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Contractor's Report

Third Assessment of California's Compost- and Mulch-Producing Infrastructure — Management Practices and Market Conditions

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Executive Summary

The following report presents the results of a statewide survey of California's Compost and Mulch Producing Infrastructure, including industry management practices and market conditions. Many parts of the current survey are similar to two previous statewide surveys conducted on behalf of the former California Integrated Waste Management Board in 2000 and 2003. The earlier surveys developed important baseline infrastructure information on the organics processing and composting industry. This project, in addition to documenting baseline infrastructure information, investigates how organics processing and composting industry is responding to new and to current regulatory challenges. Specific questions about how these new challenges affected composters and processors were added to understand the impact regulatory issues might have on the continued success of organics diversion in California.

The results of this study provide the California Department of Resources Recycling and Recovery (CalRecycle) and the California organic materials management industry with definitive information and data on the number of producers, feedstock sources, products, and markets for compost and mulch. It also provides information on composting technology approaches to managing potential environmental impacts to air and water. For the first time the survey documents the number of jobs provided by the organics processing and composting industry and the motivations behind these facilities. Critical to the success of CalRecycle's strategic vision for expanded organics diversion, the survey investigates critical barriers to facility expansion on a number of fronts – Regulatory, Economic, Land Use and Markets, barriers which must be overcome if CalRecycle is to meet Strategic Directive 6.1 that seeks a 50 percent increase in organics diverted from landfills by 2020.

Surveying the Industry

This 2010 report contains results from the most recent survey as well as a comparison of the 2008 data with previous statewide organics and composting industry survey data (2000 and 2003).

The 2008 survey generally was well-received by the industry and produced a very significant response from composters and processors (the largest number of facilities completing surveys – in the history of the infrastructure survey efforts). However, there were a number of factors that influenced the overall outcome of the survey effort. Similar to 2003, the survey form was 10 pages long, and due to the increased length, most respondents took more time in completing the survey and some required considerable encouragement. In addition, considerable surveying time was spent confirming that many previously permitted and operating compost facilities and chipping and grinding (processor) facilities are no longer operating. Also the number of businesses who chose not to participate was significantly higher than in the previous surveys. Quite a few of the businesses listed in CalRecycle's database as "active" had gone out of business at the time of the survey. Many of the organics processing and composting industry are small family-owned businesses, pressed for time prior to the current economic crisis, and many found they could not take the time to complete all (or part) of the survey. In addition, many facilities responded to repeated telephone calls with a stated intent to complete the survey but after multiple repeated calls, never got around to completing the survey.

Participation in the survey is voluntary. It is probably more remarkable that the survey response was as high as it was, even though 73 facilities chose not to participate. If there is one generalization that can be made about composters and processors it is that, by and large, they are independent. Many facilities are small and have limited staff to complete a survey such as this. While some facilities have a long track record (a number have been operating continuously for more than a decade) and appear to be thriving, a significant number of facilities are small and struggling. The benefit of a survey such as this to a smaller facility is sometimes difficult to communicate.

Throughout this report, participating facilities are grouped into one of two major categories:

- "Composters" are defined as entities that actively compost organic material (composting implies a defined time and temperature period with the end of controlled decomposition). Since 2003 this has been well-defined in regulations.
- "Processors" or "chippers and grinders" are entities that process material but do not compost the materials they produce. These include stand-alone processing facilities and those that are operated at transfer stations, materials recovery facilities, and landfills.

In California there are significant regulatory distinctions between composters, who are typically more regulated (by CalRecycle, the Regional Water Quality Control Boards and the Regional Air Quality Management Districts), and processors (often called chippers and grinders), who generally are far less regulated. Several significant regulatory efforts are being contemplated by the water and air districts that may affect both composters and processors. One goal of the survey was to understand some of the current practices utilized by composters and processors to manage potential environmental impacts to air and water.

Study Elements

The following were key elements of the study:

- A comprehensive approach that included developing a project steering committee comprising both industry and regulatory representatives;
- Use of an independent contractor with strong ties to the composting and organics processing and composting industry;
- Review of the survey instrument by various regional regulatory agencies; and
- Extensive and persistent surveying techniques to try to achieve the highest possible response rate.

Survey Overview

CalRecycle's Solid Waste Information System (SWIS) database was initially queried county by county for all "active" facilities. This initial sort created a list of more than 1,000 potential facilities. This was winnowed down by a number of methods. Although all of the composting facilities were potentially eligible for the survey, other facilities (in particular co-located chipping and grinding facilities) were a little harder to isolate. For example, a transfer station that also does

chipping and grinding may have a separate Compostable Materials Handling Permit which may or may not be identified as a chipping and grinding facility by SWIS. The same facility, if it has both a transfer station permit and a "chipping and grinding" permit, may be listed as if it were two separate facilities (or more) in the database. Similarly, a landfill that processes green material or wood waste for Alternative Daily Cover might or might not have a separate chipping and grinding permit in the database. The rise of construction and demolition processing facilities also adds to the difficulty of isolating facilities that may be processing organic materials because some (but not all) of these facilities segregate wood from the wastestream for recycling, primarily for biomass fuel, but also in some cases as a soil amendment or colored mulch. Some of the facilities only process inerts, but there is no easy way (at least within the SWIS system) to tell one from the other. Unfortunately, due to the current economic situation and the overall downturn in housing in California, many previously operating construction and demolition facilities in the state have ceased operations.

