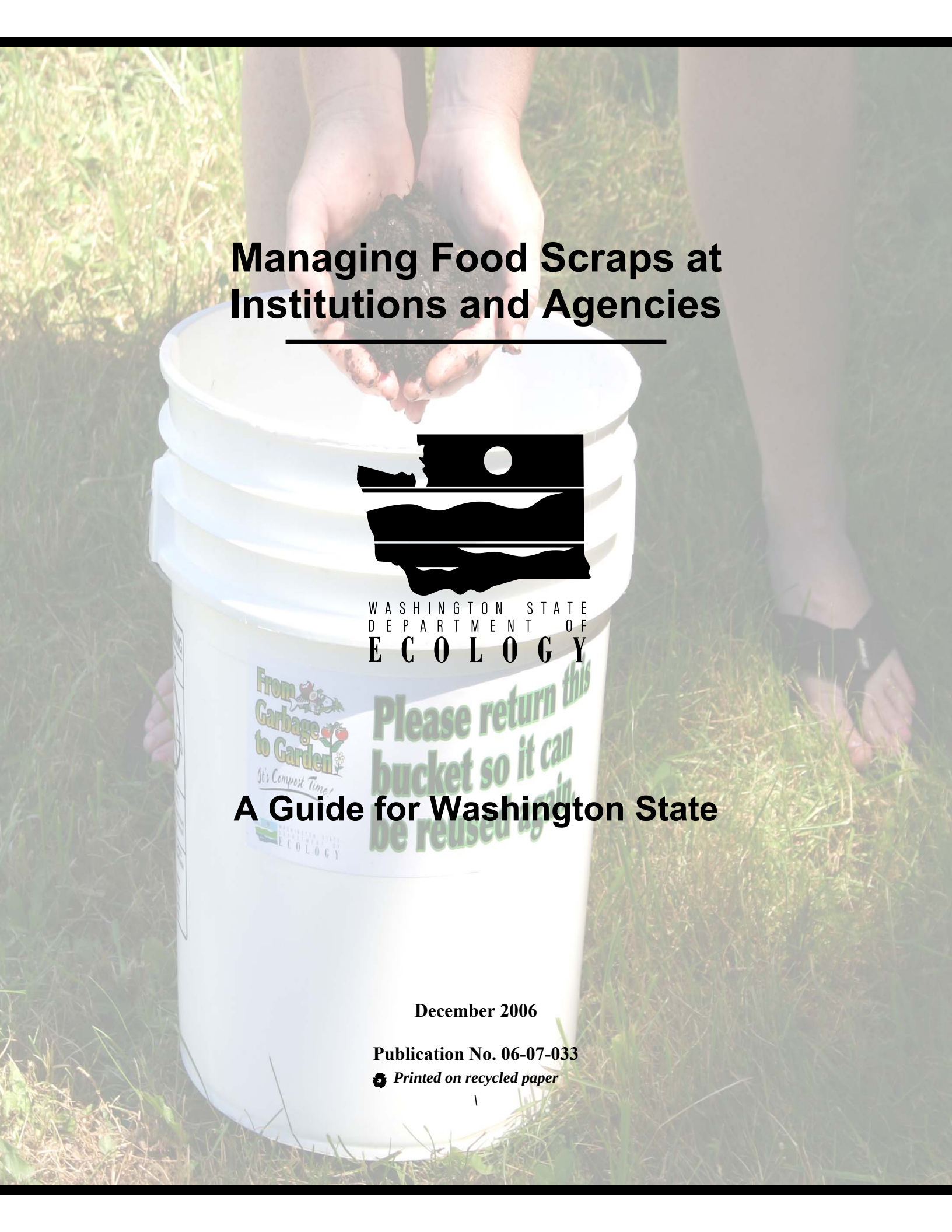
Managing Food Scraps at Institutions and Agencies



WASHINGTON STATE DEPARTMENT OF ECOLOGY

A Guide for Washington State

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For a printed copy of this report, contact:

Name: Michelle Payne
E-mail: mdav461@ecy.wa.gov
Phone: (360) 407-6129
Address: PO Box 47600, Olympia WA 98504-7600

Authors:

Chery Sullivan
Washington State Department of Ecology
Solid Waste & Financial Assistance Program
E-mail: chsu461@ecy.wa.gov
Phone: (360) 407-6915
Address: PO Box 47600, Olympia WA 98504-7600

Holly Wescott
Washington State Department of Ecology
Solid Waste & Financial Assistance Program
E-mail: hwes461@ecy.wa.gov
Phone: (360) 407-6113
Address: PO Box 47600, Olympia WA 98504-7600

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Abstract

The Department of Ecology (Ecology) in Lacey, Washington, developed its Compost Demonstration Program in order to "walk the talk" of sustainability. By doing so, they reduced the organic portion of their trash and created a valuable product called compost. Based on that experience, Ecology has written this guide to help you set up and carry out a food scrap management program at your facility.

The first portion of the guide provides general steps that all institutions, agencies and business can take to develop a successful composting program.

Appendix A, *Ecology's Story* details the birth and life of the composting program at Ecology. **Appendix B, *Lessons Learned***, tells about some of the good and bad experiences that Ecology had when planning the Compost Demonstration Program. **Appendix C, *Case Studies*** gives a glimpse of various On-Site compost programs directed by institutions and agencies of different sizes. **Appendix D, *Tools***, holds useful documents that can make managing your program easier. These include examples of waste audit procedures, food scrap collection logs, trouble shooting at the Compost Center and examples of graphics used to promote Ecology's program.

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- Shelly McMurry. Ecology, Environmental Specialist with Social Marketing expertise.
- Ecology, Waste Reduction and Recycling committee members.

Regional Contacts for Department of Ecology

Eastern Regional Office
4601 North Monroe Street, Suite 202
Spokane, WA 99205-1295
509.329.3400

Southwest Regional Office
300 Desmond Drive SW
PO Box 47775
Olympia, WA 98504-7775
360.407.6300

Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902-3401

Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

Introduction

As we in Washington State look for ways to save money and resources, focusing on what else we can keep out of the trash becomes essential. Food and other organic scraps should not be wasted in the garbage. This guide will help agencies and institutions corral the organic portion (food scraps, etc.) of their trash and turn it into a valuable resource called compost.

Organic materials make up a major portion of our waste. According to the U.S. Environmental Protection Agency, almost 60 percent of the annual garbage produced in the United States is organic, compostable material. That wasted material includes *96 billion pounds* of food. Food and other organic scraps left to slowly rot in the landfill, release a greenhouse gas into our atmosphere called methane. Composting on-site or off-site is a good way to manage food and other organic scraps—reducing waste, producing a valuable product and protecting the environment.

The Department of Ecology (Ecology) in Lacey, Washington, developed its Compost Demonstration Program in order to reduce the organic portion of its garbage and to demonstrate a responsible waste management system. Based on that experience, Ecology has written this guide to help you set up and carry out a food scrap management program at your facility.

Creating a program at your facility will involve six general steps:

1. Build a compost planning team.
2. Gain facility and management support for your idea.
3. Secure funding to carry out the idea.
4. Design plan to manage food scraps.
5. Put food scrap management plan into action.
6. Monitor program, measure results, refine plan, and promote your success.

Please use the appendices of this guide to further help you decide if on-site or off-site composting is right for your facility. **Appendix A, *Ecology's Story*** details the birth and life of an on-site composting program. Following that, an all-important ***Lessons Learned from Ecology's Compost Demonstration Program*** appendix may save new programs a lot of time and money.

1. Build a compost planning team to create a food scrap management program

What does a planning team look like?

A planning team brings diverse talents together.

ROLES	SKILLS
Marketing Expert	o Researching audience. o Defining opportunities to change people's habits and barriers to change. o Developing education and outreach materials. o "Selling" program to management and staff.
Facilities Representative	o Managing contract for janitorial services. o Understanding facility policies.
Composting Technical Expert	o Responding to compost questions.
(if composting on-site)	o Researching and recommending a compost system o Providing knowledge to keep system running.

Build a planning team of experts who share your vision. A well-organized, resourceful planning team will design and carry out an efficient food scrap management program that will become part of daily operations.

2. Gain facility and management support for your idea

Do your homework

You will need to convince others that this is a good idea.

(a) ***Build support*** for your program with a **waste audit.** See **Appendix D, *Tools*** for waste audit guidelines. An audit will show how much organic material (food, food-soiled paper, napkins, paper towels, floral trimmings, etc.) you are currently throwing away. The results of your audit will help you answer the following questions:

- What percentage of our trash could we compost?
- Will we save money by composting?

(b) ***Build support*** for your program with **existing policies** that call for sustainability and food waste diversion in Washington state agencies and institutions.

- Governor's Executive Order 02-03
  http://www.governor.wa.gov/actions/orders/eoarchive/eo_02-03.htm
- Facility Sustainability Plan (mandated by E.O. 02-03)

(c) ***Build support*** for your program by explaining and promoting the **benefits** of diverting food and other organic scraps from the trash.

- Diverting organic scraps from the landfill reduces global warming, because slowly rotting organic matter releases methane, a very harmful greenhouse gas.
- Diverting organic scraps from the landfill reduces water pollution, because water leaching through slowly rotting organic matter comes out polluted.
- Turning food and other organic scraps into compost creates a soil amendment with the following benefits:
  - Increased water-holding capacity—save money on the water bill.
  - Decreased need for pesticide use—save money here, too.
  - Decreased need for fertilizer use—save money yet again.
  - Improved soil structure for better plant growth—get your money's worth.
- Diverting organic scraps increases public awareness of sustainable actions and builds a positive image for the facilities that take part.

(d) ***Build support*** for your program, showing that it will be a professional and convenient program.

- Make the program an official part of daily operations, not dependent on volunteer efforts.
- Case studies show other agencies and institutions have succeeded in diverting food and other organic scraps from the trash. See **Appendix C, *Case Studies*.**
- Building occupants will find it easy and convenient to take part.

(e) ***Build support*** for your program by being **realistic**. If you have never worked on a food scrap program before, let your managers know that there will surely be *learning opportunities* as your program matures. See **Appendix B, *Lessons Learned.***

- Will there be odor issues? It depends on what type of management program you choose and the level of ongoing support the program has.
- If composting on-site, suggest several compost systems and discuss the pros and cons of these systems.
- Will this program divert all of the food and organic scraps from the facility's garbage? It depends on the composting system you choose, the type of management program you select, and how many people take part in the program.

- Will our facility save money by diverting food scraps from the trash? It depends on the composting system you select, on how much food waste you collect, and what the costs are to operate the program. You may be able to reduce your garbage hauling fees, depending on how your garbage hauler charges for collection. If your garbage hauler charges by weight, you may save money because food scraps are heavy. If your garbage hauler charges by volume (that is, by the size of the trash container), you may not save money on hauling charges. That is because food scraps take up very little space. However, if you divert enough food scraps, you may be able to start using a smaller trash container. That could save you money.

Find out who makes the decisions and share your vision

Use your research to convey the **environmental**, **economic,** and **social value** of creating a food scrap management program at your facility.

3. Secure funding to develop and carry out your plan

How much will it cost?

This is a chicken-or-the-egg problem. You won't have a definite dollar figure until you completely develop your plan and put it in action, and you won't be able to completely develop your plan until you find out how much money is available. Look at food scrap management plans at other facilities and you can get a pretty good idea of how much your program will cost. Start your calculations by deciding whether you will be collecting and composting food scraps **on-site** or collecting and sending them **off-site** to compost.

