

Survey of Home Compost Bin Recipients La Grande, Oregon

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In partnership with the City of La Grande, Oregon

Executive Summary

In 2001, the City of La Grande, Oregon, sold 311 compost bins to households. Bins cost approximately \$50 each but were sold at a price of only \$10 each. This bin distribution program was paid for in part by a solid waste reduction grant from the Oregon Department of Environmental Quality (DEQ). The City distributed the home compost bins as part of a larger strategy aimed at reducing landfilling, increasing composting, and reducing outdoor burning. The City also offered a mobile chipping service and, at about the same time, the City's exclusive garbage hauler opened a site where households could drop-off yard debris for free. The City is currently an EPA non-attainment area for PM-10 particulate, and the burning of wood and yard wastes has historically been a major contributor to air pollution.

In late 2002, the City and DEQ collaborated on a mail-back survey of all 303 households who purchased compost bins. Principles of community based social marketing were applied to obtain a high response rate. Using commitments, community norms, prompts, and incentives, a remarkable 89% of surveys were returned completed. Mail-back surveys of this type normally attain only a 20-40% response rate.

This report provides detailed analysis of the survey responses. Responses are also compared against a separate survey of La Grande residents as a whole regarding wood burning practices.

The bin distribution effort appears to have diverted material from the landfill, provided households with finished compost material, and contributed to a reduction in outdoor burning of yard debris and associated air pollution. Some of the key findings of the home composting survey are summarized below.

Bin Use

- 82% of respondents claim to be using their City-provided bin more than a year after purchasing it.
- Among the 18% who aren't using the City-provided bin, roughly half are composting on-site anyway, or stopped using the bin due to circumstances unrelated to problems with the bin or composting.
- More than a year following bin distribution, only 46% of bin users have used some of their finished compost, although another 53% said that they haven't yet but plan to do so.

Changes in On-Site Composting, Burning, and Disposal

- 91% of households surveyed are composting at least some of their yard debris on-site, up from 49% prior to bin distribution. Grass clippings are composted on-site by 76% of households and leaves by 77% of households; 64% of households compost some or all of their green prunings (trimmings, weeds, etc.) on-site, while only 23% of households compost woody prunings on-site.

- Prior to bin distribution, 63% of households disposed of at least a portion of their yard debris in the garbage. This fell to 34% following bin distribution.
- Prior to bin distribution, 27% of households burned at least some of their yard debris outdoors. Outdoor burning fell to 14% following bin distribution.
- 59% of households are composting materials other than yard debris on-site. The most commonly composted “other” materials include food waste (55%) and garden food scraps such as garden vegetables and apples (8%).

Estimated Waste Diversion

- The City-provided bins are diverting an estimated 40 to 78 tons of yard debris per year. However, perhaps less than half of this is “new” diversion. The remainder is material that households were already composting at home, or material that has been shifted to on-site composting from another waste diversion method such as grasscycling, mulching, or off-site composting.
- Among households who *started* composting on-site following bin distribution, only about 20% of them did so at the expense of the off-site composting program. Thus, a relatively small fraction of material put into compost bins was material that previously had been sent to the area’s centralized composting facility.

Education and Information

- 95% of bin users reported that the educational materials they received with their bins were either “very useful” or “useful”.
- There is moderate demand among the bin recipients for additional services and information:
 - 16% of respondents said that they would like another compost bin.
 - 55% said they would be interested in additional information.
 - 32% asked for information about native/drought-tolerant plants.
 - 25% asked for information on appropriate herbicide/pesticide use.
 - 24% asked for information on composting food scraps at home.
 - 17% asked for information on “grasscycling” (leaving grass clippings on the lawn).
 - 69% of respondents signed up to receive a free Natural Gardening booklet (provided by DEQ and mailed out by the City of La Grande).
 - 75% asked to be entered into a drawing for a prize of two cubic yards of finished compost, donated by City Garbage Service.

Satisfaction with Compost Bins

- 52% of households using their bins reported that they were “very satisfied” and had “no problems” with the bins. Another 43% reported being merely “satisfied” and that the bin “could be better”. Only 5% of bin users reported being not satisfied. However, among households no longer using their bin, 37% reported being “not satisfied”.
- The most common complaints were problems with the bins/bins being difficult to use (cited by more than 30% of respondents) and “compost didn’t break down” (cited by 26% of respondents).
- Future bin distributions in La Grande (and other communities) might want to explore a bin model other than the brand used in La Grande, and may also want to use enhanced or improved educational materials.

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At DEQ, the solid waste grant that led to this project was managed by Bruce Lumper. Scott Fairley assisted with bin distribution and education. Survey design, interpretation of results, and preparation of this report was led by David Allaway, with assistance from Bruce Lumper, Scott Fairley, Michelle Shepperd, Judy Henderson, Marti Roberts-Pillon, and Mary Sue Gilliland. Scott Latham designed the survey database, while Michelle Shepperd developed the survey form.

Introduction

This introduction section profiles the community of La Grande, describes the compost bin distribution program, and then provides details about the survey objectives, methodology, response rate, and data analysis. Actual survey results are described in the following section.

Community Profile

The City of La Grande is located in Union County in northeast Oregon. In 2003, the city had a population of approximately 12,500. It is the largest city and the county seat of Union County (population 24,650). Agriculture, lumber, higher education, and manufacturing are the area's primary industries.

Nestled at the foot of the Blue Mountains on the edge of the fertile Grande Ronde Valley, La Grande is located at 2,800 feet above sea level and has cold winters (average January temperature is 24 degrees Fahrenheit) and warm, dry summers (average July temperature is 86 degrees Fahrenheit). Botanically, the environment in and around La Grande is similar to other mountainous areas in the inland Northwest, with conifers (including the deciduous conifer tamarack) as the dominant type of native tree, but significant plantings of broadleaf shade trees in the city. La Grande has been recognized as a "Tree City USA" by the National Arbor Day Foundation for 13 years.

Composting yard debris can reduce on-site burning, and therefore reduce air pollution. The City was declared a “non-attainment area” for PM-10 (particles less than 10 microns in aerodynamic diameter) in 1991, although data showing non-attainment dates back to 1987. PM-10 particulate pollution is significant from a health perspective because the respiratory system (nose, etc.) is not very effective at filtering out these very small particles. Once inside the lungs, PM-10 can cause both restrictive (such as pulmonary fibrosis/scarring) and obstructive (such as asthma) lung diseases. Since 1988, La Grande has operated an air quality program that has raised citizen awareness of the health impacts of burning wood, using burn barrels, backyard yard debris burning, and other activities. The quality of La Grande’s air has improved but a recent National Air Toxics Assessment listed Union County as having a concentration of many air toxics over ten times the benchmark.

Surveys in 1993 and 2002 of wood burning practices were commissioned by the Oregon DEQ and conducted by the Oregon Institute of Technology. These surveys were administered by U.S. mail to a randomly selected sample of households both inside and outside the city limits of La Grande. While these surveys focused on issues of indoor burning of firewood (types and amounts of wood burned, etc.), they also asked a few questions about outdoor burning of yard debris.

Prior to 2001, there was no formal yard debris composting service in the La Grande area. Households could manage their yard debris on-site, pay a landscaping/chipping service to chip and/or remove the yard debris, or haul it to the area’s landfill (which was recently closed to the public and replaced with a waste transfer station). In 2001 the La Grande City Council approved a \$1.75 per month rate increase for the City’s sole franchised garbage hauler (City Garbage Service) to fund a yard waste drop-off site and composting operation, which opened in August 2001. The drop-off site is open to the public from March through November each year (it shuts down during December, January and February due to limited need). This composting facility, called “Waste-Pro,” is located at the area waste transfer station and collected 275 tons of compostable material in 2001, 710 tons in 2002, and 1,893 tons in 2003.

Compost Bin Distribution

In 2000 the City of La Grande applied for a DEQ solid waste reduction grant to purchase and distribute compost bins to city residents and to provide curbside tree limb chipping services. The grant was awarded in 2001. These activities, along with the new yard debris drop-off and composting site described above, were designed to reduce the landfilling of yard waste, improve air quality by reducing the open burning of yard waste, and promote composting.

The City purchased 250 compost bins and sold them the La Grande citizens for \$10 each. The City chose to sell the “Cascadia” Compost Bin, shown in Figure 1. Each bin has a capacity of 21 cubic feet and is manufactured from recycled plastic containers and auto battery cases. DEQ grant funds of \$12,315 were used to purchase and pay for the shipping of 250 bins, for a per-bin cost (including delivery) of \$49.26. These first bins were distributed to city residents in May and June of 2001. Using the \$2,500 in revenue from the resale of these first bins, the City then purchased an additional 61 bins and distributed them in August 2001 (a few bins were distributed

in the autumn). A few individuals purchased more than one bin, so the final tally was 303 households purchasing 311 bins.

All residents purchasing a bin were given some simple information about how to compost yard debris as well as information about food waste composting, grasscycling (leaving grass clippings on the lawn) and mulching (placing uncomposted plant material directly on the soil). They also signed a contract agreeing to pay \$10 for the bin, leave the bin on-site if they moved out of La Grande, and respond to a participation survey roughly one year after bin distribution. This contract is included as part of Appendix A.

Figure 1.
Assembly of “Cascadia” Compost Bin, Demonstrated by Scott Fairley (DEQ).



Survey Methodology and Response Rate

The Oregon DEQ worked with the City of La Grande to design and administer a survey of the 303 households who purchased bins. The survey, which is included in Appendix A, was mailed to all 303 households by the City on November 20, 2002. The timing of this survey meant that all recipients had at least one full year in which to set up and use their bin. The majority of recipients (the first 250) had one full year plus an additional summer, so in theory they should

have had enough time to fill their bin, create and use finished compost, and start the process over again.

In designing the survey and its delivery, DEQ and the City drew on several principles of community based social marketing in order to maximize the response rate, including the following:

- The survey was accompanied by a cover letter signed by the City manager, a community leader.
- The cover letter noted the importance of everyone's response and reminded recipients of the commitment they had previously made (in the contract) at the time they purchased the bin to participate in the survey.
- The survey was designed as a "self-mailer" and had return postage already attached.
- All survey recipients were offered a free Natural Gardening booklet (provided by DEQ) if they responded to the survey form. (69% of survey respondents requested the booklet).
- Also, all survey recipients were offered the opportunity to be entered into a special prize drawing. The prize, donated by City Garbage Service, was two cubic yards of finished yard debris compost. (75% of survey respondents asked to be entered into the prize drawing.)
- The City planned on conducting a follow-up telephone survey of non-respondents (people not mailing back the print survey). The telephone survey would attempt to re-administer the full survey, but if people were unwilling to do the full survey over the phone, a few select questions would be asked as a refusal survey.

The follow-up telephone calls were intended to increase the response rate, and, combined with the short refusal survey, were to be used to test whether bin use was statistically different between non-respondents and respondents. Typically, mail-back surveys of this type obtain a response rate in the range of 20%-40%. If respondents are not representative of the larger survey population, this can yield misleading results. (For example, enthusiastic composters may be more likely to respond to the survey, while less enthusiastic households or people who didn't use the bin might be less likely to respond to the survey.) The follow-up survey was designed to find out if the two groups (respondents and non-respondents) were different and if any conclusions could be drawn about the population of bin recipients as a whole.