From this initial sort of the SWIS list, a smaller database was created of composting facilities, stand-alone chipping and grinding facilities, and construction and demolition recycling facilities, Material Recovery Facilities and Transfer Stations that were potentially chipping and grinding and landfills that similarly were potentially chipping and grinding. All small and limited volume transfer-processing facilities were excluded as it was reasoned that they were unlikely to be providing regular on-site chipping and grinding. Similarly mushroom farms (some aspects of which are potentially regulated under CalRecycle regulations) were excluded. Mushroom farms often have CalRecycle permits (or Local Enforcement Agency notification permits), but are not the focus of this study. The survey contractor is not aware of any mushroom operation that is receiving green material or wood waste as part of their process. Similarly, manure spreading (spreading, not necessarily composting) is regulated under CalRecycle's Compostable Material Handling Regulations. However, the survey contractor is not aware of a single manure spreader that also manages green material or wood waste from the waste stream. Some manure composters do take green material and wood feedstocks and some do not. Manure composting facilities were included in the survey, but very few of them completed the survey – largely because they felt it did not apply to them as they see their operations as agricultural in nature. Similarly a number of on-farm composting operations were included in the survey because some have CalRecycle or LEA permits. Some of these operators completed surveys, but analysis of the surveys reveals that few of them are receiving green material or wood waste feedstocks for use on the farm.

Keeping all of the information in the SWIS database current is an ongoing issue. Although only "active" facilities were queried from the database list, a substantial number of facilities contacted had gone out of business or were no longer actively engaged in the activity covered by the permit (for example a composting facility that was no longer composting). When these facilities were identified they were removed from the list, but documented in the survey database as no longer operating. For the first time, LEAs were contacted to help clarify operating status as well as chipping and grinding status of a number of facilities.

Table ES-1 lists the total number of potential and actual facilities included in the survey.

Table ES-1. Total Potential and Actual Facilities Surveyed.

	Potential*	Actual
Composting Facilities	202	115
Chipping and Grinding Facilities	844**	115
TOTAL	1046	230

*"Potential" refers to the number of facilities listed in the database when queried county by county for all "active" facilities. "Actual" refers to the number of facilities operating in 2008; inactive, non-operating, non-processing facilities were removed.

**This number is also somewhat misleading because, for surveying purposes, an integrated facility (for example a landfill with a composting facility, or a transfer station that also does green material chipping and grinding) may have more than one database listing, but is only counted once for the purposes of the survey. Similarly, in most cases attempts were made to exclude transfer stations that sent material to a composting facility to avoid double counting the tonnage.

In order to further refine the database, the LEA for a given county was contacted by e-mail to confirm whether or not a facility was conducting chipping and grinding.

Over 400 surveys were mailed or e-mailed to the facilities in the database. As mentioned above, 73 facilities declined to participate (this number includes facilities that did not decline overtly, but did not return a survey after multiple contacts). A summary of the number of facilities surveyed (in both the current and previous surveys) is shown in Table ES-2.

Table ES-2. Summary of Surveyed Facilities.

	2000	2003	2008
Operating Facilities Surveyed	169	170	230
Composters	104	101	115
Processors	65	69	115
Operating Facilities which Declined to Participate	11	32	73
Composters	5	16	28
Processors	6	16	45
Landfills reporting Green Material ADC Use	N/A	58*	N/A

* For the 2004 report, a separate survey of landfills using green material ADC was made. This was not repeated in 2008, because the landfills or their suppliers were surveyed directly.

As shown in Table ES-3, while composters have achieved modest growth on a tonnage basis, processors appear to have experienced a significant decline; this is primarily explained by the decline of the housing construction market in as well as the overall economic uncertainty of 2008.

Table ES-3. Comparison of Materials Processed by Survey Respondents and Estimates (Tons).

	2000	2003	2008
Tons Processed by Survey Respondents			
Composters	3,407,000	4,026,081	4,479,393
Processors	2,701,000	4,090,231	1,879,773
Total	6,108,000	8,116,312	6,359,166
Tons Estimated to be Processed by Non-Respondents			
Composters	N/A	704,000	1,281,000
Processors	N/A	1,047,800	1,676,250
Total	N/A	1,751,800	2,957,250
Combined Tons Processed by Survey Respondents and Estimated Non-Respondents			
Composters	N/A	4,730,081	5,760,393
Processors	N/A	5,138,031	3,556,023
Total	N/A	9,868,112	9,316,416

Table ES-4 compares the volumes (cubic yards) of materials produced by composters and processors.

Table ES-4. Comparison of Products from Composters and Processors (Cubic Yards).