Least cost: Is there a compost facility nearby that has a permit to accept food waste? If so, **off-site composting** is the least expensive option. Budget for the following components of a food scrap management plan for off-site composting.

- Marketing plan (research, brochures, stickers, signs, etc.).
- Food scrap collection containers.
- Labor to empty and clean the containers.
- Transportation and tipping fee charges from a commercial hauler.

More cost: If no permitted compost facilities are available, you may want to consider using worms to compost vegetative scraps. This type of composting is called **vermicomposting**. If you choose to vermicompost your food scraps, budget for the following costs.

- Marketing plan (research, brochures, stickers, signs, etc.).
- Food scrap collection containers.
- Construction or purchase of vermicompost bin.

- Site preparation ~ minimal.
- Initial purchase of worms and bedding.
- Labor to empty and clean the containers.
- Labor to feed worms and harvest vermicompost.

Most cost: If you choose to collect ***all* food scraps**, (including meat and dairy) and you want to **compost on-site**, your program will cost more. You will need to buy or build a closed system that you can intensely manage to maintain proper air and water requirements. Consider these costs for a comprehensive food scrap collection and composting program.

- Marketing plan (research, brochures, stickers, signs, etc.).
- Food scrap collection containers.
- Construction or purchase of compost system and incidentals such as shovels and wheelbarrows.
- Site preparation ~ could be extensive and possibly include constructing a separate building or rewiring and replumbing an existing space.
- Regular purchase of bulking materials, such as sawdust and wood shavings.
- Labor to empty and clean the containers.
- Labor to manage system; adding and mixing food scraps and harvesting compost.
- Periodic compost quality testing (after composting meat scraps, a compost quality test will tell you if your system and method of composting have reduced pathogens associated with composted meat and dairy scraps).

In general: All of these examples (off-site composting, on-site vermicomposting, and on-site all-food composting) have at least three costs in common, which you cannot ignore.

1. **Marketing:** Use social marketing techniques to design your education and outreach materials—know your audience and be aware of why they might welcome or resist the chance to change their habits. Invest in plenty of methods to promote your program; address concerns and clarify actions that you want people to take. (Learn more about social marketing at the Social Marketing Institute, see http://www.social-marketing.org/sm.html.) The quality of your education and outreach materials will motivate a change in habits, help increase participation, and decrease contamination.
2. **Food scrap collection containers:** Test a couple of different containers *before you buy enough of one kind for your whole building*. Or talk with someone who is using a reliable container. If the containers you buy are low quality and come unhinged after a week of use, it will cost more than just the hassle and expense of buying different containers. It also costs confidence in your program and results in fewer people taking part.

3. **Labor to empty and clean the containers:** To ensure your program runs smoothly, we recommend that you budget for an hour of labor a day (or more if your program is large). It will take someone this long to empty and clean the collection containers. This budget will ensure that you can get the job done on a regular basis, and that "missed pickups" and odors do not occur. *An hour a day does not include labor to operate an on-site compost system*.

Who will pay?

Securing funding for your project goes hand in hand with gaining support for your idea. You've made your case; your executive and facility managers think that diverting food scraps at your facility is a great idea. Now it's time to talk about the dollars you'll need to get the program up and running.

Many of the costs are one-time, capital expenses for facility upgrades or equipment. If your facility has several business divisions under one roof, you may be able to approach the managers of each division and talk about sharing the costs of capital improvements for your food scrap management program.

Your facility could absorb other expenses, such as labor and incidentals, as part of the building services and maintenance budget.

It's wise to think about program costs and where the money may come from before you cast your plan in stone. **The plan needs to match available funding.**

4. Design a plan to manage food scraps

Whether you are planning to compost **on-site** or **off-site**, you will need to consider the three major components of all compost plans as mentioned above: **marketing, food scrap collection containers,** and **labor**. Under On-site composting below, you'll see details on these three components; these details also apply to the Off-site composting section.

On-site composting

On-site composting does not require the expense of hauling food scraps to a different facility. Also, you can reap the benefits by using the finished product on-site or giving the compost to staff. However, on-site composting does require a larger investment in marketing, equipment, and a skilled operator to make sure "compost happens" in a safe and complete manner.

Marketing: A marketing plan for on-site composting takes more effort than one for off-site composting. Not everyone will want compost systems, big or little, in the backyard or basement of the work place. Survey your building occupants. When you develop your outreach materials, use what you learned in the survey about what attitudes, concerns, and resistance the building occupants have to composting. (Review responses to Ecology's survey @ www.ecy.wa.gov/programs/swfa/. Follow the link at the bottom of the page: Solid

Waste Topics, Compost.) And use incentives such as free compost from your program to help the occupants view your program as a benefit, not a personal cost. Learn more about social marketing at the Social Marketing Institute, see http://www.social-marketing.org/sm.html.

Some of the attitudes, concerns, and resistance you will encounter are:

- No time to separate food scraps. Time is too valuable.
- Keep it simple.
- Not in the habit of separating waste.
- Want to do the right thing.
- Out of site, out of mind.
- Worms are scary or dirty.
- Doesn't make a difference.
- Why now?
- Don't want someone telling them what to do.
- Want peer approval.
- Perceived inconvenience.
- Confusion or lack of knowledge about sorting food scraps from trash.
- Not wanting to be the "change agent." Not wanting to stand out.
- Notion that it's just for "ecos."

Communication—communication—communication*!** If people in the building don't want to take part, the biggest budget and best equipment will not make your compost program succeed. Design your education and outreach materials to address concerns. Decide on a slogan, such as *From Garbage to Garden, It's Compost Time*. Create a logo for your program. Identify media outlets (email, agency newsletters, etc.) to get your messages out. Together, these efforts will create recognition for your program and a sense of ownership in it as well. All graphics and logos created by Department of Ecology are available from the Solid Waste and Financial Assistance Program at: www.ecy.wa.gov/programs/swfa/. Follow the link at the bottom of the page Solid Waste Topics, Compost. See **Appendix D, *Tools for examples of graphics used by Ecology's Compost Demonstration Program.

Food scrap collection containers: As with an off-site program, collection containers are necessary for your program. Every break room or kitchenette in your facility should have a one- to three-gallon container for collecting food and other organic scraps. Order some extra containers that people can use for meetings or to replace broken containers. If your facility has a cafeteria, *work with its staff* to figure out what style and size (20- to 60-gallon) of container works best for them. A container that is close to countertop level may be the most convenient to use in a kitchen. *In fact, it's a good idea to include kitchen managers on the*

first discussions about food scrap collection. They will respond much better to change if they have some control over it. The containers should have the following features:

- Pedal-opened lid for use in kitchenettes, or no lid for use in cafeteria kitchen.
- Removable insert that you can wash repeatedly.
- Strong hinges that won't break with repeated use.

If the containers are difficult to use, fewer people will take part in the program.

Compost system: Choosing the right compost system is crucial. It must efficiently compost the scraps you want to divert. It must fit into your budget and also fit in the space you have available for your on-site system. Many things will influence your decision when choosing a compost system:

- Type of scraps that you want to compost.
  - Vegetative scraps only (lettuce, fruit peels and cores, etc.)
  - Animal-based scraps (meat, dairy and fatty foods.)
- Daily quantity of food scraps.
- Ease of system operation.
- Space available to operate system.
- Feedback from people who use similar systems.
- Costs of system, site improvements, labor, maintenance, and permits (if applicable).

Also consider what type of warranty and technical assistance the manufacturer offers. The system may require some assembly, and you will surely have questions about the care and feeding of the system.

Vermicomposting: If you are only composting **vegetative scraps** (no meats, dairy items, or fatty foods), then you should consider vermicomposting (worm composting). Worms consume tiny organisms and bits of decomposed food scraps. Worms will also happily dine on filet mignon, but meat and dairy scraps often attract unwanted visitors, such as flies and the resulting maggots. If you *want* to compost *all kinds of food* scraps with worms, you will need to manage the bin intensively. You also need to check with your local health department to make sure there are no restrictions to your plan. We recommend composting only veggie scraps in your worm bin, because the bin will be easier to manage.

Worms feed near the surface. As you continue to load your bin, the worms will move up through the food scraps, leaving vermicompost behind. Vermicompost is worm castings (excrement) mixed with decomposed vegetable matter. It is rich with nutrients and minerals and, in small quantities, provides excellent food for plants.

Worm bins come in all shapes, sizes, and costs. In design, bins range from simple homemade models built with scrap lumber to complex industrial systems that handle tons of scraps a day. Choose your worm bin based on the daily volume of food scraps you collect

and on advice from people who have been using systems that might work at your facility. Experience is a great teacher!

Preparing a site for a worm bin really depends on the model you choose. Some worm bins need electricity to run the harvest mechanism; some worm bins need drainage to manage the moisture from excess food scraps. With all bins, someone needs to keep an eye on the temperature. Worms need to stay between 33˚ and 96˚ Fahrenheit—much colder or hotter than that, and the worms will die. In many areas, then, you may need an indoor or covered vermicompost site.

Fruit flies, pot worms, slugs, and a host of other bugs are also common in worm bins. Consider this extra wildlife that will be drawn to your worm bin when thinking about placement. Right next to the outdoor eating area may appear extremely convenient for the staff who feed the worm bin, but people who eat out there may not welcome the extra wildlife wiggling and flying around.

You will need to **buy worms** (*Eisenia foetida*, commonly called red wigglers) to start your bin. Check with your local master gardeners or master composters for places that sell worms. If you can't buy your red wigglers from a local worm ranch, look on the Internet; companies regularly ship worms across the country.

Managing a worm bin is pretty easy. Once your operator has learned the art of worm-wrangling, she or he will spend only about 15 minutes a day managing this system. While harvesting the vermicompost will take some extra time, most of the labor costs will have to do with collecting food scraps.

In-vessel and other systems: If you want to compost **all food scraps** including meat, dairy and fatty scraps, then you will need a complex system. A system designed to compost all food scraps allows you to control temperature, air flow and moisture to ensure complete and safe composting.

In-vessel systems compost organic scraps in ***enclosed*** equipment that controls temperature, moisture, and air. This type of system can compost large amounts of waste in a small area with few odor problems. It can handle meat, dairy, and fatty scraps. Rather than using worms, this system depends on a variety of microbes to decompose food scraps at high temperatures. Harmful bacteria on organic material dies when the material composts at high temperatures (above 131˚ Fahrenheit) for a specified amount of time.

Preparing a site for an in-vessel system could be quite expensive. Most of these systems need access to water (to maintain moisture levels), sewer (to handle drainage), and electricity (to power fans and augers). Composting on-site, but in a building separate from the working staff, is a nice option if you can get it. The compost process naturally releases some odor. Some people don't like the smell of compost, and some batches will undoubtedly smell worse than others.

Using a space inside or adjoining your facility for an in-vessel system is also an option. Evaluate your space to find:

- What services (power, water, etc.) will the compost system need?
- What services does the space already have?
- How much will it cost to upgrade the space?
- Is the space close to heavy foot traffic?
- Is the space convenient?
- Will you have room to store your compost for curing or distribution?

If you have a **separate building** or suitable outdoor space to house your in-vessel system, and if it is away from the majority of traffic and still convenient to the main building, then placing your system there is a good choice.

You may need to **buy some bulking materials** (high carbon) to keep your microbes happy. The microbes that turn food scraps to compost need a balanced diet of nitrogen (food scraps) and carbon (dry leaves, wood shavings, sawdust, etc.). If you don't have a ready source of carbon-rich bulking materials from your landscape, you will need to buy them from a home improvement or farm supply store. You will also need **space** to store extra bulking material.