However, within three weeks of mailing the original survey, the City had already received 198 responses – a 65% response rate. The City decided to send a follow-up letter to non-respondents before starting telephone calls, which are viewed as intrusive. (As 75% of survey respondents asked to be entered into the prize drawing, and provided their return address or contact information, the identity of the majority of survey respondents was known and so the City was able to avoid sending a follow-up letter to most households who had already responded). A follow-up letter with another copy of the survey was sent around December 12. By January 6, 2003, the number of returned surveys was 251 (an 83% response rate). A telephone reminder was made to the 52 households who still hadn't responded as of January 6. In the end, 271 of 303 surveys were returned, which is an 89% response rate. Such a high response rate is almost unheard of in these types of surveys and reflects in part the social marketing tools, described above, that were applied in the project and survey (use of commitments, community leaders, reminders/prompts, etc.).

Survey Objectives

The objectives of this survey were to:

1. Determine how many bin recipients are still using the bins for home composting, more than a year after purchasing them.
2. Determine how bin owners are managing their yard debris, and how this changed as a result of the bin distributions.
3. Estimate landfill diversion (both total and new diversion) resulting from bin use, if possible. Estimate cost per ton of new landfill diversion.
4. Determine if significant potential exists for additional diversion (do people need more bin capacity?).
5. Identify level of satisfaction, benefits and problems that the users associate with home composting (including the bins themselves and educational materials).
6. Look at reasons why households never started or stopped using their home composting bins.
7. Identify additional information or services that residents want in order to further reduce environmental impacts associated with yard, garden and lawn care.

Survey results (below) are organized according to these seven objectives.

While Oregon statute allows wastesheds (counties) to obtain special credits toward their recovery rate goals if they can document the tonnage diverted through home composting practices, this survey was not designed to be used in this manner. The population of households surveyed (303) was not representative of the larger population of La Grande (or Union County), because these 303 households purchased (at a subsidized cost) compost bins from the City, whereas the other households in Union County have not. Put differently, the households contacted in this survey may not be representative of the larger population of the city and county. (The discussion of Objective 2, below, compares responses to this survey against responses to the 2002 air quality/burning practices survey in part to determine if our survey population was or wasn't representative of the larger population.)

Data Analysis

All survey responses were entered by the City of La Grande into an Access database that was created by DEQ. City staff conducted a quality assurance/quality control check on data entry before sending the completed database back to DEQ. Data analysis was conducted by DEQ in 2003. Analysis and report preparation was delayed due to budget constraints.

Throughout this report, the participation rate or "response rate" is expressed as the *number of survey respondents responding "yes" (such as, participating in a specific behavior) divided by the total number of survey respondents*, unless noted otherwise. This is a reasonable assumption, if the 89% of households responding to the survey have similar behaviors to the 11% of

households not responding to the survey. If the survey respondents engage in a behavior at a higher participation rate than the non-respondents, then this approach will slightly over-estimate the total participation. Because only 11% of households didn't respond to the survey, even if none (or all) of them are participating in a specific behavior, they don't have a large influence on the total results one way or the other. This is illustrated in Appendix B.

Appendix B also includes a discussion of confidence intervals. In summary, all confidence intervals are calculated at 95% confidence. For example, if 72% of respondents answered "yes" to a certain question, and the confidence interval is 70%-74%, then we are 95% confident that the true percentage of all households answering "yes" *had they responded* would be somewhere between 70% and 74%. Again, this assumes that non-respondents, on average, have similar experiences and opinions as respondents.

Survey Results

Use of Bins (Objective 1)

Survey questions relevant to this objective are Questions 1 and 3 (see Appendix A for the full questions).

Figure 2 shows that 81–84% of survey respondents claim to be using their bin at least one year after receiving it. The remaining 16–19% of survey respondents were not using their bin in the late fall of 2002, more than a year after receiving them. (Reasons given are presented later in this report.)

**Figure 2.
Use of City-Provided Compost Bin**

Q1. Are you using your bin to compost yard waste now?			
response	number	percentage of (n)	95% confidence range
Yes (x)	223	82%	81% - 84%
No	48	18%	16% - 19%
No response	0	0%	
Total (n)	271	100%	

Of the 223 households claiming to be using their bin for composting, 218 answered in Question 3 that they were currently composting at least one of the four types of yard debris (grass, leaves, green prunings, and woody prunings). The remaining five respondents claim to be using their bin but didn't claim to be composting any of these types of yard debris on-site.

Of the 48 households claiming that they are not using the City-provided bin, fully half of them (24 respondents) are composting at least one kind of yard debris on-site. Thus, not all composting is limited to households who are using the City's bin.

Methods Used to Manage Yard Debris (Objective 2)

Survey questions relevant to this objective are Questions 1, 3, 4, and 10 (see Appendix A for the full questions).

Grass Clippings.

Figures 3 and 4 show how La Grande residents surveyed (both bin users and non bin users) claimed to be managing their grass clippings a year or more after bin distribution (Figure 3) and before bin distribution (Figure 4).

The percentage of households composting at least a portion of their grass clippings on-site increased from 41% before bin distributions to 76% after bin distributions. There was very little change in the percentage of households grasscycling (leaving grass clippings on the lawn) or hauling their grass clippings off-site for composting. Disposing of grass clippings in the garbage decreased; 35% of households disposed of at least some of their grass clippings in the garbage before bin distribution, but following bin distribution only 7% of households were doing so. Outdoor burning of grass clippings fell slightly, from 4% to 1% of households.

At the time of the survey (after bin distribution), 61% of households used only one method to manage their grass clippings, while 39% used a combination of methods.

Prior to bin distributions, 50% of all households were already managing all grass clippings by using *on site best management practices*, which include on-site composting and/or grasscycling/mulching (but not burning). Following bin distributions, this percentage increased to 79%.

Prior to bin distribution, 62% of households were not landfilling or burning any of their grass clippings, through an exclusive combination of on-site composting, mulching, and/or off-site composting. Following bin distribution, 92% of households were engaged exclusively in these best management practices of on-site composting, grasscycling/mulching, and/or off-site composting for grass clippings.

**Figure 3.
Management of Grass Clippings After Bin Distribution**

Q3. What do you CURRENTLY do with grass clippings? (Please check ALL that apply.)			
response	number	percentage of (n)	95% confidence range
Compost at home	198	76%	74% - 77%
Leave on lawn/mulching mower	121	46%	44% - 48%
Haul off-site for composting	41	16%	14% - 17%
Dispose with garbage	18	7%	6% - 8%
Burn outdoors	2	1%	0% - 1%
Burn indoors	0	0%	
All responses (n)	262	100%	
No response	9		
Total survey population	271		
Best Management Practices			
On-site BMPs only (1)	206	79%	77% - 80%
All BMPs (2)	242	92%	83% - 87%

- (1) Compost at home and/or leave on lawn/mulching mower
 (2) Compost at home, leave on lawn/mulching mower, and/or haul off-site for composting.
 No landfilling or burning.

**Figure 4.
Management of Grass Clippings Before Bin Distribution**

Q10. What did you do with grass clippings BEFORE receiving the City bin? (Please check ALL that apply.)			
response	number	percentage of (n)	95% confidence range
Composted at home	107	41%	39% - 43%
Left on lawn/mulching mower	116	45%	42% - 47%
Hauled off-site for composting	55	21%	19% - 23%
Disposed with garbage	91	35%	33% - 37%
Burned outdoors	11	4%	3% - 5%
Burned indoors	0	0%	
All responses (n)	260	100%	
No response	11		
Total survey population	271		
Best Management Practices			
On-site BMPs only (1)	130	50%	48% - 52%
All BMPs (2)	161	62%	60% - 64%

- (1) Compost at home and/or leave on lawn/mulching mower
 (2) Compost at home, leave on lawn/mulching mower, and/or haul off-site for composting.
 No landfilling or burning.

Leaves.

Figures 5 and 6 show how La Grande residents surveyed (both bin users and non bin users) claimed to be managing their leaves at the time of the survey (Figure 5) and before they received their compost bins (Figure 6).

As shown in Figures 5 and 6, the percentage of households composting at least a portion of their leaves on-site increased from 41% before bin distributions to 77% after bin distributions. There was very little change in the percentage of households mulching their leaves on-site (directly placing leaves on garden or flower beds), or hauling their leaves off-site for composting.

Disposing of leaves in the garbage decreased; 31% of households disposed of at least some of their leaves in the garbage before bin distribution, but following bin distribution only 7% of households were doing so. Outdoor burning of leaves fell from 9% to 2% of households. All of these results very closely mirror the results for grass clippings.

At the time of the survey (after bin distribution), 59% of households used only one method to manage their leaves, while 41% used a combination of methods.

Prior to bin distributions, 35% of all households were already managing all leaves by keeping them on site, either through on-site composting and/or mulching. Following bin distributions, this percentage increased to 53%.

Prior to bin distribution, 62% of households were not landfilling or burning any leaves, through an exclusive combination of on-site composting, mulching, and/or off-site composting. Following bin distribution, 92% of households were engaged exclusively in these best management practices of on-site composting, mulching, and/or off-site composting for leaves.

Green Trimmings, Prunings, and Weeds.

Figures 7 and 8 show that the percentage of households composting at least a portion of their green trimmings on-site increased from 27% before bin distributions to 64% after bin distributions. There was a slight increase in the percentage of households hauling their green trimmings off-site for composting (an increase from 38% before bins to 43% after bins). Disposing of green trimmings in the garbage decreased; 52% of households disposed of at least some of their green trimmings in the garbage before bin distribution, but following bin distribution only 26% of households were doing so. Outdoor burning of green trimmings fell from 13% to 6% of households.

At the time of the survey (after bin distribution), 66% of households used only one method to manage their green trimmings, while 34% used a combination of methods.

Prior to bin distributions, just 14% of all households were already managing all of their green prunings on-site through composting. Following bin distributions, this percentage increased to 36%.

**Figure 5.
Management of Leaves After Bin Distribution**

Q3. What do you CURRENTLY do with leaves? (Please check ALL that apply.)				
response	number	percentage of (n)	95% confidence range	
Compost at home	201	77%	75%	- 79%
Leave on lawn/mulching mower	53	20%	18%	- 22%
Haul off-site for composting	109	42%	40%	- 44%
Dispose with garbage	18	7%	6%	- 8%
Burn outdoors	4	2%	1%	- 2%
Burn indoors	0	0%		
All responses (n)	261	100%		
No response	10			
Total survey population	271			
Best Management Practices				
On-site BMPs only (1)	139	53%	51%	- 56%
All BMPs (2)	239	92%	90%	- 93%

- (1) Compost at home and/or leave on lawn.
 (2) Compost at home, leave on lawn, and/or haul off-site for composting.
 No landfilling or burning.

**Figure 6.
Management of Leaves Before Bin Distribution**

Q10. What did you do with leaves BEFORE receiving the City bin? (Please check ALL that apply.)				
response	number	percentage of (n)	95% confidence range	
Composted at home	105	41%	39%	- 44%
Left on lawn/mulching mower	56	22%	20%	- 24%
Hauled off-site for composting	96	38%	35%	- 40%
Disposed with garbage	80	31%	29%	- 34%
Burned outdoors	22	9%	7%	- 10%
Burned indoors	0	0%		
All responses (n)	255	100%		
No response	16			
Total survey population	271			
Best Management Practices				
On-site BMPs only (1)	89	35%	33%	- 37%
All BMPs (2)	158	62%	60%	- 64%

- (1) Compost at home and/or leave on lawn.
 (2) Compost at home, leave on lawn, and/or haul off-site for composting.
 No landfilling or burning.