	2000	2003	2008
Composters	6,590,000	5,664,956	6,076,327
Processors	8,363,000	12,755,282[1]	7,223,798
Total	14,953,000	18,420,238	13,300,126

To understand the impact that non-participating facilities had on the survey totals, an estimate was made of the potential tonnage these "missing" facilities might represent. The non-participating facilities were assumed to have the same percent distribution by facility size (tons processed annually) as the percent distribution for the facilities that participated in the survey. Based on the facility size distribution that takes into consideration the weighed feedstock, the tons processed annually for the non-participating facilities was extrapolated. This method estimated 1.7 million tons for the 45 non-participating processors and 1.3 million tons for the 28 non-participating composters. If this estimate is representative, then the total tonnage processed by

[1] This number includes an estimate of the cubic yards of ADC used in 2003 based on tonnage reported, multiplied by an average bulk density of 3.9 cubic yards per ton.

California's organics processing and composting industry is approximately 9.3 million tons in 2008.

Table ES-5 shows the breakdown of products made by specific type.

Table ES-5. Quantities of Products by Type (cubic yards).

	2000	2003	2008
Compost	4,232,000	3,011,182	4,395,725
Mulch	1,872,000	2,325,708	1,659,101
Boiler Fuel	3,446,000	3,872,983	2,944,934
ADC	2,795,000	8,482,372[2]	3,063,539
Beneficial Use at Landfills	N/A	258,150	691,423
Other[3]	2,608,000	469,843	545,405
Total	14,953,000	18,420,238	13,300,126

As discussed above, the "organics processing and composting industry" in California is an artificial distinction which encompasses a wide range of facilities – from very small scale processing facilities to multi-million dollar enclosed composting facilities, from a vineyard composting its own grape pomace to a construction and demolition recycling operation at a large integrated recycling and transfer facility. This makes it somewhat difficult to make too many accurate generalizations. While it is difficult to draw too many conclusions from the current survey, a few points are clear:

- California processors and composters continue to access an enviable diversity of end product markets. It would appear that, at least statewide, there is not reliance on a single market. Regionally however, some areas are dominated by a single large market (as the Southern region is by the green material ADC "market"). Some smaller processors also tend to rely almost exclusively on the boiler fuel (waste- to- energy) market.
- There is still considerable room for diversification in markets. The majority of facilities manufacture five or fewer products.
- As documented in the 2001 and 2004 reports, agriculture continues to be the largest single market for compost in 2008 (not green material, but all material processed into compost). This represents a significant achievement, as many observers doubted conventional agriculture would accept urban compost. Although CalRecycle has done an enviable job

[2] For the 2003 Survey, ADC was reported in cubic yards and converted based on reported bulk density figures. These figures varied widely. To increase the accuracy of these estimates in 2008, ADC amounts were reported in tons.

[3] "Other" includes material which is directly applied to `agricultural land, fines, wood chips, steer manure, bark products, etc.

promoting these markets, there is still much that is not known and potentially a great deal of capacity within this market segment.

- Very few facilities reported an increase in processing capacity in 2008. This is undoubtedly linked to the economy, both nationally and in California. The current economic crisis is making it harder for processors to get capital to purchase land, buy equipment, or otherwise make capital investments in facilities. Similarly a number of planned collection programs or expansions of collection programs have been put on hold. One waste stream in particular—construction and demolition materials (construction and demolition materials specifically, and wood waste in general)—experienced a sharp downturn in volume during 2008.

- New and emerging air and water regulations are causing considerable uncertainty for the California organics processing and composting industry. Compliance with proposed rules is expected to increase the cost of doing business, which further minimizes the capital available for facility or program expansion.

- Because of the large volume of food scraps and/or liquid wastes being disposed, an opportunity appears to exist for new and existing facilities to process these types of nontraditional feedstocks. Only 16 facilities surveyed reported processing food scraps or liquid wastes, though collection programs for these materials (especially food scraps) have been delayed by some jurisdictions.

- The organics processing and composting industry has continued to grow and has become more complicated. Future survey efforts may want to divide the survey universe into smaller subsets (i.e., composting facilities, stand alone chipping and grinding facilities, landfills, etc.) in order to avoid sending one comprehensive survey form to a diverse group of facilities. For example, the current survey had some very specific questions about composting which were not needed for the processor (i.e., non-composters) universe. Similarly, many ADC processors do not regard their operations as separate facilities from the landfills they operate, nor do many of them consider ADC to be a "product" with a "market." Individualized surveys to different targeted groups may help to clarify some of these distinctions. This may also make surveying more efficient and increase the overall response rate.

Areas for further study:

- Agriculture continues to represent the largest potential market for composted organic products. A number of composters provided agricultural crop types into which compost is sold. CalRecycle should investigate these crop types to understand the motivations for purchasing compost and which crops are more likely to purchase compost. Continuing to increase the use of compost by conventional and organic agricultural growers is key to the sustainability of the composting industry in California.

- CalRecycle has done extensive outreach to Caltrans (and similar entities) to identify erosion control and other market opportunities for using compost. CalRecycle should continue its work toward increasing markets and reducing barriers for Caltrans to purchase recycled-content organic products. This could include additional workshops, demonstration sites, additional specification and on-going outreach.

- The largest gap in this and previous surveys is reconciling “facility” data with city and county (generator) tonnage collection records. There are still no reliable data, for example, on the number or extent of curbside, green material collection programs in California. Although we now have fairly reliable records of the production facilities, the full picture of green material recycling in California cannot be fully presented without understanding the collection infrastructure. Tying city and county collection programs to facilities, then facilities to end markets would provide a more complete picture of the specific regional needs for market and facility development.
- Senate Bill 1016 (Wiggins, Chapter 343, Statutes of 2008) fundamentally changes the way jurisdictions calculate diversion rates. It is unclear exactly what type of impact this might have on the organics processing and composting industry, but it would seem that periodic surveys of the organics processing and composting industry may be helpful on the emerging policy issues and to understand industry trends.