Compost training is ***essential*** for an in-vessel compost operator. The training could happen over the course of a week, or during daily advising sessions. In any case, the operator must learn about the relationship between air, water, carbon-to-nitrogen ratios, microbes, and fungus. Even compost experts will have many learning opportunities as they deal with a new system and different food scraps. Contact your local solid waste department or regional Ecology office for technical assistance.

To help support your composting program, you should compile data monthly. Provide data sheets for your compost operator to **record daily weight and volume** of food scraps, temperature, and time spent on operation. See **Appendix D: *Tools*** for examples of data sheets.

Calculate the **minutes a day spent maintaining the compost system**. In general an operator will spend as much as an hour a day caring for and feeding the in-vessel system. Depending on the size of the system, it will take one to four hours to harvest the final product and make it ready for distribution.

If you are composting on-site, you will have compost either to **use on-site or to give away**. If you feed the system 1,000 pounds of food scraps, a "finished" batch will equal about 500 pounds of compost.

Most institutions and agencies that **consider composting on-site** will use a smaller, in-vessel or vermicomposting system. However, many other compost systems exist, such as aerated static compost piles and turned windrows. They are usually what facilities and institutions

(like universities) with large volumes of food scraps use. Larger composting systems generally require heavy equipment, a full-time employee dedicated to operating the system, and special permits and considerations from the local health department. If your facility plans on composting on a large scale, contact your local health department or regional Ecology office for technical advice.

Off-site composting

Sending your collected organic scraps off-site to a permitted composting facility requires the **least** amount of **capital** up front. This is a great option***, if it's available*** to you. Contact your local solid waste company to find out about compost facilities and hauling costs.

Off-site composting is the easiest type of program to manage and maintain. You will still have to create a thorough marketing plan, determine how you will collect food scraps, and figure out who will empty and clean the collection containers from your building.

Marketing: All successful food scrap management programs begin with marketing. First, market your idea to your managers to get their support. Second, market your program to building occupants to get them to take part. Not everyone is going to love the idea of separating food scraps from the rest of the trash. Concern about odor, pests, and inconvenience are some of the barriers a good marketing plan will overcome. For more details see **Marketing** on page 6.

Food scrap collection containers: Every break room or kitchenette in your facility should have a one- to three-gallon container for collecting food and other organic scraps. If your facility has a cafeteria, *work with its staff* to figure out what style and size of container works best for them. A container that is close to countertop level may be the most convenient to use in the cafeteria kitchen. The containers should have the following features:

- Pedal-opened lid for use in kitchenettes, or no lid for use in cafeteria kitchen.
- Removable insert that you can wash repeatedly.
- Strong hinges that won't break with repeated use.

Labor: If your facility has janitors, work with their supervisor to add collection and cleaning of the containers to their daily duties. The janitors should empty and clean the containers every night if possible. By making collection and cleaning part of daily operations, food scraps won't rot in the containers and pests won't flock to the odors. Someone will also need to regularly clean the larger containers that your commercial hauler empties.

You may use disposable or biodegradable bags so you won't have to clean containers so often. Disposable liners do save time, but they cost money and add to waste. Biodegradable liners reduce waste, but are quite expensive. Also, you must ask your compost facility what brand of biodegradable liners it will accept.

Transportation and tip fees: Janitors should empty containers from inside your facility nightly into a larger container that a commercial food scrap hauler will pick up. Work with your food scrap hauler to determine the best container and the best schedule for pickup.

If you can decrease the number of trips your garbage hauler makes to your facility, you can save money. By diverting food waste from the trash, you may be able to decrease the number of hauls to the landfill; this will offset the trips to pick up food scraps.

If there are no commercial compost facilities near you that have a permit to take food scraps, then off-site composting may not be an option. You will need to compare the costs (and opportunity) of a longer haul to an off-site compost facility with the costs for equipment and on-site composting at your facility. You should also compare both of these costs with the cost of sending food scraps to a landfill. True *environmental costs* of hauling, on-site composting, and sending to a landfill are difficult to quantify. When choosing to start any composting program, you must base your decision on outcomes from realistic economic, social, and environmental predictions.

5. Implement your food scrap management plan

Educate

All the pieces are in place. Whether composting off-site or on-site, your equipment is accessible and working. Now it's time to go back to your marketing plan.

- Print the flyers or brochures that you have designed to promote your program and address concerns.
- Rally volunteers who support your food scrap management plan to help you answer questions.
- Review the process with the compost operator and do a walk-through with the janitors to make sure they are efficiently emptying all food scrap containers.

Motivate

Plan a compost kickoff celebration. Set up tours of your on-site facility or staff a table at lunchtime to promote the new program.

- Hand out samples of compost and provide clear, descriptive information about the new process.
- Highlight the DO's and DON'T's of your program.
- Talk about the benefits of making and using compost.
- Ask a home composting group to give a demonstration about home composting.
- Involve upper management in promotion.

Update

Once your program has been running for a week, let people know how well it's working. Send out emails, or post collection results in a public area. Stay in touch with participants to keep them engaged in your program.

6. Monitor, measure, refine, and communicate

Never assume that everything is going just fine. Check in regularly (at least monthly) with the staff responsible for collecting, composting, or hauling the food scraps from your building. Are they emptying and cleaning collection containers regularly? Is the equipment holding up to constant use? Are there odor issues? Have people complained?

If you are composting on-site, make sure someone keeps the records up to date and periodically copies the information. Good records track the amount of food scraps diverted from the garbage and track inputs (such as bulking materials, water, and labor) to the system. If you are composting on-site, you will need another record that tracks outputs of finished compost. See **Appendix D, *Tools*** for data sheet examples.

Schedule another waste audit after your food scrap management program has been in place for six months. Compare the food waste numbers found in the second waste audit to what you found before your program started. You should see a dramatic decrease in food scrap disposal. If not, then you need to increase the education. You need to market this opportunity for people in your building to "do the right thing" and scrape food scraps off their plates and into the collection containers. Ideally, you should schedule waste audits twice a year to help track diversion of food scraps (in addition to other recyclable materials).

Promote your success! Use newsletters, press releases, and public events to talk about how your agency or institution is reducing waste and creating a natural soil amendment at the same time. Food scrap composting in institutions and agencies is just starting to catch on as an effective waste management tool. Sharing the results of your program will help encourage your staff and other facilities to jump on the compost bandwagon.

Contact Washington State Department of Ecology, Solid Waste and Financial Assistance Program, (**360) 407-6900**, and let us help you promote your success under the State Beyond Waste Plan.

Appendix A
Ecology's Story

Appendix A

Ecology's Story: Compost Demonstration Program

Worm Wranglers and Compost Gurus

Some people love natural gardening. Others feel strongly about cutting down on waste. People with a passion for both these aims have been corralling food scraps and fallen leaves for years. They've learned how to turn this stuff into a valuable resource called compost.

Some people even bring their passion to work, where they volunteer to collect organic material and take care of a worm bin or a compost pile. That's how the Washington State Department of Ecology (Ecology) got its start on the Compost Demonstration Program in Lacey.

Washington State Department of Ecology's Compost Demonstration Program

In 1993, Ecology staff working at different offices around Thurston County all moved into one building in Lacey. Some who had composted at those scattered offices brought their worm bins with them. In a few of the new building's kitchenettes, volunteers set out containers where people could put food scraps. The volunteers then emptied the containers into worm bins that were set up in back of the building.

This volunteer system diverted about 30 pounds of fruit and veggie scraps from the trash each week, but not everyone in the building joined in. Also, the volunteer system can falter; sometimes no one would remember to empty a food scrap container on time. That often led to swarms of fruit flies and odor complaints as the scraps rotted in the collection containers.

A few very ambitious volunteers sorted through the building's garbage. Their waste audit found that over **100 pounds** of food scraps still ended up in the trash every day. The building needed a new, sustainable system to capture more food waste in a more efficient manner.

Building Ecology's planning team

Faced with these challenges, the volunteers persuaded Ecology's Waste Reduction & Recycling (WRR) Committee to help set up an official food scrap collection program for the whole building.

In 2001, the WRR Committee published its *Model Waste Reduction and Recycling Plan*. This plan included the goal of creating a comprehensive collection and composting program for organic material.

Meanwhile, state support for sustainable actions kept building:

- 2002 Governor's Executive Order 02-03
- 2003 Ecology Sustainability Plan
- 2004 Washington State Beyond Waste Plan

The WRR Committee picked key staff members to form the Compost Planning Team (the Team). The Team would move the plan from vision to reality.

The Team included a building services manager, a compost specialist, and an environmental specialist with outreach and social marketing expertise. They brought key skills and background to the effort.

The Team builds a case for composting

In the presentation it developed for Ecology's executive management, the Team made the following points:

- Multiple **state directives** (as mentioned above) call for sustainable waste management in state institutions and agencies.
- The Team would build a **compost demonstration program** that other institutions and agencies could learn from.
- **Waste audit** data showed that up to 44 percent (over 150 pounds) of all trash that Ecology disposed of daily was compostable (food scraps, food soiled paper, and paper towels).
- The Team proposed an **institutionalized compost program** that contracted labor would professionally run. This was an important part of the plan for building services managers who received complaints resulting from the old volunteer composting program.

Calculating costs

By the fall of 2003, the Team had a pretty good idea of what the Compost Demonstration Program would look like. The Team received $8,000 through an internal grant program and earmarked some of that money for a feasibility study. The study helped the team choose compost systems and collection methods.

The Team worked with a group of ecological design students from The Evergreen State College (TESC) to create a compost research report. The students' report gave details about various composting systems (on-site and off-site). It included cost and benefit analysis, facility design

recommendations for on-site composting, food scrap collection strategies, and case studies. The students' report enabled the WRR Committee and the Team to create a project outline and begin making decisions.

Securing funds

In the spring of 2004, the Team presented Ecology's executive management with a letter stressing Washington State's and Ecology's goals of sustainability and "walking the talk." The Team compiled data from TESC's Compost Research Report, made recommendations about the Compost Demonstration Program, and defined the budget based on projected equipment needs.

- 20 food scrap collection containers.
- On-site composting.
    - Buy two *different* systems (two Earth Tubs: http://www.gmt-organic.com/EarthTub/et-info.php , and one EPM Model 5-8 Vermicomposter: http://www.wormwigwam.com/large_systems.htm) to demonstrate two ways of composting food scraps.
- Build a structure to house the compost systems.
- Marketing costs for brochures, signs, and stickers.

The Team assured executive management that Ecology staff would manage this program professionally and perpetually. Staff would do this through amended contracts with Ecology's janitorial and landscape service providers.

Ecology divisions share the cost

Ecology's management agreed that the Compost Demonstration Program was a sound investment. Collecting and composting food scraps on-site would show other agencies that Ecology is committed to "Walk the Talk" of sustainable actions. Managers of 11 different divisions of Ecology agreed to share the cost. They set aside money from each of their budgets to create a $70,000 dedicated fund to support the Compost Demonstration Program.

Ecology plans to build the Compost Center

No nearby facility had a permit to compost postconsumer food scraps, and trucking food scraps to a more distant facility cost too much. So, the Team ruled out off-site composting. The Team instead hired an architect to design a structure to house the compost systems. The structure would keep the daily compost operation (and possible odors) away from Ecology employees. It would also provide storage space for bulking materials (such as sawdust and wood shavings) and finished compost.

Compost Center: Plan B

The Team's first lesson in flexibility came very soon. The architect's planned structure would cost three times what Ecology had in the budget for the entire program.