Figure 7.
Management of Green Prunings (Trimmings, Weeds, etc.) After Bin Distribution

Q3. What do you CURRENTLY do with green trimmings/prunings/weeds? (Please check ALL that apply.)			
response	number	percentage of (n)	95% confidence range
Compost at home	166	64%	62% - 66%
Haul off-site for composting	112	43%	41% - 45%
Dispose with garbage	68	26%	24% - 28%
Burn outdoors	15	6%	5% - 7%
Burn indoors	0	0%	
All responses (n)	260	100%	
No response	11		
Total survey population	271		
Best Management Practices			
On-site BMPs only (1)	94	36%	34% - 38%
All BMPs (2)	181	70%	68% - 72%

(1) Compost at home.

(2) Compost at home and/or haul off-site for composting. No landfilling or burning.

Figure 8.
Management of Green Prunings (Trimmings, Weeds, etc.) Before Bin Distribution

Q10. What did you do with green trimmings/prunings/weeds BEFORE receiving the City bin? (Please check ALL that apply.)			
response	number	percentage of (n)	95% confidence range
Composted at home	70	27%	25% - 29%
Hauled off-site for composting	97	38%	35% - 40%
Disposed with garbage	133	52%	49% - 54%
Burned outdoors	34	13%	12% - 15%
Burned indoors	3	1%	
All responses (n)	257	100%	
No response	14		
Total survey population	271		
Best Management Practices			
On-site BMPs only (1)	37	14%	13% - 16%
All BMPs (2)	99	39%	36% - 41%

(1) Compost at home.

(2) Compost at home and/or haul off-site for composting. No landfilling or burning.

Prior to bin distribution, 39% of households were not landfilling or burning any of their green trimmings, through an exclusive combination of on-site and/or off-site composting. Following bin distribution, 70% of households were engaged exclusively in these best management practices of on-site composting and/or off-site composting for green prunings.

Woody Prunings.

Figures 9 and 10 show how La Grande residents surveyed (both bin users and non bin users) claimed to be managing their woody prunings at the time of the survey (Figure 9) and before they received their compost bins (Figure 10).

As shown in Figures 9 and 10, the percentage of households composting at least a portion of their woody prunings on-site increased from 10% before bin distributions to 23% after bin distributions. There was essentially no change in the practice of on-site chipping, which held steady at about 10% of households. Hauling of woody prunings off-site for composting increased from 49% to 63% of households. Disposing of woody prunings in the garbage decreased; 37% of households disposed of at least some of their leaves in the garbage before bin distribution, but following bin distribution only 19% of households were doing so. Outdoor burning of woody prunings fell from 25% to 11% of households. Indoor burning of woody prunings, however, remained essentially flat, at about 5% of households responding to the survey.

At the time of the survey (after bin distribution), 75% of households used only one method to manage their woody prunings, while 25% used a combination of methods.

Prior to bin distributions, just 7% of all households were already managing all woody prunings on-site through composting and/or chipping. Following bin distributions, this percentage increased to 15%.

Prior to bin distribution, 41% of households were not landfilling or burning any of their woody prunings, through an exclusive combination of on-site composting, chipping, and/or off-site composting. Following bin distribution, 67% of households were engaged exclusively in these best management practices of on-site composting, chipping, and/or off-site composting for woody prunings

Comparison of Materials.

Figures 11 and 12 display the data from Figures 3 through 10 in a slightly different format, allowing for an easy comparison between all four materials. Figures 11 and 12 also provide additional data in the last three columns, which show the prevalence of management practices for all types of yard debris. For example, if a household was landfilling only one type of yard debris and composting at home all of the others, this is reflected in the last three columns of Figures 11 and 12. Figure 11 shows all management practices at the time of the survey; Figure 12 shows all management practices prior to delivery of the compost bins.

Figure 9.
Management of Woody Prunings After Bin Distribution

Q3. What do you CURRENTLY do with woody trimmings/prunings? (Please check ALL that apply.)			
response	number	percentage of (n)	95% confidence range
Compost at home	59	23%	21% - 25%
Chip at home	23	9%	8% - 10%
Haul off-site for composting/chipping	161	63%	60% - 65%
Dispose with garbage	48	19%	17% - 21%
Burn outdoors	29	11%	10% - 13%
Burn indoors	12	5%	4% - 6%
All responses (n)	257	100%	
No response	14		
Total survey population	271		
Best Management Practices			
On-site BMPs only (1)	38	15%	13% - 16%
All BMPs (2)	171	67%	64% - 69%

- (1) Compost and/or chip at home.
 (2) Compost at home, chip at home, and/or haul off-site for composting/chipping.
 No landfilling or burning.

Figure 10.
Management of Woody Prunings Before Bin Distribution

Q10. What did you do with woody trimmings/prunings BEFORE receiving the City bin? (Please check ALL that apply.)			
response	number	percentage of (n)	95% confidence range
Composted at home	26	10%	9% - 11%
Chipped at home	25	10%	8% - 11%
Hauled off-site for composting	127	49%	47% - 52%
Disposed with garbage	96	37%	35% - 39%
Burned outdoors	64	25%	23% - 27%
Burned indoors	13	5%	4% - 6%
All responses (n)	258	100%	
No response	13		
Total survey population	271		
Best Management Practices			
On-site BMPs only (1)	18	7%	6% - 8%
All BMPs (2)	106	41%	39% - 43%

- (1) Compost and/or chip at home.
 (2) Compost at home, chip at home, and/or haul off-site for composting/chipping.
 No landfilling or burning.

Figure 11.
Management of All Yard Wastes After Bin Distribution

Q3. Please mark the appropriate boxes that describe your CURRENT yard waste management practices. (Please check ALL that apply.)

Response	Grass			Leaves			Green trimmings, weeds, etc.			Woody prunings			Any/all yard waste		
	Number	% of n	95% C.R.	Number	% of n	95% C.R.	Number	% of n	95% C.R.	Number	% of n	95% C.R.	Number	% of n	95% C.R.
Compost at home	198	76%	74% - 77%	200	77%	75% - 79%	166	64%	62% - 66%	59	23%	21% - 25%	242	91%	88% - 90%
Leave on lawn/mulching mower/chip at home	121	46%	44% - 48%	53	20%	18% - 22%	N/A			23	9%	8% - 10%	141	53%	50% - 54%
Haul off-site for composting/chipping	41	16%	14% - 17%	109	42%	40% - 44%	112	43%	41% - 45%	161	63%	60% - 65%	184	69%	66% - 70%
Dispose with garbage	18	7%	6% - 8%	18	7%	6% - 8%	68	26%	24% - 28%	48	19%	17% - 21%	91	34%	32% - 35%
Burn outdoors	2	1%	0% - 1%	4	2%	1% - 2%	15	6%	5% - 7%	29	11%	10% - 13%	36	14%	12% - 15%
Burn indoors	0	0%	0% - 0%	0	0%	0% - 0%	0	0%	0% - 0%	12	5%	4% - 6%	12	5%	4% - 5%
All responses (n)	262			261			260			257			265		

C.R. = 95% Confidence Range

Figure 12.
Management of All Yard Wastes Before Bin Distribution

Q10. Please mark the appropriate boxes that describe what did you do with yard waste BEFORE receiving the City bin. (Please check ALL that apply.)

Response	Grass			Leaves			Green trimmings, weeds, etc.			Woody prunings			Any/all yard waste		
	Number	% of n	95% C.R.	Number	% of n	95% C.R.	Number	% of n	95% C.R.	Number	% of n	95% C.R.	Number	% of n	95% C.R.
Composted at home	107	41%	39% - 43%	105	41%	39% - 44%	70	27%	25% - 29%	26	10%	9% - 11%	130	49%	47% - 51%
Left on lawn/mulching mower/chipped at home	116	45%	42% - 47%	56	22%	20% - 24%	N/A			25	10%	8% - 11%	134	51%	48% - 53%
Hauled off-site for composting/chipping	55	21%	19% - 23%	96	38%	35% - 40%	97	38%	35% - 40%	127	49%	47% - 52%	153	58%	56% - 60%
Disposed with garbage	91	35%	33% - 37%	80	31%	29% - 34%	133	52%	49% - 54%	96	37%	35% - 39%	167	63%	61% - 65%
Burned outdoors	11	4%	3% - 5%	22	9%	7% - 10%	34	13%	12% - 15%	64	25%	23% - 27%	71	27%	25% - 29%
Burned indoors	0	0%	0% - 0%	0	0%	0% - 0%	3	1%	0% - 0%	13	5%	4% - 6%	14	5%	4% - 6%
All responses (n)	260			255			257			258			265		

C.R. = 95% Confidence Range

Figure 11 shows that:

- 91% of households surveyed are composting at least one of the four materials (grass, leaves, green trimmings, and woody prunings) on-site.
- 76% of households are composting grass clippings on-site.
- 77% of households are composting leaves on-site.
- 64% of households compost some or all of their green prunings (trimmings, weeds, etc.) on-site.
- 23% of households compost woody prunings on-site.

Similarly:

- 69% of households at the time of the survey were hauling at least a portion of their yard wastes to an off-site composting facility (presumably the Waste-Pro facility).
- 34% of households at the time of the survey were disposing of at least a portion of their yard wastes with their garbage. Green trimmings (26% of households) and woody prunings (19%) are more likely to be disposed of than grass (7%) or leaves (7%).
- 14% of households at the time of the survey were burning at least some of their yard wastes outdoors, and 5% were burning at least some of their yard wastes indoors. Woody prunings and green prunings are the materials most commonly burnt outdoors, while woody prunings are the only materials that are burnt indoors.

Comparing Figures 11 and 12:

- Participation in any home composting rose from 49% to 91% following bin distribution.
- Use of on-site management practices other than home composting and burning (mulching, grasscycling, chipping) was essentially unchanged before and after, in the 48% - 54% range.
- Households hauling yard debris off-site for composting and/or chipping increased from 58% to 69% following bin distribution.
- Prior to bin distribution, 63% of households disposed of at least a portion of their yard debris in the garbage. This fell to 34% following bin distribution.
- Prior to bin distribution, 27% of households burned at least some of their yard debris outdoors and 5% burnt at least some of their yard debris indoors. Outdoor burning fell to 14% following bin distribution, while indoor burning remained steady (at 5%). Providing additional waste management methods did not affect the practice of indoor burning, suggesting that indoor burning of prunings is primarily viewed as a method of heating, rather than a waste management method.

Other Materials Composted (Food, etc.).

While the survey asked specific questions about grass, leaves, green prunings and woody prunings, Question 4 provided an open-ended question of “Are you composting other material at home? If so, what?”

160 of the 271 survey respondents (59%) answered “yes” to this question. Responses are summarized in Figure 13.

**Figure 13.
Other Materials Composted at Home**

Material	Responses	Percent of All Surveys
Kitchen food (described as potato peels, coffee grounds, kitchen vegetable waste, egg shells, peelings, fruit cores, kitchen scraps, table scraps, non-meat food scraps, food, leftovers, etc.)	148	55%
Garden scraps (described as garden excess, garden residue, garden scraps, apples, pumpkins, garden vegetables, garden extras, vegetables from garden, etc.)	22	8%
Straw/hay	5	2%
Paper, cardboard, egg cartons	4	1%
Garbage	3	1%
Manure, chicken litter	3	1%
Other (sod, sawdust, ash, pine cones, spent grain from home brewing)	1 each	< ½% each

Changes in On-Site Composting Practices.