Introduction

Compostable organic materials comprise approximately 25 percent of California's waste stream. Diverting a large percentage of these materials is key to the state achieving the diversion goals of Assembly Bill 939. In 2007, the former California Integrated Waste Management Board adopted Strategic Directive 6.1, which in addition to the diversion goals outlined in AB 939 seeks an additional 50 percent of organics diverted from landfills by 2020. The California Department of Resources Recycling and Recovery (CalRecycle) has estimated that meeting Strategic Directive 6.1 may require 50 to 100 new organics processing and composting facilities, to say nothing of the increase in the markets for these facilities. In general, since the passage of AB 939, California has developed a robust infrastructure to divert and process organic materials into useable products. However, unlike landfills and transfer stations, most compost and chipping and grinding facilities are not required to report process and production data to CalRecycle. The following report presents the results of a statewide survey and analysis of composting industry management practices and market conditions. The term "compost industry" for the purposes of this report includes the entire spectrum of organic material diversion facilities, from multi-million dollar composting facilities to small chipping and grinding operations at rural landfills, from biosolids co-composting operations to wood recovery processing facilities at construction and demolition recycling facilities, and landfills processing wood and green materials as Alternative Daily Cover.

As with previous surveys[4] [5], the 2008 survey used a comprehensive approach that included developing a project steering committee consisting of trusted industry representatives from various sectors of the organics processing and composting industry. Because of the nature of some of the information desired by CalRecycle, for the first time, members of other regulatory bodies were included on the Project Steering Committee and participated in the design of the survey instrument. A number of individual operators and facilities within this industry are not willing to share site-specific data, particularly with State regulatory agencies (or their contractors).

The project also included a combined surveying technique, which included e-mail and web-based research and aggressive follow-up to the survey mail out. This approach resulted in 157 facilities completing survey forms. A total of 73 operating facilities declined to participate, for a variety of reasons. In 2008 the predominant reason for non-participation was a perceived lack of time to complete a complex survey form.

This report contains four major sections:

1. **Study design.** Includes listing of steering committee members and descriptions of data-gathering methodology and survey form.

[4] Assessment of California's Compost and Mulch Producing Infrastructure, CIWMB, 2001.

[5] Second Assessment of California's Compost and Mulch Producing Infrastructure, CIWMB, 2004.

2. **Survey results—Infrastructure.** Detailed analysis of survey responses including the traditional survey questions.
3. **Survey results—Management Practices.** Detailed analysis of survey responses to the "management practice" questions which comprised the second part of the survey. These questions primarily dealt with air and water management information, but also practices related to odor and air emissions control.
4. **Study conclusions.**

The report also contains numerous Tables and extensive Figures in an attempt to understand the meaning of the data collected. The list of Tables is included in the Table of Contents, the list of Figures and the Figures themselves are contained in Appendix B.

Study Design

As in the previous surveys, a comprehensive outreach program was developed to assure industry buy-in and attempt to achieve a significant response rate. A major key to this approach was the creation of an industry-wide steering committee. The following describes the composition of the steering committee, the data-gathering methodology, the survey form, and other aspects of the study design.

Steering Committee

Table 1 below lists members of the Steering Committee.

Table 1. Steering Committee.

Name	Affiliation
Industry Participants	
Stuart Buckner	Executive Director, U. S. Composting Council
Neil Edgar	California Refuse Removal Council
John Gundlach	Association of Compost Producers
Mike Sullivan	Sanitation Districts of Los Angeles County
Mark Grover	Grover Environmental
Jerry Lawrie	Merced County Highway 59 Compost Facility
Chris Savage	The Wine Institute
Scott Smithline	Californians Against Waste
Regulatory Participants	
Steve Rosenbaum	Central Valley Regional Water Quality Control Board
Jong Hoon Lee	South Coast Air Quality Management District

Participation by the steering committee was crucial in providing credibility to the project.

Data-Gathering Methodology

Although the focus of this project is different from the previous “infrastructure” survey projects, it seemed important to be consistent with some of the data gathering in order to understand trends across the three surveys. Thus, many of the “infrastructure” questions from the two previous surveys mirrored previous surveys. Additional questions relating to facility expansion, employment, ownership, and facility purpose were added.

Starting with the core questions that had been asked in previous surveys, the steering committee and CalRecycle’s contract manager reviewed and improved the survey form. In order to gather information on management practices relating to air and water quality, additional questions were

developed and reviewed by the Steering Committee, CalRecycle staff, and various regulatory agencies.

Once the draft survey form was complete it was sent to a select group of composters and processors for a "pre-test." The goal of the pre-test was to evaluate the success of the survey design in gathering the requested information. Once the pre-test was complete, the completed surveys and reported data were analyzed. From that experience a final survey was created. The final survey form contained a few additional questions which were added and clarified after the pre-test.