Plan B: The Team started looking for a space inside or close to the Ecology building that with a few changes might house the compost systems. The Team considered three different locations:

1. An unused section of Ecology's parking garage seemed good because it had a roof. However, it lacked power and easy access to the sewer.

2. The Team also considered a space outside the cafeteria. The space was close to the kitchen and close to power, but it didn't have a roof or easy access to the sewer.

3. The Team finally chose the storage/loading area. It had a roof to protect the compost systems (and the operator) from the weather. It also needed the fewest upgrades to meet the needs of the composting systems.

Ecology looks for partners

The Team investigated the possibility of partnering with St. Martin's University, Ecology's neighbors in Lacey. The advantage of a partnership included a greater resource pool to draw from (more food scraps and more money). Also, if St. Martin's joined in, not one but two facilities would sustainably manage their waste.

After several meetings, however, St. Martin's staff and the Team could not work out the logistics of collection, composting, and financing. In order to get the program up and running, the Team decided to focus on Ecology food scraps; the Team still hopes to work with St. Martin's in the future.

Choosing on-site compost systems

The Team chose two different systems to compost organic scraps: the Earth Tub and a vermicompost (worm bin) system.

The **Earth Tub** is an "in-vessel" system that composts organic scraps in a closed environment. This system would allow Ecology to compost ***all*** food scraps, including meat and dairy scraps. Green Mountain Technologies designed the Earth Tub specifically for the on-site composting of food waste. The fully enclosed system has special features such as power mixing and bio-filtration of all process air. It efficiently composts postconsumer food

scraps and allows for more precise odor control. *And* it is "varmint proof."

The Team determined that Ecology would need two Earth Tubs to handle the estimated daily volume of 100 pounds of food scraps and 40 pounds of paper towels.

The Team decided to buy a **worm bin** in addition to the Earth Tubs. With a worm bin, Ecology could demonstrate a "low-tech" composting system for veggie scraps and also get a value-added compost product. Vermicompost acts like a natural fertilizer when added to plants and is very powerful in small quantities.

The Team bought a worm bin built by IPM. It was large enough (a 5'x8' raised box) to handle 50 to 100 pounds of scraps per day. Another good feature was its mechanical scraper for harvesting vermicompost.

Making the in-vessel and worm bin systems work together

Designing a plan to make the two systems work together would help justify the purchases and allow Ecology to demonstrate two different composting technologies.

The Team planned to move partially composted food scraps from the Earth Tubs and feed the unfinished compost to the worms in the bin. Before going to the worm bin, the food scraps would spend adequate time in the Earth Tub to reach temperatures high enough to kill pathogens. The Team guessed that the system operator could move approximately 50 pounds of unfinished compost from the Earth Tub to the worm bin each day.

As the worms worked through the partially composted food, they would leave vermicompost behind. The operator could harvest this weekly.

Getting Ecology's compost systems ready to run

Ecology made detailed plans for changing wiring, lighting, and drainage in the chosen space. These changes would help the Earth Tubs and worm bin work in the Compost Center.

An **electrician** worked under contract on the following tasks:

- Installing 208-volt, 3-phase power to run the two Earth Tubs' 2.5 horsepower auger motors, which mix the organic materials.
- Installing 110-volt power to run the blowers that keep the organic material aerated, to run the worm bin winch motors, and to provide utility outlets for tools and other devices as the operator might need.

- Researching, buying, and installing overhead lighting to create a productive and safe work area for operators and maintenance folks.

A **plumber** worked under contract on the following tasks:

- Adding a sanitary drain line that connected to the sanitary sewer to process leachate drained from the Earth Tubs and biofilter.
- Installing a potable water line to provide a frost-free hose bib for use in the work area year round.
- Installing extensive piping needed to plumb in the Earth Tub aeration system and leachate drainages, as well as connecting the Earth Tubs to the biofilters and the carbon filter.

The Team also bought the following containers to place in all of the kitchenettes, the cafeteria kitchen, and the dish return area:

- 20 3-gallon containers, with 40 durable plastic inserts.
- 18 color-coded and wheeled 32-gallon containers that staff could combine in sets for different functional areas, such as cafeteria, kitchen and dish return area.

Ecology's marketing plan

In April 2005, the Team drafted a marketing plan from the social marketing perspective. This was *instrumental* in creating a desired result—people changing their habits and actively taking part in the Compost Demonstration Program. The Team's plan followed specific social marketing techniques to maximize the change in habits:

- Make target audience aware that the benefits of change outweigh the costs.
- Develop outreach to show people in the building what they will get for changing their habits.
- Use different messaging techniques to reach the broadest audience.
- Use marketing to:
    - Make people aware of what "Product" they will get for their behavior change.
    - Minimize the "Price" of changing their habits.
    - Make sure people are aware of the "Places" where their changed habits can merge with their lifestyle.
    - "Promote" the change in habits by using creative and thorough outreach channels.
- Analyze competition for people's time and barriers to changing their habits.
- Monitor results of outreach and make changes to program if desired change in habits is not occurring.

The marketing plan detailed strengths, weaknesses, opportunities, and threats to the on-site composting program. Part of the marketing plan included a participant (Ecology – Lacey building occupants) survey. Learn more about social marketing at the Social Marketing Institute, see http://www.social-marketing.org/sm.html.

Staff surveys: Ecology contracted with a company to prepare an on-line, nine-question survey. The survey's purpose was to inform occupants about the compost program, find out how many folks were interested in taking part, gather ideas about how to encourage more people to take part, and create a baseline for future surveys. Of 998 people who received the survey, 334 (33 percent) responded.

Overall, the respondents were positive about taking part in the program. They also felt a compost demonstration program was appropriate, considering the Washington state and Ecology goals to "walk the talk" towards sustainability. Major concerns respondents identified revolved around convenience, odors from composting material, and vermin attracted by those odors. Review responses to Ecology's survey @ www.ecy.wa.gov/programs/swfa/. Follow the link at the bottom of the page: Solid Waste Topics, Compost.

Education / outreach material: The Team created education and outreach material that addressed concerns and barriers identified in the staff survey.

Another important part of the marketing plan included developing a slogan and logo. This helped create recognition and ownership of the program for the people taking part.

Promotional materials: All promotional materials used colorful graphics and clear language to enlighten, encourage, and guide occupants to take part in the program.

- **Freestanding posters:** Posted in kitchenettes with the DO's and DON'Ts listed on them.
- **Large, foam-core poster:** Posted in public areas with the DO's and DON'Ts listed on them.
- **Peel-and-stick stickers:** Stuck on food scrap collection containers to identify them. The Team ordered additional stickers to stick to 5-gallon buckets that staff will use to take home finished product.
- **Brochures:** Created for Ecology occupants and visitors who want to learn a little more about the Compost Demonstration Program.

The staff that makes the Plan work

Throughout the summer of 2005, the Team worked with the contracted staff who would need to work together to make sure the daily collection and composting did not fail. ***Communication, communication, communication!***

- **Cafeteria staff** offered ideas about appropriate container size for food scrap collection and about safety issues for placement. Because the program *added* a third container (the cafeteria already had trash and recycling cans), Ecology had to purchase special slim containers. It was **very important** to include the cafeteria staff in early discussions about the program. As they work within limited space and time, adding an extra step (separating food scraps) to their daily routine might have seemed an unreasonable request.

- **Janitorial staff** received training on how to collect the food scraps from the kitchenettes and cafeteria kitchen, where to leave the scraps in the Compost Center, and how to clean the collection containers to get them ready for the next day.
- A **landscape staff person** became the compost operator, responsible for the care and feeding of the Earth Tubs and the worm bin. The operator received basic training about moisture levels, carbon-to-nitrogen levels, and oxygen levels needed for optimal composting. Oversight from a compost expert supplemented this basic training.
- **Ecology staff** make up *all* the people taking part in the program. The Team targeted them with messages from emails and all forms of marketing materials.
- **Compost Champions** are a special group of Ecology staff members spread throughout the building who volunteered to help the Compost Planning Team. They received special training so they'd be able to address questions and concerns from their fellow employees about the new program.

Compost kickoff

In August 2005, all of the pieces were finally together. The equipment was wired, plumbed, and otherwise in place. Staff members were educated and motivated, brochures were printed, and compost cupcakes (edible chocolate cupcakes topped with gummy worms) were baked and warm.

The Team organized a small kickoff event to recognize the work of the contributing team members and the Ecology managers who supported the program. Ecology's director, Jay Manning, gave a short speech then dumped the inaugural bucket of food scraps into the Earth Tub. His act signified the shift from a volunteer effort to an institutionalized Compost Demonstration Program. After a day of tours and interviews by the local newspaper, *The Olympian*, the Team watched with pride as food scrap containers quickly filled up with uneaten scraps of food. The next morning the operator emptied over 80-pounds of food scraps into the Earth Tub and compost started to "happen" at Ecology.

Year in review

Ecology's program has continued to mature and the Team continues to learn valuable lessons about marketing, collection, and composting. As you read through **Appendix B. *Lessons Learned*** section, you will learn how to avoid some of the mistakes we have made. But that doesn't mean we had all the fun; undoubtedly, you too will experience some *learning opportunities* as your compost program grows.

Does Ecology feel that the Compost Demonstration Program has been a success? You bet! In the first year of operation, the program composted over 22,000 pounds of food and other organic scraps. As we continue to refine our plan and promote our success, we hope that it inspires other institutions and agencies to create their own food scrap management plans.

Please contact Ecology's Solid Waste and Financial Assistance Program, **360.407.6900**, to request information and technical assistance if you would like to start a composting program at your facility. If you already have a program going, we'd like to hear about that also…we can promote even more composting with your success story!

Appendix B
Lessons Learned

Appendix B

"Lessons Learned" from Ecology's On-Site Composting Program

A few Department of Ecology (Ecology) employees in Lacey teamed up to divert food scraps from their building's garbage. In getting this project going, the Compost Team learned many lessons. This section gives an account of the bumps, pitfalls, and successes the Team ran into. It does not review all the program's details. Rather, it outlines the main things the Team learned that would benefit other people to know when setting up their own food scrap management program.

Communication

The biggest lessons the Team learned relate to communication. Ecology's project succeeded by using these four communication tools:

- Marketing Plan ("social marketing" planning process)
- "Compost Champions"
- Notebooks
- Record of comments

Marketing Plan

The "social marketing" planning process proved to be a crucial part of the food scrap diversion project. It forced the Team to look at every audience that would come into contact with the project. This helped the Team fine tune its messages to those audiences and make program choices based on feedback from the very people who would take part. See **Managing Food Scraps for Institutions and Agencies, page 6** for more information on Social Marketing.

Compost Champions

Compost Champions were a few Ecology workers who bridged the gap between the Compost Team and all the other building occupants. Having this group of people with "inside" knowledge really helped. They could show coworkers how to actually separate out food scraps in 19 different kitchenettes throughout the building. As a group, the Compost Champions created the critical mass of enthusiasm for the program. And they kept a record of questions and answers, comments, and compliments. This record allowed the Team to stay consistent in the information it provided to everyone. The record will also guide future education and outreach materials.

Notebooks

Notebooks work well as a communication tool for the janitors, the compost operator, and members of the Compost Team. Notebooks seemed to be the only way they all could talk to each other, since no other tool (e-mail, cell phone, etc.) was available for all three groups.

All parties need to read the notes regularly, and the Team needs to transfer the information to a more permanent location periodically. Everyone has to have a common understanding of the system. Of course, the notebooks need to be in a convenient location, safe from vandalism or theft.