Figure 14 summarizes changes in on-site composting practices among survey respondents.

**Figure 14.
Changes in On-Site Composting Participation**

		Previously Composting Any Materials On-Site		
		Yes	No	Total
Currently composting any materials on-site	Yes	125 (46%)	118 (44%)	243 (89%)
	No	5 (2%)	23 (8%)	28 (10%)
	Total	130 (48%)	141 (52%)	271 (100%)

Figure 14 can be understood as follows:

- Of the 271 households responding to the survey, 130 (48%) were already composting before they received their bin from the City.
- Of these 130, 125 continued composting while 5 actually stopped composting after they received the bin.
- Of the 271 households responding to the survey, 141 (52%) were not composting before they received their bin from the City.
- Of these 141, 118 started composting following receipt of the bin, while 23 persisted in not composting.
- Thus, there was a net increase of 113 composters (118 households who started, less 5 who stopped), which is 42% of the survey respondents. The overall rate of on-site composting grew from 48% to 89% of bin recipients.

Even among the 125 households who were already composting before receiving a bin (and continued to do so), there was an increase in composting behavior. Of these 125 households, 16

reported composting fewer types of yard trimmings after receiving the bin while 40 reported composting more types of yard trimmings (and the remaining 69 households reported no change in the number of different types of yard trimmings composted on-site). Because the survey did not ask about historical (pre-bin) composting of other materials (food, etc.) the increase in on-site composting of food is not known. The average household adding types of yard debris composted on-site added 1.2 types of debris (from the list of four types in the survey) while the average household dropping types of yard debris dropped 1.1 types.

Impact of On-Site Composting on Off-Site Composting Participation.

Some solid waste professionals have asked if people who compost yard debris on-site do so at the expense of participation in off-site composting. Put differently, are bin distribution programs like those in La Grande simply shifting landfill diversion from one method (centralized off-site composting) to another method (decentralized on-site composting)?

One way of testing this theory is to evaluate households who began on-site composting following bin distribution. Of these households, how many were *previously* hauling their yard waste to a composting facility, and then discontinued that practice following bin distribution? Results are portrayed in Figure 15. La Grande does not have curbside collection of source separated yard debris, so this survey cannot evaluate the relationship between on-site composting and curbside participation.

**Figure 15.
Households Composting On-Site at the Expense of Off-Site Composting**

Number of Households That:	Grass	Leaves	Green Prunings	Woody Prunings
Started backyard composting following bin receipt (A)	103	105	102	40
and stopped hauling to composting facility following bin receipt (B)	20	17	19	9
(B)/(A)	19%	16%	19%	23%

As Figure 15 shows, among households who started on-site composting after receiving a bin, only 16%-23% of them subsequently stopped hauling their yard debris to an off-site composting or chipping facility. Thus, most, although not all, of the material put into compost bins was not material that previously had been sent to the Waste-Pro facility.

Changes in Outdoor Burning.

Figure 16 summarizes changing in outdoor burning practices among survey respondents.

**Figure 16.
Changes in Outdoor Burning of Yard Debris**

		Previously Burning Any Yard Debris Outdoors		
		Yes	No	Total
Currently burning any yard debris outdoors	Yes	32 (12%)	4 (1%)	36 (14%)
	No	39 (14%)	196 (72%)	235 (87%)
	Total	71 (27%)	200 (74%)	271 (100%)

Figure 16 can be understood as follows:

- Of the 271 households responding to the survey, 71 (27%) were burning outdoors before they received their bin from the City.
- Of these 71, 32 continued burning outdoors while 39 stopped doing so after they received the bin.
- Of the 271 households responding to the survey, 200 were not burning outdoors before they received their bin from the City.
- Of these 200, 4 actually started burning outdoors following receipt of the bin, while 196 persisted in not burning outdoors.
- Thus, there was a net decrease of 35 outdoor burners (4 households who started, less 39 who stopped), which is 13% of the survey respondents. The total percentage of survey respondents burning yard debris outdoors fell from 27% to 14%.

Of the 32 households who persisted in burning yard debris outdoors, there was a marked decrease in the number of different types of yard debris burned. Of the 4 types of yard debris asked about in the survey, the average number of material types burned outdoors by this group fell from 1.8 to 1.4 per household. This reflects 11 households who stopped burning at least one type of yard debris and only one household who increased the types of yard debris burned outdoors.

The majority of households who eliminated or reduced outdoor burning of yard debris did so by taking advantage of one or more of the non-disposal alternatives. Of the 50 households in the survey who either stopped burning altogether or reduced the number of materials burned, only 15 (30%) are sending any yard debris off for disposal; the other 70% are relying exclusively on some combination of on-site composting, on-site mulching/chipping, and off-site composting.

According to the La Grande Fire Department, the number of requests for open burning permits decreased from 145 for the fall 2000 burning season to 88 for the fall 2001 burning season. Thus, it appears that an increase in home composting has contributed to the reduction in open burning. The free yard waste drop-off service, which is available to all area residents, has also contributed to the reduction.

Outdoor Burning: Comparison to Larger 2002 Survey.

As noted in the “Community Profile” section above, DEQ’s Air Quality Program commissioned a survey of all La Grande residents in 2002 regarding outdoor burning. Comparison of results between these two surveys is useful. As the outdoor burning survey was administered to a representative sample of *all* La Grande residents, and the two surveys had a few questions in

common, comparison allows us to see if outdoor burning by bin recipients is similar to that of La Grande residents as a whole. Put differently, when it comes to outdoor burning, were bin recipients representative of the larger population? Or were they perhaps already more attuned to air quality problems and less likely to burn their yard debris outdoors?

**Figure 17.
Comparison of Outdoor Burning Surveys**

Percent Reporting Outdoor Burning of:	2002 Air Quality/Open Burning Survey (Summer 2002)	2002 Home Composting Survey of Bin Recipients	
		Pre-Bin Behavior (2001)	Post-Bin Behavior (2002)
Leaves and/or grass	12%	9%	1%
branches/shrubs*	22%	24%	13%

*Corresponding to “green prunings” and/or “woody prunings” in the home composting survey.

Figure 17 shows that the outdoor burning behavior of bin recipients *prior* to receiving the bin was very similar to that of La Grande residents as a whole:

- 9% of bin recipients burned leaves and/or grass before receiving their bin (compared to 12% of city residents as a whole) and
- 24% burned branches/shrubs outdoors before receiving their bin (compared to 22% of city residents as a whole).

After a year’s experience of working with their compost bins, the behavior of bin recipients had deviated significantly from that of city residents as a whole. Outdoor burning of leaves and/or grass fell from 9% to 1%, and outdoor burning of branches/shrubs fell from 24% to 13%. (Results for individual materials, and confidence intervals, are shown in Figures 11 and 12).

As a side note, it is interesting to compare the outdoor burning behavior of city residents with those who live in the La Grande area but outside of the City limits. While 12% and 22% of City residents claimed to be burning grass/leaves and branches/shrubs outdoors in 2002, these numbers jump to 31% and 64%, respectively, for residents outside of the City limits.

Estimated Waste Diversion and Cost-Effectiveness of Bin Distribution (Objective 3)

Some solid waste analysts may be interested in an estimate of the amount of material diverted from disposal through home composting, and specifically through the use of the City-provided bins. Not all of the material composted in the bins is “new” diversion, however, as some of the bin recipients were already composting at home before they received their bin (see Figure 14). The energy conservation field refers to such participants (people who participate in incentive programs but are already engaging in the targeted behavior) as “free-riders”. Free riders are important to account for as not all of the material they compost is “new” diversion. Further, some of the people who started on-site composting following bin distribution merely shifted diversion away from another method (such as off-site composting, as shown in Figure 15).

Therefore, it may be useful to estimate both the total amount of material diverted through the City-provided bins, as well as the portion of material which is truly “new” diversion and can be attributed to the bin distribution program. Doing so allows for the development of an estimate of the cost-effectiveness of bin distribution and a comparison of the relative cost-effectiveness of public funds being spent on bin distribution.

The methodologies used to estimate total and “new” diversion are fairly complex and are described in Appendix C. Results are summarized below.

Estimates of Total Diversion

Two different methods are used to estimate total placement of materials in the compost bins. Both methods are described in detail in Appendix C.

The first method combines survey results for participation and users’ estimates of the volume of uncompacted materials placed into their bins during the last year. The resulting total volume estimate is multiplied by a range of material densities. Food waste is treated separately from mixed yard debris. The resulting estimate ranges from 27 to 54 tons of total diversion in the City-provided bins in the first year.

The second method combines participation data from the La Grande survey with estimates of per-household diversion from studies of home composters in other communities. This leads to an estimated range of diversion of 52 to 103 tons in City-provided bins in the first year.

Both estimation methods are imperfect (for different reasons; see Appendix C) but represent the “best estimates” of diversion. The “true” answer probably lies somewhere between the lowest and highest estimates. The two estimated ranges are combined into a single range by averaging the low estimate from both methods and then averaging the high estimate from both methods. This leads to a combined range of 40 to 78 tons composted in the first year in City-provided bins.

Estimate of New Diversion.

Not all of this diversion is “new” diversion (that is, material that was previously disposed of). A significant portion of households using the bins are “free riders”; they were already composting on-site before they received the bins (see Figure 14). And households that are new to home composting may simply be shifting materials into their compost bin from methods such as off-site composting or grasscycling that were already diverting the yard wastes from disposal (see Figure 15). Estimating the percentage of total diversion which is in fact “new” is quite difficult. A very rough estimation method described in Appendix C leads to estimate that only 35% of the material put into City-provided compost bins is “new” diversion. The remainder would be materials that were already (previously) composted on-site (by free riders) and materials that were shifted from other types of diversion, including off-site composting, grasscycling, mulching, and chipping.

Given that this was the first subsidized bin distribution in La Grande, it isn’t too surprising that close to half of all bin recipients were already composting at home before they received their bin. As “early adopters” of home composting in the community, these households would be receptive to the idea of bin distribution. If bin distributions were continued in La Grande, existing

composting households would eventually become saturated with bins, and a greater proportion of households purchasing bins would be new to home composting. Long-term participation among this group might be lower, but a greater percentage of the materials put into their compost bins might be new diversion. If bin distribution continued, we would expect the percentage of diversion that qualifies as “new” to increase from this estimate of 35%.

Regardless, this 35% estimate is multiplied against the estimate of total diversion (in year one) of 40–78 tons, resulting in an estimate of new diversion of 14–27 tons.

Ten-Year Estimate of Diversion.

One of the advantages to local governments of home compost bin distributions is that they have minimal to no ongoing operating costs. Unlike curbside collection, which requires both up-front capital expenses (for trucks and in some communities, bins) and ongoing operating costs (labor, truck operation, tipping fees, etc.), public costs of home compost bin distribution programs are largely front-loaded into the costs of purchasing and distributing the bins. Some waste diversion benefits then continue for multiple years without additional government expenses.