Once the final survey form was approved by CalRecycle's contract manager, it was sent to the facilities on the contact list. Surveys were e-mailed (if an e-mail contact was available), mailed, faxed, and hand-delivered to potential participants. In many cases, repeated phone contacts, faxes, e-mails, and site visits were made in an effort to contact participating facility operators. In a few cases, surveyors interviewed facility operators on site because they were unable to make phone contact. The data in the following section has been aggregated or otherwise masked so that individual facilities cannot be identified. This anonymity was crucial to the participation of many facility operators.

Survey Form

As mentioned above, a survey form was developed using the core of previous surveys of the organics processing and composting industry. Additional topic-specific questions were added by the Steering Committee, CalRecycle staff and air or water regulatory agencies. The final survey form used for this project is contained in Appendix A.

The survey form collected the following data:

1. Quantity, type, and source of feedstocks (including municipal contracts and commercial sources).
2. Processing capacity and acreage.
3. Quantity of organic products sold by general type (e.g., compost, mulch, boiler fuel). This information was to be correlated with general use (e.g., agricultural, landscape, public agency).
4. Identification of additional services provided at point of sale (e.g., bagging, delivery, spreading, etc.).
5. Quantification of processing capacity and change in processing capacity from previous years.
6. Identification of the types of crops using compost.
7. Identification of the ownership structure of the processing organization.
8. Explanation of the motivation behind the development of the facility.
9. Impressions of the ability of the facility to expand based on regulatory, economic, land use and market factors.
10. Employment information.

Site Management Practices

The second part of the survey included specific questions related to site management practices, which may or may not be increasingly regulated in the future. These included:

1. Water quality issues such as documenting management practices for stormwater management and status of coverage under the National Pollutant Discharge Elimination System (NPDES).
2. Compost site management practices such as the type of composting system used, specific management practices followed, and the importance of each.
3. Air quality issues such as Volatile Organic Compounds, particulate and fugitive dust management, and odor control.
4. The survey also asked a number of questions relating to CalRecycle's policy on the use of green material as Alternative Daily Cover.

Contact List

Maintaining a comprehensive and accurate contact list proved to be an ongoing challenge. The existing list from the previous survey was reviewed and collated with other lists [like the Solid Waste Information System (SWIS) database, and the compost and mulch sources list on CalRecycle's website] to create the initial list. Resources of the Steering Committee and the contractor's existing database of organics processing and composting facilities supplemented this list. The SWIS list proved to be more reliable than in previous surveys because the changes to the composting regulations brought a lot of previously unpermitted facilities onto the SWIS system; but also had limitations in determining whether or not a facility is a chipping and grinding (i.e., green material and/or wood waste processing) facility. As previously mentioned, some facilities (like transfer stations, materials recovery facilities, and landfills) serve multiple functions. A transfer station that is also a chipping and grinding facility may or may not be listed as such in the database. In some cases chipping and grinding facilities have stand-alone entries in the database. Unfortunately the database also contains many closed facilities listed as active. The contractor contacted numerous Local Enforcement Agency (LEA) staff and public agency staff to verify the status of many facilities.

Geographical Distribution

Although any attempt at grouping facilities by county or region is, by nature, arbitrary, the 2004 report attempted to understand regional differences by assigning the 58 counties in California to one of five regions. The previously developed geographic distribution generally corresponds to the regions typically used by CalRecycle. The attempt to break out regional differences had to be balanced against the "risk" of disaggregating data to the point that individual facilities might be readily identified by readers of this report.

Table 2 shows the counties included in each region. For the purposes of comparing data sets, the regions remained constant from the previous Survey. Figure 1 shows the regions represented graphically. These regions do not correspond to other regulatory agencies' boundaries. Unfortunately, the jurisdictional boundaries of individual Air Districts or Water Boards in most

cases do not mesh nicely with county boundaries. Table 3 presents a county-by-county comparison of air district, water district, and LEA jurisdictional boundaries.

Table 2: Counties by Region

Region	County	
Northern Region	Butte Del Norte Humboldt Lake Lassen Modoc Mendocino	Plumas Shasta Sierra Siskiyou Tehama Trinity
Bay Area Region	Alameda Contra Costa Marin Napa San Francisco	San Mateo Santa Clara Solano Sonoma
Central Coast Region	Monterey San Benito San Luis Obispo Santa Barbara Santa Cruz Ventura	
Central Valley Region	Alpine Amador Calaveras Colusa El Dorado Fresno Glenn Kern Kings Madera Mariposa Merced	Mono Nevada Placer Sacramento San Joaquin Stanislaus Sutter Tulare Tuolumne Yolo Yuba
Southern Region	Imperial Inyo Los Angeles Orange	Riverside San Bernardino San Diego

Table 3: Air Districts, Water Quality Regions, and LEA Jurisdiction by County.