Record of Comments

The Compost Team created a simple spreadsheet for recording complaints, comments, and compliments about the program. The spreadsheet is located on a shared network drive, accessible by the Team and the Compost Champions. The Team answered questions and posted them so that all Champions could give out the same answers.

The Team learned it is important to respond right away to issues that come up. Doing so maintains enthusiasm for the program.

Equipment

These "lessons learned" about equipment do not include a technology review of individual devices the Team chose for this project. What follows are general comments and lessons learned during the first year operating the following equipment:

- Earth Tub
- Worm Bin
- Collection Containers

Earth Tub

Trial and error are good teachers when composting food scraps. The Team started with suggestions from the manufacturer and altered them according to daily experiences. While the Team has used the Earth Tub, it has always been able to meet temperatures high enough to kill pathogens associated with composting all food scraps. Managing moisture has been the key to successful operations.

Earth Tub Lessons (Recommendations)

1. Have an operator dedicated to daily care and feeding of the Earth Tub. Gaining experience with the Earth Tub over time is important, even if the operator has previous composting experience.

2. Recruit a backup operator and make sure that person can fill in when the regular operator is away.
3. Manage moisture carefully. It's crucial to balance the amount of water needed to make good compost and prevent odors. Moisture needs also vary with current weather conditions, bulking materials such as dry leaves and sawdust, and what the cafeteria is serving.
4. Run the Earth Tub on the dry side to prevent odors that come from lack of air. It's easier to add water than take it away. But remember, having too little moisture will slow down the process and can cause ammonia odors.

Worm Bin

Of all the equipment the Team bought for this project, the worm bin surprised Team members the most. The Team started by feeding composted material from the Earth Tubs to the worms. Unfortunately, the worms didn't like the material and began leaving the bin. To keep the worms from leaving the bin, the Team arranged to have the cafeteria separate its vegetable scraps. The remaining worms were much happier with these raw food scraps. However, the bin is clearly too big for the small amount of vegetable scraps the Lacey building produces each day.

Worm Bin Lessons (Recommendations)

1. Be flexible. You may need to engage "plan B" in the middle of the project.
2. Learn from others' mistakes. Be ready to question anyone who tells you that worms will thrive on pre-composted food scraps. Ecology's worms escaped when fed that diet.
3. Remember that the composting process is a living system and we can't accurately predict how the system will function at all times.
4. Budget for a second batch of worms in case the unthinkable (dead worms) happens.

Collection Containers

Collection containers are the important point of contact between the people dumping food scraps and the composting process. The Team learned how important it is to make sure the collection process is as hassle-free as possible.

The food scrap collection containers in Ecology's kitchenette areas began to fail within the first week of the program. The Team experienced several mechanical problems with the cans. The result: separating food scraps became more of a hassle, and user satisfaction plummeted. After a trial period with a new kind of container in one kitchenette, the Team bought new containers for the whole building.

Collection Container Lessons (Recommendations)

1. Test equipment before buying containers for a whole building. Set up a test collection site, and let people use the container for at least a couple of weeks.

2. Make sure equipment comes with a manufacturer's guarantee.
3. Be responsive to any complaints users have about the containers. These folks are the "customers" who will make or break a program by taking part or not.
4. Pay attention to location of the collection cans. If possible, move the regular garbage can to a less convenient place and highlight the compost can with signs and bold arrows.
5. Purchase extra containers for back-ups and to make available for meetings.

Operations

The Team learned several lessons described below under the category of "operations." The topics include:

- Odor management
- Technical Assistance
- Standard Operating Procedures
- Troubleshooting
- Contamination

Odor Management

In the Earth Tub's first year, odor was sometimes a problem. Some odor gets out when you lift the Earth Tub lid to add food scraps. Odor also occurs when the auger is turning towards the center of the tub. This action creates a gap where odors from the churned material can escape. Covering this gap with a simple piece of cardboard successfully prevented most odors. Out of 24 hours, the Earth Tub is open for only about 30 minutes.

Whether these occasional odors are a problem is subjective. People who are used to compost will not mind the odor. However, people who are new to compost may think it stinks a bit.

As long as the environment is friendly to the microbes (plenty of air, not too much water, and a balanced diet of carbon and nitrogen sources), the Earth Tub will produce only a little odor, even when composting meat, dairy and fatty foods. As the Earth Tub's blower pulls air through the composting material and into a biofilter, microbes in the biofilters scrub odor from the air. This process effectively gets rid of odor from the Earth Tub, as long as the system remains closed and the composting material remains porous.

When an Earth Tub goes bad, it goes very, very bad. One batch of compost went anaerobic—no oxygen—and it smelled awful, even to a seasoned composter. The Team removed the bad batch from the Earth Tub and started over with fresh bulking material. See **Appendix D. *Tools*** for the **Trouble Shooting** guide we developed for the Earth Tub.

Odor Management Lessons (Recommendations)

1. Operate the Earth Tub at the same time every day. People who are overly sensitive to "organic" odors can avoid the area at those times.
2. Keep the Earth Tub's diet balanced with water, carbon, and nitrogen-rich foods. This takes practice and experimentation.
3. Don't let feedstock get too wet—it should be no wetter than a wrung-out sponge.

Technical Assistance

Technical assistance comes in several forms: from the manufacturers of the equipment you chose to collect and compost organics, and from coworkers who might have compost expertise.

The Team expected to use the manufacturer's technical assistance a couple of times. The Earth Tubs and corresponding biofilters are relatively complex systems to set up (leveling, plumbing, and wiring). When Team members had questions, they were able to contact an Earth Tub expert via email or phone. Responses or visits, if necessary, were always timely and helpful.

The Team also expected that the operator would need guidance from on-site compost experts as he learned about the Earth Tub system. However, the Team did not anticipate how much time or expertise it would take to get the system running smoothly. After nine months of operation, technical assistance was still necessary on a weekly basis.

Technical Assistance Lessons (Recommendations)

1. Make sure the program has a commitment from, and access to, manufacturer technical assistance.
2. Plan for extra time to monitor daily compost processes for the first three (or more) months.
3. A thorough knowledge of the composting process is essential to the success of an on-site composting program.

Standard Operating Procedures (SOP)

Ecology's Team did not immediately develop SOPs for collecting and composting food scraps. Team members knew that there would be some changes to the daily routine as they refined techniques. The need for an SOP became urgent when the Team realized that only a couple of people actually understood how to operate the Compost Center. If those knowledgeable people were all "out" at the same time, the process would not run smoothly.

Ecology needed a second SOP for the crew of janitors who collected the food scraps nightly. The Team discovered that job turnover was high and sometimes no one passed the procedure for collection on to the next janitor. Someone always emptied the food scrap collection containers and there was no apparent disruption in collection, but the food scraps didn't always end up at

the Compost Center. Instead of splitting the food scraps between two containers, sometimes the janitors would put all the food into one large container. They didn't know that the combined weight of the food was too heavy for the compost operator to lift and empty into the Earth Tub.

SOP Lesson (Recommendations)

1. Create an SOP for both the composting process and the food scrap collection process. Update the documents as necessary.
2. Identify and train several people who can manage the compost process as backup for the main operator.
3. Maintain communication with operators and periodically audit the system.

Troubleshooting

Troubleshooting guides were available, but none seemed to address the Team's specific issues with the Earth Tub. As problems arose at the Compost Center, the Team made notes about how to address the issues, and then created Ecology's own Troubleshooting Guide. The guide is kept with the Compost Center SOP and records notebook.

Troubleshooting Lesson (Recommendations)

1. Use general troubleshooting guides to get your program started.
2. Write about any problems you run into with your system. Record actions you take to solve the problems. This will help a lot.

Contamination

Contamination continues to be a significant problem in the food scrap collection system. Plastic bags, dishware, disposable food service containers, and mysterious mechanical parts all end up in the food scrap collection containers. Even with consistent education by emails, workshops, and posters, contamination remains an issue.

Contamination Lessons (Recommendations)

1. Contamination happens. Develop a plan to deal with it.
2. Invest in a good pair of grapplers, a.k.a., grabber-nabbers or litter picker-uppers. These light weight, hand tools extend your reach into the Earth Tub to remove contamination.
3. Pull out as much contamination as possible before the food scraps finish their journey to compost. This will be the operator's job if you can't get your participants to "clean up their act." As the material continues to break down, more contamination will come to the surface and the operator will need to pull it out.

4. If time permits, use a screen, sized to fit your operation, to screen out contaminants at the end of the process.

The broad categories of Communication, Equipment and Operations can not capture all of the lessons we have learned. But as you develop and carry out your own food scrap management program, these Lessons Learned may help you avoid some of the challenges that Ecology experienced.

Appendix C
Case Studies

Appendix C

Case Studies

From big universities to little offices to scenic state parks, composting operations come in all sizes. Together, the following case studies show how these programs can work. We hope their stories inspire other agencies and institutions around Washington State to give composting a try.

Washington State University (WSU) ~ Pullman, Washington

History: In 1992 the WSU Center for Sustaining Agriculture and Natural Resources began planning a compost facility. The Center saw the need to responsibly manage manure from the campus research and teaching animals. Also, a state government mandate required WSU to reduce solid waste 50 percent by 1995. Taking a close look at WSU's garbage, the Recycling and Compost Committee estimated it could divert 16,000 tons of organic materials a year. The committee also estimated WSU could save about $200,000 a year in hauling and tipping fees by composting on-site.

In 1993, WSU accepted the committee's $314,000 proposal to build a facility on campus. The committee chose a site and gained approval in late 1993 for most of the required permits. Construction of the Compost Facility began in the spring of 1994, and by October of that year the first compost windrow was built.

Materials Accepted: Planners designed this facility to compost the following materials:

- Manure and bedding from WSU Animal Sciences and Veterinary Medicine.
- Separated beef and dairy solids.
- Nonrecyclable waste paper.
- Dining center food wastes.
- Campus yard waste.

Collection: Organic materials come from all over WSU's campus, so three different campus services take care of collecting it all and delivering it to the Compost Facility. The Compost Facility supplies a truck and driver for collecting feedstocks (manure and bedding from the beef and dairy barns) and delivering the finished compost. The campus waste collection team collects and delivers organic materials from various departments. Finally, the recycling collection team delivers food waste from dining services.

Composting Process: Staff record the weight and volume for all feedstocks coming into the Composting Facility. Materials remain in stockpiles until the volume is sufficient to create windrows. Using a front loader, staff create approximately two windrows a week then mix the piles weekly using a windrow turner. Depending on time of year and availability of feedstocks, the facility creates two different end products: a finished compost for soil amendment and a composted bedding mixture used in the WSU dairy barns. Both products meet PFRP (process to

further reduce pathogens) standards. After the material has composted for 10 to 14 weeks, staff screen the finished product so pieces are three-quarters of an inch or smaller and store it off-site on concrete slabs.

End Use: WSU uses finished compost on site for campus landscaping and for animal bedding in the barns. WSU also applies compost to some of its agricultural research land. The facility also sells compost wholesale to local nurseries.

Challenges: According to Rick Finch, Compost Facility Manager, challenges have been few. After the first year of composting, the committee realized that its facility was too small to handle the quantity of organics received. The committee applied for and received a $400,000 loan from WSU to allow for expansion. (The plan was that the facility would be self-supporting, but existing revenue could not cover this expansion.)

The other challenge came in 2000 when the persistent herbicide clopyralid turned up in the facility's finished compost. The contaminated compost damaged a few sensitive plant species. After identifying hay and straw as the carrier of clopyralid, the Compost Facility established a certified (clopyralid-free) vendor program to reduce the chance of future contamination.