This report takes a 10-year horizon for the purpose of estimating total diversion. It is known that use of bins attenuates over time as people move, age, or otherwise stop using their bins. Using attenuation data from one of the few communities known to have collected such data (Seattle), it is assumed that 70% of the bins distributed in La Grande will still be in use at the end of ten years. This and other assumptions (see Appendix C) leads to ten-year cumulative estimates of 127–250 tons of new diversion, and 363–716 tons of total diversion, through the City-provided compost bins.

Cost of Bin Distribution.

The cost per ton of diversion is estimated using a multiple-step method that involves:

- Estimating the public-sector cost of bin distribution.
- Applying this cost against the ten-year diversion totals for an estimate of cost-per-ton.

The estimated gross cost to the City of La Grande for distribution of the 311 compost bins was approximately \$19,432. This includes \$15,488 for the purchasing and shipment of bins, and an additional \$3,944 in personnel and supplies. (The City’s grant report estimates \$4,676 in personnel costs and supplies, although the grant included \$2,800 in mobile chipping service costs as well, and so the personnel/supply costs are pro-rated between the home composting and the mobile chipping elements of the grant).

Offsetting the gross cost of \$19,432 is an estimated \$3,110 in revenue, as each of the 311 bins was sold to the public at a cost of \$10 each. Thus, estimated net costs (after sales revenues but before DEQ grant funds) were \$16,322, or \$52.48 per bin. Actual cost to the City was considerably lower because of the DEQ grant.

Not included in this estimate is the cost of grant administration by DEQ or the costs of assistance with outreach, training, and donated “free” media. Also not included is City and DEQ time spent on program evaluation.

Similarly, the cost to the bin recipients to purchase the bin (at \$10 each) and the labor cost of using the bin is also not included. Of course, purchase and use of the bins was totally voluntary.

Cost of Diversion.

Net costs to the City of \$16,322 (not including the DEQ grant), divided by the estimate of new diversion of 126–250 tons translates into a cost per ton of new diversion ranging from \$65-\$129.

Dividing net costs by the estimate of 363–716 tons of total diversion translates into a cost per ton of all materials diverted ranging from \$23-\$45.

To put these costs into perspective, the marginal price to the public to dump a ton of garbage at the local transfer station is \$22/ton. Yard debris and wood waste can be dropped-off at no charge. The marginal cost to the public to dispose of these materials in their curbside garbage can is higher as it includes both the disposal fee plus collection costs.

These per-ton costs are higher than those estimated in several other communities. One possible explanation is that the small number of bins distributed in La Grande (relative to some other communities) may have led to higher per-bin costs, as larger buyers sometimes benefit from per-unit discounts deeper than those offered to La Grande.

Not reflected in the discussion above is any estimation of the financial benefit of on-site composting. Generally speaking, the benefits of composting on-site include:

- the production of a finished compost product, which has water conservation and soil fertility and health benefits,
- the potential to displace use of commercial petrochemical fertilizers with compost product,
- reduced pollution associated with the collection, consolidation, and centralized processing of yard debris,
- reduced greenhouse gas emissions (primarily methane) from the decomposition of yard debris in landfills, and
- the physical and emotional benefits associated with outdoor activity and gardening.

The benefit of these activities is not included in the estimates of cost, above.

Need for Additional Bin Capacity (Objective 4)

The bins provided to La Grande residents were the “Cascadia” brand compost bin, with a capacity of 21 cubic feet. While most residents purchased only one bin, a small number purchased more than one. (303 households purchased a total of 311 bins.)

Question 9 of the survey provided households with an opportunity to note if they had any problems with home composting, and if so, prompted them with a list of possible reasons. One of the prompted reasons was “bin not large enough”. Only 15 households (6% of survey respondents) checked this box. This subgroup is so small as to make statistical comparison against the larger population of bin recipients less than ideal.

Not surprisingly, households in this subgroup are more likely to be composting on-site each of the four yard debris types at rates higher than the survey population as a whole:

- Grass: 93% of the “bin not large enough” subgroup compost grass on-site vs. 76% of all respondents.
- Leaves: 87% of “bin not large enough” subgroup compost leaves on-site vs. 77% of all respondents.
- Green prunings: 87% of “bin not large enough” subgroup compost green prunings on-site vs. 64% of all respondents.
- Woody prunings: 27% of “bin not large enough” subgroup compost woody prunings on-site vs. 22% of all respondents.

If the bins are not large enough, it is implied that excess materials must be managed in some other manner. Yet a comparison of landfilling practices between the two groups shows mixed results:

- Grass: 13% of the “bin not large enough” subgroup landfill at least a portion of their grass clippings vs. 7% of all respondents.
- Leaves: 7% of both groups landfill at least a portion of their leaves.
- Green prunings: 20% of the “bin not large enough” subgroup landfills at least a portion of their green prunings vs. 26% of all respondents.
- Woody prunings: 13% of the “bin not large enough” subgroup landfill at least a portion of their woody prunings vs. 19% of all respondents.

Given these results, and the relatively small number of households who noted insufficient bin capacity as a problem, it appears that insufficient capacity is not leading to significant disposal of “excess” yard debris.

In Question 11, at the end of the survey, respondents were asked if they would be interested in receiving another compost bin. 16% of respondents answered “yes” to this question. The households in this 16% group who would like an additional bin but who didn’t say that insufficient bin capacity was a problem can be interpreted as households for whom insufficient capacity isn’t viewed as a “problem”. These households may be composting excess material on the side, or managing it in some other manner that doesn’t inconvenience them.

Satisfaction; Benefits and Problems Associated with Home Composting (Objective 5)

Satisfaction with Bins.

The survey asked several questions regarding households’ satisfaction with the bin and educational materials, use of finished compost, and problems with home composting.

**Figure 18.
Satisfaction With City-provided Compost Bin.**

Q5. How satisfied are you with your City-provided compost bin?				
	Bin users (Q1 = "yes")		Other (Q1 = "no")	
	Number	Percentage of (n)	Number	Percentage of (n)
Very satisfied, no problems	115	52%	19	54%
Satisfied, could be better	95	43%	3	9%
Not satisfied	11	5%	13	37%
All responses (n)	221		35	
No response	2		13	

Figure 18 shows the results to Question 5, “How satisfied are you with your City-provided compost bin?” Results are shown for two groups: those claiming to be using their bins (Q1 = “yes”) and others. Interestingly, the percentage of households not using the bin who said they were “very satisfied” (54%) is essentially the same as the percentage of households using the bin who are also “very satisfied”. Thus, a portion of households no longer using the bin (Q1 = “no”) have not stopped composting due to dissatisfaction with the bin, but rather due to some other problem. (See Objective 6, below, for an evaluation of why some households stopped on-site composting.)

However, there is a significant difference between these two groups in the other responses. 43% of bin users said they were “satisfied” but not “very satisfied,” while only 5% said they were not satisfied. Among non bin users, this pattern is essentially reversed, with 9% saying they were merely “satisfied” and 37% saying they were “not satisfied.” Thus, while the large majority of bin users (95%) are either “very satisfied” or just “satisfied,” a much smaller majority of non bin users (63%) share this viewpoint.

Usefulness of Educational Materials.

Figure 19 shows the results to Question 6, “How useful was the educational material you received with the bin?”

**Figure 19.
Usefulness of City-Provided Educational Materials**

Q6. How useful was the educational material you received with the bin?				
	Bin users (Q1 = "yes")		Other (Q1 = "no")	
	Number	Percentage of (n)	Number	Percentage of (n)
Very useful	68	31%	10	26%
Useful	139	64%	24	63%
Not useful	9	4%	4	11%
All responses (n)	216		38	
No response	7		10	

Responses to Question 6 were similar between bin users and households not using their bin. Large majorities of both groups (89% to 95%) reported that the educational materials were either “very useful” or “useful.” The relatively small numbers claiming that the educational materials were “very useful” (31% of bin users; 26% of non-users) suggests that there may be a benefit to improving upon the materials used in future distributions. Educational materials handed out with the bins are included in Appendix A.

Use of Finished Compost.

Question 8 asked if the household had used any of the finished compost from the bin. As the survey was administered more than a year after bin distribution, all households should have had an opportunity to fill their bin, create finished compost, use it, and start over again. This question is important because, like recycling, the full benefit of composting is not realized until the collected/processed material is used in a productive manner.

Figure 20 shows the responses to Question 8.

Figure 20.
Use of Finished Compost

Q8. Have you used any of the finished compost from the bin?				
	Bin users (Q1 = "yes")		Other (Q1 = "no")	
	Number	Percentage of (n)	Number	Percentage of (n)
Yes	101	46%	13	37%
No, but I plan to	116	53%	17	49%
No, and I don't plan to	1	0%	5	14%
All responses (n)	218		35	
No response	5		13	

The large majority of survey respondents either have used their finished compost or state that they plan to. As of the time of the survey, however, only 46% of current bin users had actually used finished compost, with another 53% claiming that they hadn't but planned to.

Problems with Composting.

Question 9 of the survey asked, "Have you had any problems with home composting?" Households were then invited to check from a list of problems and to write in other problems not on the list. 52% of current bin users and 38% of respondents not currently using their bin reported having problems with home composting. Figure 21 shows the number and percentage of survey respondents who listed specific problems.

A review of Figure 21 suggests that the most common problem La Grande residents had involved the design of the compost bin. The most common complaints were "compost didn't break down" (cited by 26% of residents) and "bin difficult to use" (cited by 23% of residents). When the prompted and unprompted responses are combined, 30% of respondents cited problems with the bins. (This includes the 23% of respondents who checked "bin difficult to use" plus an additional 7% of respondents who didn't but noted bin-related problems in their comments under "other").

Reasons Households Never Started or Stopped Using Bins (Objective 6)

Question 1 of the survey asked residents if they were currently using their bin(s) to compost yard waste. Respondents answering "no" (n = 48) were asked to please explain why not. Responses were unprompted and can be classified into three general groups as follows:

- Problems with the bin (17): this includes bin design (mostly too large, too tall, too hard to use, fell over), materials (poor quality, cracked) and problems with the wind blowing the lid and/or the bin away. One respondent said that they couldn't assemble the bin, and took it back to the City.
- Circumstances unrelated to the bin or composting (14). Eight respondents said they had moved, three had become too ill to use the bin, one said their bin was stolen, and two said they weren't currently composting because it was wintertime.

- Other comments, not easily classified (10). These included variations of “I don’t produce enough yard debris to use the bin” (4 responses), “just haven’t gotten around to it yet” (3 responses), “I don’t know how” and “it isn’t what I expected”.

Figure 21.
Problems with Home Composting

Q9. Have you had any problems with home composting? If yes, please check ALL that apply.		
	Number	Percentage of respondents (n = 271)
<i>Prompted Responses</i>		
Compost didn’t break down	71	26%
Compost smelled bad	26	10%
Pests/rodents	7	3%
Bin difficult to use	62	23%
Bin not large enough	15	6%
Other	89	33%
<i>Unprompted Responses (respondents checking “other”, above, were asked to explain)*</i>		
Awkward to use (includes difficult to aerate, difficult to turn compost, too deep, too big, hard to stir, can’t get to bottom, bin should turn/spin, etc.)	46	17%
General problems getting material to compost (includes didn’t add enough water, didn’t add enough green materials, compost is slow, not hot enough, fir needles and sunflower stalks don’t compost well)	18	7%
Wind problems (blew away, lid blew off)	10	4%
Flimsy (sides collapse, won’t stay round)	5	2%
Weed/insect transmission problems – weed seeds weren’t composted and germinated in garden beds where finished compost was applied; compost spread click beetle to garden beds	3	1%
Need more bins	3	1%
Yellowjackets, bees	2	1%
Flies, maggots	2	1%
Mold	2	1%
Others (1 each; includes “live on hill, bin in shade”, “never got nuts and bolts”, “flat washers should be included”, “just need to open it and check it”, “need educational material, bin was here”, “took awhile to get started”, “will try wrapping in plastic”, “yard man takes grass and leaves”, and “we have bin from Portland”).	10	Less than 1% each

*Explanations of “other” problems by respondents varied widely and have been classified into general categories. Some respondents listed multiple “other” problems and thus are counted in several categories.