County	Air District	Water Board	LEA
Alameda	Bay Area AQMD	San Francisco Bay or Central Valley RWQCB	Alameda County, City of Berkeley and CalRecycle
Alpine	Great Basin Unified APCD	Central Valley or Lahontan RWQCB	Alpine County
Amador	Amador County APCD	Central Valley RWQCB	Amador County
Butte	Butte County AQMD	Central Valley RWQCB	Butte County
Calaveras	Colusa County APCD	Central Valley RWQCB	Calaveras County
Colusa	Colusa County APCD	Central Valley RWQCB	Colusa County
Contra Costa	Bay Area AQMD	Central Valley or San Francisco Bay RWQCB	Contra Costa County, City of Pittsburg
Del Norte	North Coast Unified APCD	North Coast RWQCB	Del Norte County
El Dorado	El Dorado County AQMD	Central Valley RWQCB Lahontan RWQCB	El Dorado County
Fresno	San Joaquin Valley APCD	Central Valley RWQCB	Fresno County
Glenn	Glenn County APCD	North Coast or Central Valley RWQCB	Glenn County
Humboldt	North Coast Unified APCD	North Coast RWQCB	Humboldt County
Imperial	Imperial APCD	Colorado River Basin RWQCB	Imperial County
Inyo	Great Basin Unified APCD	Lahontan RWQCB	Inyo County
Kern	San Joaquin Valley APCD	Central Valley RWQCB Lahontan RWQCB	Kern County
Kings	San Joaquin Valley APCD	Central Valley RWQCB	Kings County
Lake	Lake County AQMD	North Coast or Central Valley RWQCB	Lake County

Lassen	Lassen County AQMD	Central Valley or Lahontan RWQCB	Lassen County
Los Angeles	South Coast AQMD	Los Angeles or Lahontan RWQCB	Los Angeles County, City of West Covina, City of Los Angeles Sunshine Canyon City of Vernon
Madera	San Joaquin Valley APCD	Central Valley RWQCB	Madera County
Marin	Bay Area AQMD	San Francisco Bay RWQCB	Marin County
Mariposa	Mariposa County PCD	Central Valley RWQCB	Mariposa County
Mendocino	Mendocino County AQMD	North Coast RWQCB	Mendocino County
Merced	San Joaquin Valley APCD	Central Valley RWQCB	Merced County
Modoc	Modoc County APCD	North Coast, Central Valley, or Lahontan RWQCB	Modoc County
Mono	Great Basin Unified APCD	Lahontan RWQCB	Mono County
Monterey	Monterey Bay UAPCD	Central Coast RWQCB	Monterey County
Napa	Bay Area AQMD	San Francisco or Central Valley RWQCB	Napa County
Nevada	Northern Sierra AQMD	Central Valley or Lahontan RWQCB	Nevada County
Orange	South Coast AQMD	Santa Ana, or San Diego RWQCB	Orange County
Placer	Place County APCD	Central Valley or Lahontan RWQCB	Placer County
Plumas	Northern Sierra AQMD	Central Valley RWQCB	Plumas County
Riverside	South Coast AQMD/ Mojave Desert AQMD	Colorado River Basin, Santa Ana, or San Diego RWQCB	Riverside County
Sacramento	Sacramento Metro AQMD	Central Valley RWQCB	Sacramento County
San Benito	Monterey Bay Unified AQMD	Central Coast or Central Valley RWQCB	San Benito County

San Bernardino	South Coast AQMD or Mojave Desert AQMD	Lahontan, Santa Ana, or Colorado River Basin RWQCB	San Bernardino County
San Diego	San Diego County APCD	San Diego or Colorado River Basin RQCB	San Diego County, City of San Diego
San Francisco	Bay Area AQMD	San Francisco RWQCB	San Francisco County
San Joaquin	San Joaquin Valley APCD	Central Valley RWQCB	San Joaquin County City of Stockton
San Luis Obispo	San Luis Obispo APCD	Central Coast RWQCB	San Luis Obispo County - CalRecycle, City of Paso Robles – CalRecycle
San Mateo	Bay Area AQMD	San Francisco RWQCB	San Mateo County
Santa Barbara	Santa Barbara County APCD	Central Coast RWQCB	Santa Barbara County
Santa Clara	Bay Area AQMD	San Francisco or Central Coast RWQCB	County of Santa Clara, City of San Jose
Santa Cruz	Monterey Bay Unified APCD	Central Coast RWQCB	CalRecycle
Shasta	Shasta County AQMD	Central Valley RWQCB	Shasta County
Sierra	Northern Sierra AQMD	Central Valley or Lahontan RWQCB	Lassen County
Siskiyou	Siskiyou County APCD	North Coast or Central Valley RWQCB	Siskiyou County
Solano	Yolo/Solano AQMD	Central Valley or San Francisco RWQCB	Solano County
Sonoma	Bay Area AQMD North Coast AQMD	North Coast or San Francisco RWQCB	Sonoma County
Stanislaus	San Joaquin Valley APCD	Central Valley RWQCB	Stanislaus County
Sutter	Feather River AQMD	Central Valley RWQCB	Yuba County
Tehama	Tehama County APCD	Central Valley RWQCB	Tehama County
Trinity	North Coast Unified	North Coast	Shasta County

	AQMD	RWQCB	
Tulare	San Joaquin Valley APCD	Central Valley RWQCB	Tulare County
Tuolumne	Tuolumne County APCD	Central Valley RWQCB	Tuolumne County
Ventura	Ventura County APCD	Central Coast or Los Angeles RWQCB	Ventura County
Yolo	Yolo-Solano AQMD	Central Valley RWQCB	Yolo County
Yuba	Feather River APCD	Central Valley RWQCB	Yuba County

* Jurisdictional boundaries of the air or water agencies do not always match well, in the case where a jurisdictional boundaries overlap, all possible agencies are listed.