Successes: In 2005, the Compost Facility processed over 10 tons of campus organics, saving WSU about $1 million in landfill disposal and transportation fees. Additionally, WSU animal units are using the composted bedding to meet some of their bedding needs at a reduced cost. An added benefit appears to be a reduction in mastitis for the animals bedding in the composted material.

Teaching and learning opportunities continue to grow as the Compost Facility works with WSU's Energy Research Unit. The Compost Facility continually (and successfully) strives to fulfill its vision and mission as stated in its 2004 Strategic Plan.

"Vision: Provide a customer service orientated environment that enhances the teaching, learning, research, service and outreach initiatives of the University.
Mission: The mission of the Compost Facility is to manage the University organic waste steam in an efficient, sustainable and safe manner."

The Evergreen State College (Evergreen) C.E.L.L.

(Center for Ecological Living and Learning), Organic Farm, Farm House, Community Garden, Compost Facility, Biodiesel, Demeter's Garden [permaculture garden] ~ Olympia, Washington

History: In 1998, three volunteers got together and on a small scale began collecting food scraps to compost on-site. This small action garnered financial support from Campus Housing in 1999, which allowed for two paid students to operate the compost program. At this time, the students collected food waste from campus housing and the cafeteria and composted the material in windrows at Evergreen's C.E.L.L. location.

In 2001 the composting operation expanded, using additional funding from Student Activity fees, Campus Facilities, grant money from the Hohlbourn Foundation, and individual donations. These funds helped build the original compost reactors (three enclosed bays with forced aeration). In 2004, Evergreen hired a new farm manager, who improved the quality of the product by changing the procedures and the recipe.

Materials Accepted: The operation collects all pre- and postconsumer food waste from campus housing, the childcare center, and a small amount cafeteria at Evergreen. Additionally, staff collect wood chips, shavings, and sawdust from the campus wood shop. They combine all this with leaves and use it as a bulking material to mix with the food waste.

Collection: Both campus housing and the cafeteria separate their food waste for collection. Students need to provide their own compost bucket. To help absorb moisture and odors, wood chips (from campus wood-shop) fill the bottom one-third of each bucket. Students empty their full buckets into a centrally located, 20-gallon bucket, which farm staff members collect three times a week. Staff collect scraps from the cafeteria and childcare center on the same schedule. The farm receives a half ton of food waste a week, depending on the time of year, the level of student activity, or events such as conferences or workshops.

Composting Process: At the farm, staff load food waste mixed with wood shavings and equal parts of wood chips in the first aerated bay using a manure spreader. The compost is put in the first bay on an 8" bed of wood chips called a plenum. The plenum provides aeration from beneath the compost pile. When enough material has piled up in the first bay, staff measures the bulk density and adds more wood chips and/or water to reach the recommended carbon-to-nitrogen ratio, bulk density and moisture for proper composting. Staff then load the material from the first bay into a manure spreader and unload it into the second bay. The manure spreader helps physically break up the material and mix the food waste with the woody scraps. Staff monitors temperatures to ensure the material reaches PFRP (process to further reduce pathogens) in the first stage of composting. The material sits in the second bay for about one week before it is moved to the third (last) bay of the reactor. In the last bay, material will continue to decompose and again reach PFRP temperatures. After staff move the compost outside, the pile will heat up to PFRP temperatures a final time (for a total of three days at 130 F or higher but below 170), which is required for post consumer food waste and organic composting.

C.E.L.L. also has a large worm bin system. Staff have experimented with the worm bin, feeding some of the finished compost from the reactor to the worms. The worms have done better on a diet of raw, chopped food scraps. The cafeteria sets aside preconsumer, vegetative scraps for the worms. Students harvest the worm compost (vermicompost) to use in field trials in the organic garden.

End Use: As of 2005, C.E.L.L. was looking for funding to purchase a compost screener. Screening the finished compost will help remove uncomposted wood chunks and clean up contaminants (plastic bags, etc.) and will turn out a better product to use on campus. C.E.L.L. received a small compost screener that they can use 9 months out of the year. Staff places a "small pile" of unscreened compost in the center of the community garden for general use, and hold the rest on-site until screening. Cell uses some of the compost as a soil builder on the farm. In the future, screened compost will be used as an ingredient in the farms potting soil mix. A small portion of the compost is used in the campus landscaping.

Challenges: One of the first challenges was getting Evergreen Administration to see the value of the composting program and pay for it. While composting falls in line with Evergreen's ethos, it took several years of volunteer labor and lobbying to get the college to support the program.

Also, refining the compost process has been a challenge for the program. This challenge includes agreeing upon a technology and recipe to help organic material decompose in the safest, odor-free manner. In the past, odor coming from the composting material had caused complaints from neighboring houses.

Funding continues to be a challenge as the college has not identified a permanent funding source.

Success: The compost operation continues to refine its process and successfully turn out a quality product. Composting on-site reduces food waste going to the landfill and creates a valuable product that can help grow food for campus use. It also allows Evergreen to show others a sustainable operation.

Washington State Department of Ecology, Eastern Regional Office (ERO) ~ Spokane, Washington

History: Approximately 140 staff members work at ERO. For years, staff at ERO collected coffee grounds in the main lunchroom, and a volunteer took them home to compost. After an odor complaint (which turned out not to be coming from the coffee grounds), the volunteer program was halted.

ERO staff finally decided that an on-site vermicompost unit would fit their composting needs. While researching the various systems, a staff member called a county office that had used grant funds to purchase "Worm Wigwams" for itself and for a couple of local schools. Unfortunately, one of the schools didn't want its Worm Wigwam, so the county offered it to ERO. Normally, the system costs about $600, but ERO spent only about $200 on additional materials (worms, extension cord, scale, and watering can) needed to start its operation.

Now throughout the office staff have convenient access to food scrap collection containers and most folks participate in the program.

Materials Accepted: The Worm Wigwam can compost the following materials:

- Paper towels
- Napkins
- Coffee grounds and filters
- Tea bags
- Fruits/Vegetables
- Breads
- Pasta/Rice/Beans
- Plant cuttings
- Any plant-based material

Collection: Each coffee bar and lunch area (except the Administration Program that had declined to participate) has a lidded 2.5-gallon bucket to collect the scraps. Volunteers empty the collection buckets once or twice every week. Each bucket collects between 6 and 10 pounds of material a week.

Worm Wigwam vermicomposter

In each area, individual staff offered to take care of the bucket on an ongoing basis. ERO has a list of backup volunteers who can step in to take care of an area if regular volunteers can't do so.

Composting Process: The Worm Wigwam is 3 feet tall and 3 feet wide, weighs 86 pounds, and comfortably houses about 15 pounds of worms. Volunteers load scraps into the top of the system. As worms and other organisms feed on the decomposing organic matter, vermicompost builds up at the bottom of the Worm Wigwam. Turning a crank at the bottom of the unit will separate the finished vermicompost into a pile. The Worm Wigwam is a "continuous flow" system, meaning

you can keep on adding organic material to the top and harvesting vermicompost from the bottom, without ever emptying the bin.

End Use: Vermicompost from the Worm Wigwam will amend the soil around ERO's building or in employees' personal potted plants. ERO may also donate some for use in a community garden.

Challenges: For the coordinator, "Worm Woman" or "Worm Lady" soon became a nickname she didn't really want to stick.

A real challenge lies in getting everyone in the building to take part. A handful of employees think collecting organic material is unsanitary and have declined to take part, despite the fact that material is stored in closed containers. Others who support this program may be unable to take part because a few employees won't allow the collection containers in their coffee bar.

One person complained about excessive houseflies near the Worm Wigwam, which sits outside on the building's loading dock. Other staff members who frequent the area have noted no more flies than would be seen elsewhere outdoors. Regardless, the complaint made its way to staff throughout ERO, and even to staff at Ecology headquarters in Lacey, painting this program in a negative light.

Fruit flies are a natural part of the composting system. At first, though, ERO had too many of them. After adding extra worms to compost material more quickly, fruit fly numbers dropped quickly and are now tolerable.

Successes: Almost all staff members have supported recycling ERO's organic waste. Introductory messages before this project started, as well as an announcement the project was underway, met with encouragement and thanks.

A picnic table now sits within six feet of the Worm Wigwam, and since its placement no one has complained about flies, odors, or other nuisances.

Because the Worm Wigwam is in an outdoor area, weekend vandalism was a concern. After more than a year, the Worm Wigwam remains vandalism-free! A thank you goes to the maintenance man, Miguel, who foresaw that a locked unit would attract vandalism, while one easily opened would deter tampering once people saw what it contained.

Washington State Department of Ecology, Central Regional Office (CRO) ~ Yakima, Washington

History: CRO sorted through its trash in April 2003 and discovered that the largest portion of the garbage was food scraps. At least 5 percent of the scraps were vegetative, which people could easily compost in a simple home system or a worm bin. After this "waste audit," a group of CRO employees started a voluntary compost program to help reduce the organic waste in their trash.

Materials Accepted: Vegetable scraps, coffee grounds, bread, and floral scraps—no meat, dairy foods, or fatty items.

Collection: The compost buckets in CRO's kitchen areas have tight lids for holding the food scraps for as long as a week. Each week the volunteers take food scraps from their office kitchen area and add them to their own home compost piles.

Composting Process: Processing occurs at the homes of volunteers through worm bins and backyard compost bins.

End Use: The finished compost amends the soils in home gardens.

Challenges: The highest portion of CRO's compostable waste materials was paper towels from the bathrooms. The paper towels made up 40 percent of the garbage. However, CRO doesn't have a way to divert and compost the paper through the volunteer home composting program.

CRO would love to try on-site composting, but doesn't have space to do so. The office lies in an urban area and has only a small loading dock for storage. Staff have considered trying to get a worm bin on one of the two decks that they have, but these face south and the worms would not survive both the summer heat and the winter cold. In addition, CRO had a worm bin about 10 years ago, but staff misused it and fruit flies flooded the office. Now many people at CRO are very hesitant to allow another.

Success: This voluntary system, managed by 5 people, serves about 130 employees and diverts about 5 pounds of food waste from the dumpster each week. A waste audit in 2004 showed less compostable food waste in the trash, compared to the 2003 waste audit. CRO hasn't had a problem with fruit flies, and a good number of people are taking part in the program.

Washington State Department of Ecology, Northwest Regional Office (NWRO) ~ Bellevue, Washington

History: Before NWRO put its BioStack in place, staff at times tried to compost food scraps in black drums that were half buried in the ground. This inefficient system had vermin problems and was hard to harvest. Staff at NWRO had the will, but lacked a good way to compost their organic scraps.

In 2004, the different sections of NWRO pooled their money to buy a $2,000 BioStack vermicomposter that can handle the organic scraps from about 160 people a day.

Materials Accepted: The BioStack can compost the following materials:

- food scraps (no meat, dairy foods, or excessive oils)
- tea bags, coffee grounds and filters
- napkins
- floral scraps
- paper towels

Collection: The lunchroom at NWRO has one covered bucket for coffee grounds and another for food scraps. NWRO stores the coffee grounds separately because they will keep longer; staff can hold the grounds back if other scraps are overloading the system. Members of the NWRO Sustainability Team empty the buckets every other day, chop the scraps into small pieces, and then add them to the BioStack.