Household Interest in Additional Information and Services (Objective 7)

The last two questions of the survey asked about respondents’ interest in receiving additional information or materials. Question 11 provided a list of information or materials that households could express an interest in receiving. A final question (unnumbered) provided households with an opportunity to be entered into the prize drawing (for two cubic yards of finished compost, donated by City Garbage Service) and also to receive a free Natural Gardening booklet.

Figure 22 summarizes responses to these questions.

The highest interest was expressed for information on native and drought-tolerant plants (32% of survey recipients). Interest was also moderately high for information on appropriate herbicide/pesticide use (25%) and information on composting food scraps (24%). 16–17% of households expressed an interest in another compost bin and information about “grasscycling” (leaving grass clippings on the lawn).

Finally, 75% of households asked to be entered into the prize drawing for two cubic yards of finished compost, and 69% specifically requested for a free natural gardening booklet. DEQ provided copies of this booklet (co-produced with Metro) to the City of La Grande, who addressed and mailed them to all respondents who asked for the booklet as a “thank you” for participating in the survey.

Figure 22.
Household Interest in Additional Information and Services

Q11. Please mark the box(es) that indicate additional items/information you are interested in.		
	Number	Percentage of respondents (n = 271)
<i>Prompted Responses</i>		
Another compost bin	44	16%
Information on native/drought-tolerant plants	88	32%
Information on appropriate herbicide/pesticide use	67	25%
Information on “grasscycling” (leaving grass clippings on the lawn)	47	17%
Information on composting food scraps at home	65	24%
More information on composting yard waste at home*	48	18%
Please enter me in the prize drawing	202	75%
Please send me the free Natural Gardening booklet	186	69%

*Recipients answering this question were asked to describe (unprompted) what additional information they wanted. 33 respondents gave fairly generic responses involving yard waste such as “how to compost yard waste at home”, “leaves, grass and pine needles” and “how to speed up yard waste”. Other responses included worm composting (2), recommendations on home chippers (2), gray water systems (1), food composting (1), “chemical to break down wet garbage” (1), “want to sell bin” (1), and “what NOT to put in bin” (1).

Appendix A

Contract for Bin Recipients

Educational Materials

Survey Form and Cover Letters

SAMPLE

COMPOSTING BIN CONTRACT

This Contract is entered into between the City of La Grande (City) and the Recipient of a subsidized composting bin named below. Recipient agrees to pay \$10.00 for the composting bin, receipt of which is hereby acknowledged.

Recipient understands that the composting bin was funded in part by a grant from the Oregon Department of Environmental Quality (DEQ). The goal of the program is to divert yard waste from landfills, produce organic material for gardening and reduce open burning.

Recipient agrees that the composting bin shall remain with the property if recipient sells or moves outside of the City of La Grande. If recipient moves to another location within the City of La Grande, the bin may be moved also. Alternatively, the composting bin may be returned to City Garbage Service for distribution to another Recipient. No refunds will be granted unless the composting bin is returned unused within ninety (90) days of purchase.

Recipient understands that the City and DEQ will be conducting a survey of recipients approximately one (1) year from this date. Recipient agrees to respond to said survey to help City and DEQ measure the success of this program.

Dated this _____ day of May 2001.

City of La Grande

Recipient

«FirstName» «LastName»

«Address1»

«City», «State» «PostalCode»

Phone: «Phone_»

• FOOD WASTE

6% of our garbage is Food Waste. This represents about 1,200 tons per year at Foxhill. This waste placed in garbage trucks bumper to bumper would stretch 1½ miles. Food can be composted by direct burial in the ground. This is the simplest and least labor intensive. The other option is to use red worms. Red worms, unlike garden or earthworms or nightcrawlers, thrive on organic waste. This process will yield a very high quality, rich compost. A box like the one illustrated below will handle about 7 lbs. of food scraps per week.

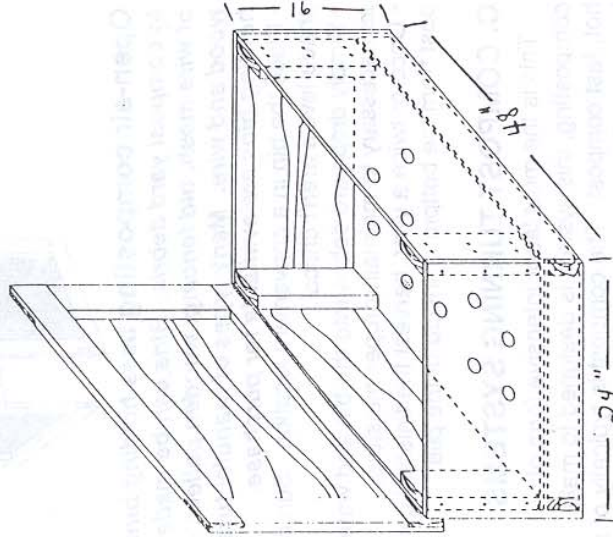
- (1) Find or build a shadow box like the one illustrated with drainage holes and a heavy, tight fitting lid.
- (2) Fill your worm bin with moist "bedding," brown leaves, shredded newspaper or cardboard, straw or peat moss.
- (3) Bury vegetable and fruit scraps into the bedding, rotating locations throughout the bin.
- (4) Every 6 to 8 months push the old bedding and decomposing scraps to one side of the bin. Rebed the empty side and start burying food wastes in the fresh bedding.
- (5) After allowing the older scraps to finish for another month or so, remove the compost and add more fresh bedding.
- (6) Worms must be kept between 40 and 84 degrees. If left outside in the winter, they will more than likely perish.

City Garbage Service has detailed plans, sources of red worms and more detailed information call: **963-5459**

COMPOST NEWS

Find out how easy it is to compost at home.

Each year 4,000 tons of yard debris and food waste are deposited at Foxhill Landfill. This is a waste of a usable resource.



CITY GARBAGE SERVICE
1202 WILLOW
LA GRANDE, OREGON 97850
(503) 963-5459

• YARD WASTE

Approximately 17% of the waste going to Foxhill is yard waste. This equates to 3,400 tons per year. If all this material were in garbage trucks and they were parked end to end, they would stretch for 4½ miles. To use a land fill for disposal of yard waste is unnecessary and wasteful. There are several alternatives to landfilling these materials.

A. DIRECT LAND APPLICATION

This is the simplest way to recycle organic materials at home. Direct land application uses the many types of organic wastes in their original form as mulches, or bury them into the soil.

Grasscycling saves time spent bagging and can reduce annual fertilizer needs.

- Remove excess thatch (over 1/2 inch), then leave clippings on the lawn.
- Keep your mower blade sharp.
- Mow frequently when the grass is dry and at the recommended cutting level for your type of turf.
- Never cut more than 1/3 of the grass length.
- Avoid over-fertilizing or over-watering your lawn.

Mulching enriches the soil, suppresses weeds, conserves moisture, prevents soil erosion, and protects plants from cold.

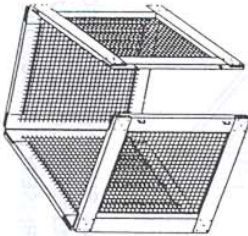
- Use grass clippings, leaves, straw, manure, sawdust, bark and wood chips as mulch around trees, shrubs and other perennial plantings.
- In annual flower and vegetable gardens, use only non-woody mulches (i.e., grass clippings and leaves) that break down quickly.

Soil Incorporation means simply burying organic materials right into the soil. Because of the absence of air, some nutrients will be lost.

- Grass clippings, leaves and soft garden wastes can be tilled directly into garden beds.

B. COMPOST HOLDING SYSTEMS

This is a more labor intensive and time-consuming way to compost. While bins are not technically needed for composting, they keep piles neat, organized, and out of reach from pests and children.

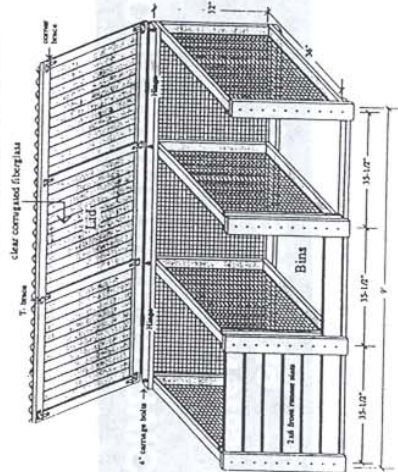


Open-air composting uses holding bins to compost yard debris. Bins can be made of wire mesh, old fencing, wooden pallets, or wood and wire. Many types of manufactured holding bins are available for purchase.

- Place the bin in a convenient location. Sun or shade levels aren't critical.
- Simply drop yard debris into the bin and water as necessary to maintain proper moisture.
- Once or twice a year, harvest the finished compost from the bottom or inside of the pile.

C. COMPOST TURNING SYSTEMS

This is the most labor intensive form of composting, this system is designed to make hot, fast compost. The compost is typically of a higher quality, because the high temperatures kill weed seeds and many plant diseases.



Hot composting with multiple bins is best for gardeners who have large volumes of yard debris and the desire and time to make high-quality compost. A series of 2 or 3 bins can be made of wood, wire, or masonry blocks. Call for construction plans.

- Mix alternating layers of brown (high-carbon) and green (high-nitrogen) materials.
- Dampen materials until they feel like a wrungout sponge.
- Turn and mix the materials into the next bin just after the pile temperature peaks and decreases substantially (approximately 4 to 7 days).
- If the materials feel dry, add more water; if they didn't get hot the first time, add more high-nitrogen material (or nitrogen fertilizer).
- Turn again after the temperature peaks (4 to 7 days).
- After the compost cools down for a few weeks, it should be ready to use.

The finished product can be used for soil amendment, potting mixture, mulch or as a top dressing.

If you have further needs, questions or would like detailed drawing for the construction of holding or turning systems contact:

CITY GARBAGE SERVICE
(503) 963-5459

Tips on Composting

WHY COMPOST AT ALL?

Along with fuel efficiency, water conservation, and reduction in meat consumption, home composting is one of the most environmentally beneficial activities of modern society. Yard and food wastes make up approximately 30% of the waste stream in the US. Not only does composting successfully divert a significant portion of your family's waste stream from the landfill and water treatment facilities, it is a natural method of recycling organic materials into valuable humus. Finished compost is nutritious enough to use as a soil amendment, buffering the pH and helping to retain water in the soil. It can cool the soil's surface, and help mitigate erosion. Why buy topsoil when you create your own endless supply?