A list of acronyms is contained in Appendix C.

Results – Infrastructure Survey

This section summarizes the survey results, with collated data appearing in this section or in Appendix B ("Figures"). Throughout the survey, participants are grouped into one of two major categories:

1. "Composters" are defined as entities that actively compost organic material (composting implies a defined time and temperature period with the end of controlled decomposition).
2. "Processors" are entities that process material but do not intentionally or actively compost the materials they produce. This may include a stand-alone chipping and grinding facility, a chipping and grinding facility located at a transfer station or a landfill, and Alternative Daily Cover-producing facilities located at landfills.

The state regulations governing these types of facilities were substantially revised in 2003. The 2003 revisions to Title 14 (California Code of Regulations) set a clear threshold for how a compost facility is defined. It also established criteria for distinguishing a compost facility from a chipping and grinding facility. This led to a significant number of previously unpermitted facilities either getting permits or complying with Enforcement Agency Notification requirements. In addition the 2003 revisions consolidated what had been five "tiers" (Excluded, Notification, Registration, Standardized, and Full) into three categories (Excluded, Notification, and Full). In an effort to identify facilities that needed a composting permit under the new regulations, LEAs identified a number of new or previously unknown facilities which now fall into one of the three tiers. In addition, since 2003, a number of chipping and grinding facilities were developed, for a variety of reasons, perhaps most noticeably for the processing of construction and demolition materials. Most construction and demolition materials are not suitable for composting, but some sites do segregate the woody fraction of construction and demolition for chipping and grinding to produce a wood mulch, biomass fuel, or Alternative Daily Cover product.

Summary

Over 400 surveys were e-mailed, mailed, or otherwise delivered to the list of facilities. The 2008 survey had the highest response number of any of the three surveys with 157 facilities participating, but also had the highest number of facilities that declined to participate. However, the facilities that did respond are likely very representative of the entire industry, partially due to the types of facilities excluded (i.e., manure-spreading facilities, mushroom farms, and on-farm-only composters). As mentioned previously, 73 facilities declined to participate. In addition separate e-mails were sent to LEAs in an attempt to determine which facilities which might not be identified as conducting chipping and grinding (e.g., at a landfill), but were in fact chipping and grinding. Also every attempt was made to contact facilities which may have been identified in CalRecycle's SWIS database, but for a number of reasons were not actually operating.

A summary of the number of facilities surveyed (in the current and previous surveys) is shown in Table 4.

Table 4. Summary of Surveyed Facilities.

	2000	2003	2008
Operating Facilities Surveyed	169	170	230
Composters	104	101	115
Processors	65	69	115
Operating Facilities Which Declined to Participate	11	32	73
Composters	5	16	28
Processors	6	16	45
Landfills Reporting Green Material ADC Use	N/A	58*	N/A

* For the 2004 report, a separate survey was made of landfills using green material ADC. This was not repeated in 2008, because the landfills or their suppliers were surveyed directly.

Feedstock Processed

As shown in Table 5, composters and processors reported processing 6.1 million tons of organic materials as feedstock in the year 2000. In 2003, this number had increased to 8.1 million tons. In 2008 the number was 6.4 million tons.

Table 5. Comparison of Materials Processed by Survey Respondents and Estimates (Tons).

	2000	2003	2008
Tons Processed by Survey Respondents			
Composters	3,407,000	4,026,081	4,479,393
Processors	2,701,000	4,090,231	1,879,773
Total	6,108,000	8,116,312	6,359,166
Tons Estimated to be Processed by Non-Respondents			
Composters	N/A	704,000	1,281,000
Processors	N/A	1,047,800	1,676,250
Total	N/A	1,751,800	2,957,250
Combined Tons Processed by Survey Respondents and Estimated Non-Respondents			
Composters	N/A	4,730,081	5,760,393
Processors	N/A	5,138,031	3,556,023
Total	N/A	9,868,112	9,316,416

In 2003, approximately 2.1 million tons of the total tons processed were comprised of green material used as ADC. Some of this was processed by the landfill at the landfill (some is not processed at all, but merely applied directly after collection) and some is processed by composters and processors. This quantity was added after the 2003 survey was completed and may have resulted in double-counting some of the tons. Looking at the total tonnage in 2000 with the total tonnage in 2008, the numbers are more comparable. Similarly, if you compare the tons processed by processors, the tonnage from 2000 to 2008 is off by about 30 percent (821,227 tons), which is the quantity reported by many processors and solid waste managers. However it is very difficult to compare this type of statewide data over the nine-year time frame represented by the surveys. Many factors contribute to the amounts of feedstock processed.

Composters and processors receive a wide array of feedstocks in California. Figure 2 indicates 72 percent of all respondents process some quantity of green material, which was the main focus of this project. Another 52 percent of all respondents process wood waste (which technically, as defined by CalRecycle regulations, is a subset of green material), 23 percent manure, and 28 percent agricultural by-products. About 16 percent of the responding composters handle food scraps, and about 16 percent compost biosolids. “Other” feedstock processed by composters includes stable bedding, sawdust, shavings, filter medium, wheat straw, whey, shredded paper, and mixed solid waste. Because many facilities handle multiple feedstocks these percentages are not additive, but merely represent the breadth of types of feedstock handled by the surveyed facilities.