Composting Process: The BioStack system has three tiers. To begin, you add bedding, worms, and food waste to the first tier. As worms consume the organic materials and the first tier fills with vermicompost, you add the second tier. As you add scraps to the second tier, the worms will move up from the first. By the time you add the third tier, the vermicompost in the first tier is ready to harvest. This system can handle about eight pounds of chopped material in each addition, depending on the season. (If it is warm outside the worms will be more active and eat a more material.)

BioStack Vermicomposter

End Use: Vermicompost from the BioStack will amend the soil in NWRO's public demonstration garden and in employees' home gardens.

Challenges: Management of the BioStack is intense:

- If you don't watch how much you add to the bin, material can become very dense in the center.

- One year, a problem occurred when staff neglected to chop organic material before putting it in the bin, and the bin was in the direct sun. In the very late afternoon, heat-loving strains of bacteria flourished, but worms died. It was awful.
- The top drawer can leak leachate onto the bottom drawer.
- The hinges rusted and one of the sliding bars broke.
- The vermicompost sometimes comes out too wet, which makes harvesting really messy. Also, spiders (big ones) like to hide in the BioStack housing.
- Capacity is not exactly what the seller advertised.

Successes: People at NWRO have actively supported the project. The Sustainability Team has collected a very consistent volume of material. NWRO gave away about 100 zip-lock bags of vermicompost for Earth Day 2005.

Fort Worden State Park, Port Townsend, WA

History: Two local volunteers brought the idea for composting with worms to Fort Worden. One was Deirdre Morrison, a student at The Evergreen State College who was researching commercial composting ventures. The other volunteer was Christopher Overman, manager of the Hostelling International - Olympic Hostel at Fort Worden. (Christopher was already composting waste from the hostel.) When Fort Worden built a new dining hall, volunteers saw a very good chance to begin testing how composting might work on a larger scale.

The initial budget was $1,000 for materials. Volunteers donated time to construct the bins and maintain the system.

"When I initiated this project I saw so many reasons for Fort Worden to be involved in composting," says Deirdre. "First and foremost, commercial sized food service facilities produce so much food waste. Estimates from waste management statistics say forty to fifty percent of what leaves the facility as garbage is actually food. From the Fort Worden facility this amount in poundage could be higher than ten tons annually. That's a lot of waste that could be recirculated into compost, and eventually back to nutrient-rich fertilizer that can be used on the park grounds."

It was also a chance for Fort Worden to put into practice Executive Order 02-03 for Sustainable Practices by State Agencies. If Fort Worden is willing to act as an example, and if it can successfully maintain and manage the composting , doors will open for other Washington State Parks to start similar systems.

After less than a year in operation, the project received a grant from Ecology and bought a commercial worm bin. The project installed the bin at the Commons dining hall at Fort Worden. Now, volunteers don't have to haul food scraps and coffee grounds to a different place in the park. The original worm bins (as shown in the picture above) currently serve educational purposes. They continue to function but at much lower capacity.

Christopher Overman working the Original worm bins used at Fort Worden.

Materials Accepted: Kitchen prep waste (vegetable, fruit, bread, pasta, coffee grounds, etc.), but no meat, fat, or dairy foods.

Collection: Volunteers put scraps in plastic buckets with tight fitting lids, and place these outside in back of the building. Two or three times a week, volunteers empty the buckets into the worm bin.

Composting Process: The Hostel uses a commercial worm bin to compost food scraps, choosing vermicomposting over traditional composting methods for several reasons:

- Worms break down food fast; each square foot of bin space can accept up to 10 pounds of food every few days.
- By simple digestion, worms kill most pathogens that may be present.
- Worm castings (excrement) are the richest natural soil enhancer known. The worms themselves promote healthy bacteria and aggregation of the soil too. This type of system takes up less space than pile-style composting.

Volunteers load food scraps on the top of existing bed and cover the scraps with shredded paper or mulched leaves from the Fort's grounds. Volunteer groups, from Girl Scouts to Juvenile Services (part of the Hostel's youth mentoring program), gathered five dump truck loads of leaves in the fall 2006. The Fort stockpiled the leaves for future use in the worm bin. As worms work up through the compost, they leave vermicompost behind, which volunteers collect from the bottom of the system.

End Use: The vermicompost will fertilize Fort Worden's landscape, saving the park money and reducing the impacts of chemical fertilizers.

Challenges: Volunteers completely run this program. The Guest Services office was open to trying composting, but all maintenance, education, and collection falls to volunteers. When the project began, volunteers hoped local chapters of Master Gardeners or other interested groups would share in the work. This community connection has not occurred because the initial volunteers have not had time to create the partnership.

Volunteer Overman currently takes care of the commercial worm bin. He is hoping, however, that dining hall staff will eventually integrate this task into their weekly yard cleanup schedule, along with other recycling efforts.

Employee turnover is high at the dining hall. Volunteers must repeatedly train new workers about the correct separation of food scraps. Without training, employees don't separate food scraps from trash and the worms go hungry.

Successes: This project has earned enthusiastic support from Jefferson County waste management staff and Port Townsend City Council members. This support improves the public impression of the project, and may pave the way for similar projects at other facilities.

People are learning about the value of waste reduction and vermicomposting. Signs display information at the site. Visitors often walk past the site, and hostel-led tours make it their first stop. These tours, part of the hostel's environmental studies program, have been a hit with people who complete evaluation forms. The compost collection site at the hostel, along with other types of recycling, has an estimated 95 percent usage rate. The composting activity and recycling rate support the hostel's designation as a **Sustainable Living** Center by Hostelling International.

Calculated cost savings over disposal is approximately $150 a month. The Park also offsets some fertilizer costs by using the vermicompost on-site.

After two years of weighing food scraps, the data shows the system has diverted 8,000 pounds of food waste from the landfill. Volunteers have spent about 80 hours hauling food scraps, mixing them into the system, testing soil composition, and keeping records.

Appendix D
Tools

Appendix D

Tools

Useful guides to track, report and educate

While these documents were created for Ecology's Compost Demonstration Program, you may use these "tools" to help you plan, implement and track the progress of *your* food scrap management program.

You will find the following documents in this appendix:

- Waste Audit Standard Operating Procedure.
- Waste Audit Tally Sheets.
- Janitorial Food Scrap Collection Standard Operating Procedure.
- Compost Center Standard Operating Procedure.
- Compost Center Data Logs.
    - Earth Tub Record.
    - Vermicompost Record.
    - Earth Tub Harvest.
    - Vermicompost Harvest.
- Trouble Shooting at the Compost Center.
- Compost Graphics.

Standard Operating Procedure for WASTE AUDITS

Waste audits are a great way to track progress and identify areas of waste reduction that need improvement. Getting staff involved in the audit helps make an impression on them after seeing reusable and recyclable material in the waste.

Listed below are some steps that can be taken to ensure successful audits.

Before the audit

1. Choose a date
2. Rally volunteers—5 to 10 people is about right – in addition to WRR Participants (1 dozen total workers minimum?).
3. Consult with trash hauler to make sure regular collection occurs *after* your audit is complete.
4. Collect necessary "gear" to collect data and handle the trash safely
    a. Scale that accurately weighs at least 100 pounds
    b. Plastic sheeting to spread trash on.
    c. Tables – 4 for sorting & 2 for supplies.
    d. Labels for different categories of waste. See second page for examples of categories.
    e. Containers to collect different categories of waste. Use 18 - 30 gallon containers.
    f. Clipboards/pencils/pens and forms to record data on.
    g. Safety gear for volunteers
        i. Goggles
        ii. Gloves
        iii. Coveralls – Tyvek recyclable type. Collect after use and bag for shipping.
5. Have janitor save an entire day's waste *the day **before** the audit*.
    a. Have the janitors label/separate bags: Kitchen & Main Bldg.
    b. Place bags in large carts next to the Baler on the Loading dock.

Day of the audit

1. Set up "gear"
2. Brief volunteers
    a. Safety issues: Sharps, wrapped or closed packages, sanitary products, etc.
    b. Assignments: Who will sort, who will record, etc.

c. Procedure: Talk about parameters of different categories—make sure everyone knows the difference between paper and plastic.

d. Why their help makes a difference…what you hope to learn from their efforts.

3. Open a couple bags as space allows and begin sorting into categories.
4. As containers fill, record weight and volume, then empty container into appropriate recycling or trash receptacle.
5. At the end of the audit, make sure all trash bags have been accounted for.
6. Thank volunteers!

After the audit

1. Enter data collected into a simple spread sheet.
2. Divide total weight and volume of each different category by grand total of all categories to get percents.

   Example: 14 pounds of recyclable, mixed paper divided by 127 pounds of all categories, means that **11% of the total was recyclable, mixed paper**.

Tip: Use the same form with the same categories each time you perform an audit; this ensures consecutive waste sorts can be compared to each other.

This table illustrates different categories that you might want to track.

Category	Building		Kitchen		Total	
	Lbs	Gal.	Lbs	Gal.	Lbs	Gal.
Paper Towels						
Compostable Food Waste						
Office Pack Paper						
Mixed Waste Paper						
Cardboard						
Commingled Recyclables						
Miscellaneous Reusables						
Disposables (to go & cafeteria only)						
Garbage						
Totals						

12.05.06 Ecology HQ Building Waste Sort Data

Total # Bags_____ Total Unsorted Weight_____

	Building					Cafeteria					
Category	**Weight**				**Ttl**	**Weight**				**Ttl**	**Total**
Paper towels and tissue											
Compostable food waste											
Office Pack Paper (mostly white)											
Mixed Waste Paper											
Commingled Recyclables											
No-Stream Recyclables											
Disposable dishes and plastic-ware To Go containers											
Reusable/Salvageable											
Cardboard											
Garbage											
Hazardous Waste											

Observations:

Food Scrap/Paper Towel Collection for Night Janitor
Ecology ~ Lacey Building

Monday through Friday

Scraps from the coffee bars

1. Pick up cart with clean Food Scrap/Paper Towel Bin (bin) inserts. There should be 19 clean inserts on cart.
2. In coffee bars through out the building, remove filled inserts from bins and replace with clean inserts.
3. Take filled inserts to the Compost Center and empty them into an empty, red 44-gallon can, marked FOOD SCRAPS.
4. Place empty, used bins on cart, take to kitchen and wash them in the commercial dish washer.

Scraps from the kitchen cafeteria

1. Place bags of food waste from rectangular, FOOD SCRAPS containers on the cart—there should be about seven, black bags of scraps, including ***one clear bag of veggie scraps*** for feeding the worms.
2. Take cart to Compost Center and place bags in an ***empty***, red 44-gallon can—*leave the scraps in the plastic bags*.
3. Record volume (gallons) of scraps collected in the log book on top Rubbermaid locker in the Compost Center. Also record questions and comments.

Wrap up

1. Return to the kitchen with cart.
2. Finish washing inserts.
3. Load inserts on cart for next day's use.

The Compost Center

There should be **two** empty, red 44-gallon cans available for food scraps. Put loose food scraps in one, and bagged food scraps in the other can.

Please make sure that there are **no scraps** outside of the containers. This will help keep rodent problems under control.

In the morning, the Compost Center Operator will empty the food scraps into the Earth Tubs, feed the clear bag of veggie scraps to the worms, and put the 44-gallon cans back where you left them.