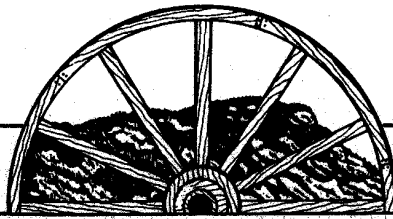
Home Composting also serves as an invaluable educational tool, teaching youngsters about conservation, the cycle of life, and inter-connectedness of the natural world. If it gets your child thinking about science or biology, or voluntarily participating in gardening and yard work, isn't it well worth the effort?

HOW TO COMPOST

Like death and taxes, composting happens - whether we want it to or not. Though all organic matter will eventually decompose (despite neglect), the trick is to get your pile to decompose as fast as you can fill it. The rate at which breakdown occurs depends on several factors: oxygenation, temperate, water content, particulate surface area, and the carbon:nitrogen ratio (see chart below). Like painting, composting is more art than a rigid science, and can at times require a bit of finesse and skill. However, with patience and a little practice, you can have ready-to-use humus for your garden in 6-8 weeks.

Factors Affecting Rate	Description
Oxygenation	Oxygen is required for respiration by all aerobic inhabitants within the pile. Adequate ventilation, wind, convection currents and manual turning or mixing will help keep the anaerobic critters from producing foul odors.
Temperature	The optimum temperature for fast decomposition is between 90 and 135 degrees F. Whether it is due to cold climate or insufficient bacterial activity, when the temperature falls below this, decomposition will slow, but not cease. To keep temperatures elevated, try an insulation jacket or better placement for maximizing radiant solar heat. Also choose black colored bins in cooler climate zones.
Water Content	An efficient composter needs to have a moisture content around 50% (feels like a damp towel). If it is too dry, decomposition will slow down considerably, while overly wet piles can smell. Keep pile covered during heavy rains, and add rain water when dry spells occur (chlorine in municipal water can kill the organisms in your living system).
Surface Area	Maximize this by shredding and chipping all clippings and waste into small pieces. The more area you expose to micro-organisms, the larger the dinner table, and the faster the decomposition.

CITY OF



LA GRANDE

THE HUB OF NORTHEASTERN OREGON

OFFICE of the CITY MANAGER P.O. BOX 670 LA GRANDE, OREGON 97850 PHONE (503) 962-1302 FAX (503) 963-3333

Dear City Resident:

Our records show that you purchased a reduced-cost home compost bin from the City last year. At the time you purchased the bin, you agreed to participate in a follow-up survey. Please take a few minutes to complete this survey and return it to us by folding, taping it, and dropping it in the mail (return postage has already been provided).

Your responses are very important, even if you haven't used the compost bin. The survey results will be used to improve our existing Yard Waste Recycling Program. La Grande's Yard Waste Recycling Program is also viewed as a model by other cities in Oregon and the survey results will be of interest to them.

As a way of saying "thank you", we will send you (if you want it) a free booklet with helpful natural gardening tips. Everyone who completes the survey will also be entered into a drawing for two (2) cubic yards of finished compost, valued at \$25.00, donated by City Garbage Service.

Please complete and return the survey today! Thank you. If you have questions, please call the Community Development Department at (541) 962-1307.

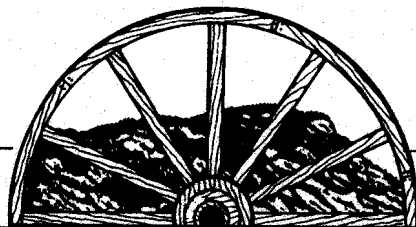
Sincerely,

R. Wes Hare, II
City Manager

MAH/mah/ljg

Enclosure

CITY OF



LA GRANDE

THE HUB OF NORTHEASTERN OREGON

Community Development Department - Planning Division P.O. Box 670/1000 Adams Avenue, La Grande, OR 97850 Phone: (541) 962-1307 Fax: (541) 963-3333

December 12, 2002

Dear Compost Bin Owner:

RE: Compost Bin Survey

During the summer of 2001, your household received a reduced price compost bin from the City of La Grande, thanks to a Solid Waste Grant received from the Oregon Department of Environmental Quality (DEQ). When the bin was obtained, an Agreement was signed indicating that you would participate in a follow-up survey so the City and DEQ could measure the success of the Program.

The follow-up survey was mailed to your household on November 20, 2002. To date, we have received 201 of the 303 surveys, but have not yet received the completed survey from your household.

Enclosed is another copy of the survey. Please take a few minutes to complete the survey and return it to this office (postage is already paid) by December 31, 2002. If you have completed and returned the survey prior to receiving this reminder, please disregard this letter and accept our thanks for your reply.

If you have any questions regarding this letter, please contact this office at 962-1307. Happy holidays!

Sincerely,

Michael A. Hyde, AICP
Community Development Director/Planner

MAH/mah/ljg

Enclosure



City of La Grande
**Home Composting
Bin Survey**
Autumn 2002

1. Our records show that you purchased a home composting bin(s) from the City in 2001.
Are you using your bin(s) to compost yard waste now?
 Yes No
If "No" please explain why not _____

2. How many city bin(s) did you purchase? _____
3. Please mark the appropriate boxes that describe your CURRENT yard waste management practices.

Material Type **What you CURRENTLY do with it. (Please check ALL that apply.)**

Grass Clippings Compost at home Burn outdoors
 Dispose with garbage Burn indoors
 Leave on lawn/mulching mower Haul off-site for composting

Leaves Compost at home Burn outdoors
 Dispose with garbage Burn indoors
 Leave on lawn/mulching mower Haul off-site for composting

**Green trimmings/
prunings/weeds** Compost at home Burn outdoors
 Dispose with garbage Burn indoors
 Haul off-site for composting

**Woody trimmings/
prunings** Compost at home Burn outdoors
 Dispose with garbage Burn indoors
 Chip at home Haul off-site for composting/chipping

4. Are you composting other material at home? If so, what? _____

5. How satisfied are you with your City-provided compost bin?
 Very satisfied, no problems Satisfied, could be better Not satisfied

6. How useful was the educational material you received with the bin?
 Very useful Useful Not useful

7. Thinking of the size of the City compost bin, please estimate the total amount of material you placed in your bin(s) over the last 12 months.
 Less than 1/2 of a bin 1/2 to 1 full bin 1 to 1 1/2 full bins
 1 1/2 to 2 full bins 2 to 3 full bins More than 3 full bins

8. Have you used any of the finished compost from the bin?
 Yes No, but I plan to No, and I don't plan to

9. Have you had any problems with home composting? Yes No
If "Yes", please check ALL that apply.
 Compost didn't break down Compost smelled bad Pests/rodents
 Bin difficult to use Bin not large enough
 Other, please explain _____

(continued on other side)

10. Please mark the boxes that describe how you managed your yard waste materials BEFORE you received the City compost bin.

Material Type What I did BEFORE I received the City bin. (Please check ALL that apply.)

- | | | |
|--|---|--|
| Grass Clippings | <input type="checkbox"/> Composted at home | <input type="checkbox"/> Burned outdoors |
| | <input type="checkbox"/> Disposed with garbage | <input type="checkbox"/> Burned indoors |
| | <input type="checkbox"/> Left on lawn/mulching mower | <input type="checkbox"/> Hauled off-site for composting |
| Leaves | <input type="checkbox"/> Composted at home | <input type="checkbox"/> Burned outdoors |
| | <input type="checkbox"/> Disposed with garbage | <input type="checkbox"/> Burned indoors |
| | <input type="checkbox"/> Left on lawn/mulching mower | <input type="checkbox"/> Hauled off-site for composting |
| Green trimmings/
prunings/weeds | <input type="checkbox"/> Composted at home | <input type="checkbox"/> Burned outdoors |
| | <input type="checkbox"/> Disposed with garbage | <input type="checkbox"/> Burned indoors |
| | <input type="checkbox"/> Hauled off-site for composting | |
| Woody trimmings/
prunings | <input type="checkbox"/> Composted at home | <input type="checkbox"/> Burned outdoors |
| | <input type="checkbox"/> Disposed with garbage | <input type="checkbox"/> Burned indoors |
| | <input type="checkbox"/> Chipped at home | <input type="checkbox"/> Hauled off-site for composting/chipping |

11. Please mark the box (es) that indicate additional items/information you are interested in.

- Another compost bin
- Information on native/drought-tolerant plants
- Information on appropriate herbicide/pesticide use
- Information on "Grasscycling" (leaving grass clippings on the lawn)
- More information on composting yard waste at home (describe: _____)
- Information on composting food scraps at home

12. Thank you for your participation! Please include your name and address here. (Optional)

- Please enter me in the prize drawing. Please send me the free Natural Gardening booklet.
(Please include return address, for mailing).

To return, please fold and tape.

(Fold Here)

City of La Grande
Community Development Department
PO Box 670
La Grande, OR 97850

Appendix B: Response Rate, Data Analysis, and Confidence Intervals

Throughout this report, the response rate (or participation rate) is expressed as the *number of survey respondents responding “yes” (such as, participating in a specific behavior) divided by the total number of survey respondents*, unless noted otherwise. This is a reasonable assumption, if the 89% of households responding to the survey have similar behaviors to the 11% of households not responding to the survey. If the survey respondents engage in a behavior at a higher participation rate than the non-respondents, then this approach will slightly over-estimate the total participation. Figures B-1 and B-2 illustrate this point.

In Figure B-1, 223 (82%) of survey respondents claim to be using their compost bins, while the remaining 48 (18%) claim not to be using them. If the 271 survey respondents are representative of the entire population of 303 households, then 82% of all households are using their bin (and 18% are not).

Figure B-1.
Hypothetical Results, Equal Bin Use Between Respondents and Non-Respondents

	Survey Respondents	Survey Non-Respondents	All
Number using their compost bin	223	26	249
Number not using their compost bin	48	6	54
Total	271	32	303
% using their bin	82%	82%	82%

But Figure B-2 illustrates an extreme example of where none of the non-responding households are using their bin. In this case, the true participation rate is 74%, which represents the extreme “worst case” scenario. The relatively small spread between results of Figures B-1 and B-2 is due to the exceptionally high response rate to the survey (89%, as described in the report). Because only 11% of households didn’t respond to the survey, even if none (or all) of them are participating in a specific behavior, this don’t have a large influence on the total results one way or the other.

Figure B-2.
Hypothetical Results, Non-Equal Bin Use Between Respondents and Non-Respondents

	Survey Respondents	Survey Non-Respondents	All
Number using their compost bin	223	0	223
Number not using their compost bin	48	32	80
Total	271	32	303
% saying “yes”	82%	0%	74%

Throughout this report, confidence intervals are calculated using the normal approximation of the binomial distribution, unless noted otherwise. All confidence intervals are calculated at 95% confidence. With a population size of N ($N = 303$), a sample size of n ($n = 271$ or less, if not all survey respondents answered a specific question), and x representing the number of “yes” responses to each question, the estimated percentage of “yes” responses is calculated as x/n and the upper and lower bounds of the confidence interval equals $x/n \pm 1.96 * \text{SQRT} ([x/n][1 - (x/n)][N - n]/N[n - 1])$. For example, if 72% of respondents answered “yes” to a certain question, and the confidence interval is 70%-74%, then we are 95% confident that the true percentage of all households answering “yes” *had they responded* would be somewhere between 70% and 74%.

Appendix C: Methodology for Estimating Total and New Diversion

This Appendix describes in detail the methodology used to estimate total and new diversion resulting from the compost bin distribution program.