If you have questions, contact Steve Strope @ 407.6089 or Chery Sullivan @ 407.6915

Compost Center Standard Operating Procedure

Compost Operations

Primary Operator: Tom Suja, H & H Landscaping.
Secondary Operator: Aaron Johns, Building Services, 407.7059
Tertiary Operator: Doug Fawver, Building Services, 407.6160

Additional Contacts: Chery Sullivan, 407.6915; Holly Wescott, 407.6113; Jon Bennett, 407.6055

Compost Equipment Maintenance/Repair

Primary Contact: Steve Strope, Facility Manager, 407-6089
Secondary Contact: Doug Fawver, Bldg Services, 407-6160

This SOP is ***not a complete operating procedure for the Compost Center***. It is intended to provide enough information to guide the secondary or tertiary operator in case the primary operator is unavailable on a given day.

Earth Tubs

- Record weight of food scraps in log book (scale, tools and log book are in the grey locker)
- Remove lid of "active" tub, record temperature of compost taken with thermometer.
- Empty scraps from the red, 44-gallon containers into active Earth Tub.
- Distribute the food scraps evenly across the top of the Earth Tub by spreading them with the canoe paddle.
- Replace Earth Tub lid, turn on auger power and slowly rotate top of Tub *clockwise* two times. Run auger to center of Tub and slowly rotate top of Tub *counter-clockwise* two times, ending with the Tub lid ¼ turn from where it started. (This will make sure food scraps are added in a new location the next day.)
- Check moisture level of compost (should be moist like a wrung-out sponge). If too dry, add water with spray nozzle (1 ½ minutes of spray inside tub = 5 gallons of water), **record water added**. Turn on auger and slowly rotate top of Tub *clockwise* one turn, then *counter-clockwise* one turn to thoroughly mix in water.
- Clean the red, 44-gallon containers by scrubbing down sides of containers with 10 to 12 handfuls of sawdust; leave sawdust in the bottom of the container.
- Remove lid of "curing" tub and record temperature.

Harvest Earth Tub

If compost in the "curing" tub cools to ambient temperatures, and no visible remains of food are left, the compost is ready to be harvested.

- Place tarp under the side door.
- Line up several 44-gallon cans to hold compost.
- Open side door and shovel compost into 44-gallon cans for storage. Remove visible contamination as you see it, like utensils, plastic and larger woody debris.
- Move compost from the 44-gallon container to 5-gallon containers as they become available.
- Compost will be distributed to Compost Lottery winners in 5-gallon containers.

Bulk Earth Tub

After an Earth Tub is emptied, it needs to be "bulked" with carbon rich leaves, sawdust and wood shavings.

- Start with two inches of bark nuggets distributed evenly across the bottom of the Earth Tub. The auger in the tub should not touch this layer.
- Add three, 44-gallon containers of dry leaves.
- Add two, 44-gallon containers of fir wood shavings.

- Add one, 44-gallon container of fir or alder sawdust.
- Moisten with a spray nozzle and mix with auger until material is slightly damp…like a *well* wrung out sponge.
- Bulking material should fill the Earth Tub to the top of the side door. Add more leaves and wood shavings until you have the right volume. You are ready to add food scraps.

Worm Bin

- One of the bags of food scraps coming from the cafeteria will be clear. This bag should contain vegetative scraps only— OK bread, coffee grounds—NO meat, dairy or fatty scraps.
- Record weight of material added to worm bin in log book.
- Pull back the tarp on the worm bin, pull back top leaf or straw layer.
- Evenly distribute compost across the top of the worm bin in a layer no greater than one inch thick. Cover with leaf layer and tarp.
- Distribute food in a new location the next day.

Harvest Vermicompost

- After sufficient vermicompost has accumulated at the bottom of the worm bin, operator will use the hydraulic bar to "scrape" vermicompost from the bottom screen. Vermicompost falls through the screen and is collected below.
- Transfer harvested material to 5-gallon (or other designated) containers for distribution.
- Record weight of material harvested in log

Earth Tub (ET) Record

Date	ET Tub #	Temp°F	Pounds Food Scraps	Gallons Food Scraps	Pounds Sawdust	Gallons Sawdust	Gallons Water Added	Minutes Time Spent	Number of bags	Comments

Questions?? **Trouble shooting:** Holly Wescott, 407.6113 or Chery Sullivan, 407.6915 **Facilities:** Steve Strope, 407.6089

Vermicomposting System Record ~ "5-8 Worm Bin"

Date	Pounds ET Compost	Gallons ET Compost	Pounds Bedding	Gallons Bedding	Gallons Water Added	Minutes Time Spent	Comments

Questions?? **Trouble shooting:** Holly Wescott, 407.6113 or Chery Sullivan, 407.6915 **Facilities:** Steve Strope, 407.6089

ET = Earth Tub

Earth Tub Harvest Record

Date	E.T. #	Gallons	Pounds	End Use	Comments

Questions?? **Trouble shooting:** Holly Wescott, 407.6113 or Chery Sullivan, 407.6915 **Facilities:** Steve Strope, 407.6089

Vermicompost Harvest Record ~ "5 - 8 Worm Bin"

Date	Gallons	Pounds	End Use	Comments
Questions?? **Trouble shooting:** Holly Wescott, 407.6113 or Chery Sullivan, 407.6915 **Facilities:** Steve Strope, 407.6089				

Trouble Shooting at Ecology's Compost Center

Ideal Compost

Balance: **50% Carbon rich materials** (leaves, sawdust, wood shavings) and **50% Nitrogen rich materials** (fresh food scraps, green grass)

Moisture: Feedstocks should be moist like a **wrung out sponge**. When feedstocks are squeezed tightly, no water should drip out, but hand should glisten with moisture when feedstocks are released.

Oxygen: Keep compost **aerobic** (plenty of oxygen) at all times. Mix or turn daily, feedstocks should have a variety of particle sizes, including some woody debris.

Particle size: Majority of feedstocks should be no larger than **1 to 2-inches** for quickest decomposition.

Earth Tubs

Stinky:

1. Look at and sniff the floor drain between the two Earth Tubs; if you sense an odor, poor water down the drain.
2. Make sure biofilters are plugged in and running (pulling air from the Earth Tubs).
3. Open air valve (red handle at base of Earth Tub) all the way; handle should be in line (parallel) with the pipe coming out from the base of the Earth Tub.
4. Is compost anaerobic? If compost is too wet or too densely packed, no oxygen can penetrate the material and anaerobic bacteria take over the decomposition work ~ they can create a tremendous stink!

   If compost is anaerobic, add bulky, carbon materials like wood chips or shavings (start with 30 to 40 gallons and check the next day). Leaves will do in a pinch. Turn compost **thoroughly to mix** in bulky material, this will add oxygen and the bulky material will help keep pore spaces open so oxygen can flow through the pile.
5. Moisture level of compost is important; sometimes a slight odor will be given off if compost is too dry…all material in the Earth Tub should be evenly moist, and feel like a **wrung out sponge**. To dampen compost, spray mist through hatch for 1.5 minutes (equals 5 gallons), turn compost and repeat three times. Record amount of water added in log book.

1. Check drain.
2. Check biofilters.
3. Check air valve on Earth Tub.
4. Check oxygen levels in compost.
5. Check moisture levels of compost.

Cold:

1. Moisture level may have dropped too far. Add water as indicated in step 5 above. **Compost should be damp like a wrung out sponge**. If compost is drying out too quickly, close the air vent (red handle at base of Earth Tub) down a little. If the handle is in line with the air vent pipe, then the air vent is wide open; if the handle is at a 90˚ angle (perpendicular) to the air vent pipe, then the air

1. Check moisture level and air valve.
2. Check oxygen level.
3. Check compost balance.

vent is completely closed**. Do not completely close vent**.

2. Compost may be anaerobic, caused by too much water; add 30 to 40 gallons of bulky, carbon materials and **mix thoroughly**.
3. The right **balance of carbon** (brown leaves, wood shavings…) **and nitrogen** (green, fresh food scraps…) is **essential to a hot compost pile**. Sometimes cold compost needs more nitrogen. After a couple of days of regular food scrap additions, compost should begin to heat up again.

Too Wet:

1. If compost is too wet and is going **anaerobic**, add dry, carbon material such as wood shavings, sawdust or leaves to absorb the water and increase porosity, then **mix thoroughly**.

1. Check porosity.
2. Check air valve.

2. Open air valve (red handle at base of Earth Tub) all the way; handle should be in line (parallel) with the pipe coming out from the base of the Earth Tub.

Too Dry:

1. Use **CAUTION** when thinking about adding water: Remember that food scraps have high moisture content; as you add scraps, the moisture level in the Earth Tub will increase. After starting a new batch of compost, **wait for two weeks** before considering the addition of water.

1. Don't add water too soon.
2. Check moisture level.
3. Check air valve.

2. If compost is too dry then add water; **spray mist** through hatch with a sweeping motion to cover the compost surface, for **1.5 minutes**; **turn compost** and **repeat three times**. Add approximately 20-gallons of water then check the moisture level the next day. **Compost should be moist like a wrung out sponge**.
3. Close the air vent (red handle at base of Earth Tub) down a little. If the handle is in line with the air vent pipe, then the air vent is wide open; if the handle is at a 90˚ angle (perpendicular) to the air vent pipe, then the air vent is completely closed**. Do not completely close vent**.

Trouble Shooting at Ecology's Compost Center

Ideal Worm Bin Environment

Food: Feed vegetables and grains such as salad bar scraps, moldy bread, coffee grounds. Egg shells are good too. NO MEAT, DAIRY OR FATTY FOODS

Moisture: Feedstocks should look moist, but ideally, no water should drain from the bottom of the worm bin.

Temperature: Worms do well between 55˚ and 85˚F. Too cold, they stop working, so reduce food. Too hot and they'll leave the bin.

Worm Bin

Worms are escaping:

1. Worm bin may be **too moist**.
    a. Remove tarp from top of bin.
    b. Gently lift surface of feedstocks with pitchfork or shovel to allow more airflow.
    c. Place feedstocks in small piles to allow more airflow.
2. Worm bin may be **too hot**.
    a. Stop feeding the worm bin ~ the worms may have more food than they can process.
    b. Follow steps a. through c. under #1 above.
3. The worms may be **hungry**. If feeding partially composted material, make sure there is sufficient food value left in the compost to sustain the worms. If the worms are not crawling all over the compost, then they need additional, fresh food. Feed them pre-consumer veggie scraps, coffee grounds and moldy bread.

1. Watch moisture level. Worms like to be damp, but they are not aquatic.
2. Keep temperatures below 90˚ F.
3. Do worms have enough to eat?

Stinky worm bin:

1. Worm bin may be **anaerobic**. Follow steps under Worms are escaping
2. Make sure worms can process the amount of food being fed. Also check feedstocks…there should be **NO meat, dairy or fatty foods** in the worm bin.
3. **Keep feedstocks covered** with a loose layer of leaves.

1. Keep worm bin aerobic.
2. Do not over-feed worms.
3. Cover feedstocks.

Fruit flies, maggots or other insects swarming around the bin:

1. **DO NOT over-feed the bin**. The quicker the food is processed, the fewer the insects there will be.
2. Check the feedstocks… **NO meat, dairy or fatty foods** in the worm bin.
3. **Keep feedstocks covered** with a loose layer of leaves.
4. **Freeze** or **microwave** all feedstocks before feeding to worm bin to kill fruit fly eggs.

1. Do not over-feed worms.
2. No meat, dairy or fatty foods.
3. Cover feedstocks.
4. Freeze or microwave all feedstocks (if absolutely necessary.)

Promotional Materials

These pictures represent stickers and signs used to promote food scrap composting at Ecology. Any program interested in using these designs can download the files from the Solid Waste and Financial Assistance Program at: www.ecy.wa.gov/programs/swfa/. Follow the link at the bottom of the page Solid Waste Topics, Compost.