There are many different methods that other communities have used to estimate landfill diversion from compost bin distribution programs. Summarizing these methods is beyond the scope of this report, but interested readers are invited to contact the author for additional information if desired (David Allaway, Oregon DEQ, (503) 229-5479, allaway.david@deq.state.or.us).

Summary of Methodology.

The methodology applied in this report is a hybrid approach that draws on the methods used by several other communities. It is far from perfect but should yield a reasonable range of results within which the “true” answer can be found.

First, two different estimates are developed of the total weight of material expected to be placed in City-distributed home compost bins in La Grande in the first year following bin distribution. On-site composting in loose piles or other (non-City provided) bins is not included in these estimates, nor is other on-site management such as grasscycling, mulching, chipping, etc. The first estimate involves using survey results to estimate the total volume (in cubic feet) of material composted, then multiplying this amount by a range of material densities in order to derive a range of estimated weights. The second estimate involves applying participation data from this survey against published national estimates of per-household diversion, again in order to derive a range of estimated weights. Averages from the two low estimates and the two high estimates are used as the low and high estimate of total diversion, respectively.

Next, survey data are analyzed to derive an estimate of the fraction of total materials composted on-site in City-provided bins which is truly “new” diversion. This analysis accounts for materials that were composted on-site prior to bin distribution, as well as materials put into compost bins that, prior to bin distribution, had been managed through some other diversion effort, such as off-site composting. This fraction is applied to the low and high estimate of total diversion (described above) to arrive at a low and high estimate of “new” diversion.

Finally, total diversion over a ten-year period is estimated by estimating attenuation (decay) in bin use over a ten-year time horizon and applying these estimates to the low and high estimates of both total and new diversion in year one, thereby deriving estimates of ten-year diversion totals.

Estimate of Total Diversion: Method One.

This estimate of total diversion starts with responses to Question 7 of the survey. In Question 7, respondents were asked: “Thinking of the size of the City compost bin, please estimate the total amount of material you placed in your bin(s) over the last 12 months”. Respondents were given six options to choose from:

- Less than ½ of a bin.
- ½ to 1 full bin.

- 1 to 1 ½ full bins.
- 1 ½ to 2 full bins.
- 2 to 3 full bins.
- More than 3 full bins.

This may be a very difficult question for respondents to answer accurately. Because materials may quickly begin settling and decomposing when they are first placed in a bin, a typical bin can hold more than its own capacity in loose materials, as long as those materials are placed into the bin over a period of time. For example, a household might begin by filling their bin with loose material. After a month, if this material has settled to a third of its original volume, the household could re-fill the bin with another two thirds of a bin worth of loose material. Repeating this process every month, the bin after six months would be 90% full yet would have had 2.75 “bins worth” of “loose material” put into it. Unless respondents carefully read and understand this question, and understand how much loose material settles, it is expected that they will underestimate the amount of material put into their bin.

Regardless, answers to this question from survey respondents who said that they are using their bin (a year after receipt) were tabulated, using mid-points of the ranges provided. (A household checking the ½ to 1 full bin option was assumed to have put 0.75 bins worth of material in their bin. Households checking “more than 3 full bins” were assumed to average 4 bins worth of material diverted.) Not including results from 5 households who didn’t answer Question 7, the total estimated volume of material placed in bins equals 309 cubic yards (388 bins worth of capacity multiplied by 21 cubic feet per bin).

This result represents a likely “low” end of the range. A higher estimate is derived by adding to the low estimate an estimate of diversion from the five households who claimed to be using the bin but didn’t answer Question 9, as well as a portion of the households who didn’t respond to the survey at all. This higher estimate results in a total estimated volume of 345 cubic yards (444 bins worth of capacity multiplied by 21 cubic feet per bin).

These low and high estimates of volume are then multiplied by low and high estimates of material density. The density of loose yard waste is estimated to be 100–250 pounds per cubic yard, according to estimates published by the National Recycling Coalition. The density of food waste is considerably higher and is estimated at 800 pounds per cubic yard. (This estimate is based on research by the City of Portland [650 pounds/cubic yard, including soiled paper] and primary research conducted by the author, who measured the volume and weight of his household’s compostable food scraps for a year [950 pounds/cubic yard]). According to Figure 13, 55% of households are composting some food scraps, which compares to 91% of households who are composting some yard debris. (Put differently, 60% of all households composting yard debris are composting food waste.)

The average density of mixed materials composted in bins is estimated as follows:

- Average volume of all materials placed in bins: 1.39 cubic yards per household (based on responses to Question 7).
- Average weight of food waste composted by those households composting food waste: 200 pounds/year (this is considerably lower than the 427 pounds/year measured by the author).

- Average weight of food waste composted among all households doing on-site composting (including those not composting food waste): 120 pounds/year (weighted average of 200 pounds/year among 60% of households composting food and 0 pounds/year among 40% of households not composting food).
- Average volume of food waste composted (among all households doing on-site composting): 0.15 cubic yards/year per household (120 pounds/year @ 800 pounds/cubic yard).
- Average volume of yard waste composted: 1.24 cubic yards per household (1.39 total, less 0.15 food).
- Weighted density (low end): 176 pounds/cubic yard (1.24 cubic yards of yard waste @ 100 pounds/cubic yard + 0.15 cubic yards of food waste @ 800 pounds/cubic yard).
- Weighted density (high end): 310 pounds/cubic yard (1.24 cubic yards of yard waste @ 250 pounds/cubic yard + 0.15 cubic yards of food waste @ 800 pounds/cubic yard).

Applying these density estimates to estimated total volumes results in an estimated diversion of 27 tons (309 cubic yards @ 176 pounds per cubic yard) to 54 tons (345 cubic yards @ 310 pounds per cubic yard) of total diversion in the City-provided bins in the first year.

Estimate of Total Diversion: Method Two.

Perhaps the greatest shortcoming of the first method is that it relies on a highly speculative method of estimating the volume of materials composted. Other communities in the U.S. have conducted more precise estimates using a variety of techniques including on-site scales and diaries and on-route weighing schemes involving control groups. Many of these programs were surveyed in 1995 by the consulting firm Applied Compost Consulting (ACC) on behalf of the U.S. Composting Council. ACC's report, titled "Economic Cost-Benefit Analysis of Home Composting Programs in the United States" notes that among 35 programs surveyed, the average program claims to be diverting 646 pounds/year per household, with a 95% confidence range of 467–825 pounds/year.

These low and high estimates (467–825 pounds/year) of per-household diversion are applied to low and high estimates of bin use in La Grande. The low estimate of bin use is limited to the 223 households who both responded to the survey and said they were still using their bin a year later. A higher estimate of bin use is derived by taking the 82% rate of bin use among survey respondents and multiplying it by the total number of households receiving bins (303), for an estimate of 249 households using the City-provided bins.

These estimates lead to an estimated range of diversion from 52 tons in City-provided bins in the first year (223 households @ 467 pounds per household) to 103 tons (249 households @ 825 pounds per household).

Perhaps the greatest shortcoming of this methodology is that it applies national averages to a community that may be atypical in yard waste generation. La Grande has a shorter growing season than many parts of the country, and its landscaping practices, mixture of grass vs. leaves vs. prunings, and lot sizes may also be different.

Combined Estimates of Total Diversion

The simple average of the low end-points of Method One and Method Two is 40 tons composted in the first year in City-provided bins.

The simple average of the high end-points of Method One and Method Two is 78 tons composted in the first year in City-provided bins.

Estimate of New Diversion.

Not all of this diversion is “new” diversion. A significant number of households using the bins are “free riders”; they were already composting on-site before they received the bins. And households that are new to home composting may simply be shifting materials into their compost bin from methods such as off-site composting or grasscycling that were already diverting the yard wastes from disposal. This report estimates the fraction of total diversion which is new diversion according to the following formula:

$$F_n = [(1/2)B_1 + (2/3)B_2 + (3/4)B_3 + (1/3)B_4 + (1/2)B_5 + (1/4)B_6 + C_1 + wC_3]/[T]$$

Where:

- F_n = Fraction of total diversion that is new diversion
- T = Grand sum of total diversion among all survey respondents using their bins, measured in units of “bins” and estimated in a method very similar to that described in Method One, above.
- B_1 = Diversion among free riders who increased the number of yard debris materials composted on-site from one to two (out of a possible maximum of four). This is measured in units of “bins” and estimated in a method very similar to that described in Method One, above. Thus, we make the simplifying assumption that $1/2$ of the material composted on-site is “new”.
- B_2 = Similar to B_1 except these free riders increased the number of yard debris materials composted on-site from one to three (out of a possible maximum of four). Thus, we make the simplifying assumption that $2/3$ of the material composted on-site is “new”.
- B_3 = Similar to B_1 except these free riders increased the number of yard debris materials composted on-site from one to four (out of a possible maximum of four).
- B_4 = Similar to B_1 except these free riders increased the number of yard debris materials composted on-site from two to three (out of a possible maximum of four).
- B_5 = Similar to B_1 except these free riders increased the number of yard debris materials composted on-site from two to four (out of a possible maximum of four).
- B_6 = Similar to B_1 except these free riders increased the number of yard debris materials composted on-site from three to four (out of a possible maximum of four).
- C_1 = Diversion among households new to home composting who started home composting without discontinuing any on-site mulching, grasscycling, or chipping, and also without discontinuing any hauling (of any materials) to an off-site composter. As with B_1 , this is measured in units of “bins” and estimated in a method very similar to that described in Method One, above.
- C_3 = Diversion among households new to home composting who started home composting and discontinued a combination of a) any on-site mulching, grasscycling, or chipping,

and/or off-site composting and also discontinued b) some combination of burning and/or disposal. Thus, a fraction of the material put into their compost bin, but not 100%, can be conjectured to be new diversion.

w = A weighting factor that gives more credit for new diversion to those individual materials (grass, leaves, etc.) that households stop disposal of without also stopping other diversion-based management, and gives less (but still partial) credit to those materials where households cease both disposal and other diversion-based management.

This very rough estimation method leads to estimate that only 35% of the material put into City-provided compost bins is “new” diversion. The remainder would be materials that were already (previously) composted on-site (by free riders) and materials that were shifted from other types of diversion, including off-site composting, grasscycling, mulching, and chipping.

This 35% estimate is multiplied against the estimate of total diversion (in year one) of 40–78 tons, resulting in an estimate of new diversion of 14–27 tons.

Ten-Year Estimate of Diversion.

This report takes a 10-year horizon for the purpose of estimating total diversion. It is known that use of bins attenuates over time as people move, age, or otherwise stop using their bins. Very few communities have studied participation in bin use several years after bin distribution. One community that has, however, is the City of Seattle. Seattle began an active program to distribute compost bins in the 1980s and has conducted a series of longitudinal surveys since then. The City has concluded that the long-term rate of use of its compost bins is approximately 70%.

Lacking data from other communities, this report assumes that of the bins distributed in La Grande, 70% are still in use during their tenth year. It also assumes that 82% of bins are used during their first year (see Figure 2) and that use ramps down between years one and 10 (with decreases greater in earlier years and smaller in later years). This leads to a 10-year multiplier of 9.2. Expressed differently, the cumulative amount of material diverted in years one through ten averages 9.2 times the amount diverted in the first year (when participation is 82%).

Applying this multiplier to the year one estimates above leads to ten-year cumulative estimates of 127–250 tons of new diversion, and 363–716 tons of total diversion, through the City-provided compost bins.