Both composters and processors handle green material and wood waste (the bulk of organic materials processed). For obvious reasons, processors do not typically handle putrescible materials such as food scraps, liquid wastes, manure, or biosolids. Processors are also more likely to process construction and demolition materials (typically clean wood available in the construction waste stream). Aside from these exceptions, there are no other significant differences in materials handled by processors or composters statewide. Only 16 percent of the total composting facilities participating in the survey processed biosolids, though more biosolids composting facilities participated in the survey than in previous years. In California, facilities composting biosolids tend to be either relatively small or fairly large.

Because of the large quantity of food scraps being disposed in landfills,[6] an opportunity appears to exist for new and existing composting facilities to process these types of “nontraditional” feedstocks. Only 16 facilities surveyed reported processing residential and/or commercial food scraps and/or liquid wastes. A number of facility operators reported that planned food scraps collection programs had been postponed, primarily due to the current economic situation.

It would also appear that the total quantity of wood waste, both separated from the mixed solid waste stream and from construction and demolition, is down substantially from previous surveys. This would be consistent with the housing slowdown and the poor economy in general. Some estimates expect Municipal Solid Waste, or MSW, tonnages to be down as much as 30 percent statewide. While this is not as likely to affect the green material (trees, shrubs, and lawns grow regardless of the economy) it is clear that construction and demolition wood volumes have decreased substantially. Figure 2A compares the types of feedstock handled over the time span

[6] Statewide Waste Characterization Study, CIWMB, 2004.

covered by the three surveys. Although some changes are to be expected, most columns are within a fairly reasonable range of previous years. Figures 2B and 2C highlight the specific feedstocks accepted by composters and processors over the three survey periods. This data would seem to suggest that more composters are processing green material and fewer are accepting wood.

Feedstock Seasonality

In 2003, the survey was expanded to try to determine the seasonality of specific feedstocks. Originally this was created at the request of the Department of Pesticide Regulation in an attempt to gauge the impact of seasonality on certain feedstocks (i.e., grass). Unfortunately, as was the case in 2003, the 2008 seasonality data is extremely inconsistent. Responses for the same material type in the same region, by composters for example, show differing responses. One reason for this is that most facilities do not divide a given feedstock type (such as green material) into its component parts (i.e., leaves, brush, grass, etc.).

Another way to look at this would be to say that there is little consensus (at least from survey respondents) as to the seasonality of certain feedstock. Clearly both quantity and types of some feedstock vary seasonally; however, it is difficult to develop meaningful data on feedstock variation with this survey form. Figure 3 shows three years of green material collected by the City of Sacramento. This shows a relatively predictable seasonal flow of green materials, at least for green material in the upper San Joaquin Valley. Other parts of California may have slightly different patterns.

Sources of Feedstock

Although the primary focus of this project was municipally generated feedstocks (i.e., organic materials diverted from landfills), the organics processing and composting industry straddles many sources of potential feedstocks. These include municipal (franchise) contracts, commercial contracts, self-haul, materials recovery facility (MRF)-generated, in-house city sources, agricultural sources, wastewater treatment plants, and self-generated feedstocks. In 2003, the survey question was improved to include brief definitions of these terms so that the wide variety of respondents would all be using similar terms (in 2000 there was considerable confusion over the term “self-haul”).

When all sources are evaluated for this report, composters and processors reported receiving 70 percent of material from self-haul, 41 percent from municipal, and 56 percent from commercial (Figure 4). Composters and processors receive material from a wide variety of sources. In 2000, Figure 4A shows self-haul (61 percent) was the largest category (although the confusion over the definition of that term may have led to more tonnage being attributed to self-haul) followed by municipal (51 percent). In 2003, self-haul provided the bulk of the tonnage (63 percent), followed closely by commercial (57 percent). Figures 4 and 4A list the sources of feedstock reported. Figures 5, 5A, and 5B show reported tonnages by those various sources.

Figure 4A compares the sources of feedstock reported by all respondents between the three survey periods. In general there does not appear to be significant changes in the sources of feedstock over the three study periods. MRF-generated tonnage has increased, consistent with the

development of MRFs since 2001. More composers were likely to accept agricultural by-products in 2008 than in 2000.

Processing Capacity

Processing capacity for all facilities, reported as tons per day, is shown in Figure 6. The data for this figure comes from two questions on the survey form. The first asks the "incoming processing capacity" of the facility in tons per day (0 - 500+ tpd) The follow-up question asks the respondent to answer the same question in tons per year. The total reported processing capacity in this 2010 report was 6.4 million tons (which represents the tons processed by survey respondents in 2008). These numbers are estimates of annual capacity and are probably slightly less accurate than the reported tons elsewhere in the report. Processing capacity relates to available processing equipment and manpower and is not necessarily a good measure of actual production. Well-planned facilities may have more capacity than they actually use to allow for peak flows, maintenance, breakdowns, and other contingencies. Information reported here does not necessarily relate to permitted capacity or actual throughput.

The major concentration of all facilities (both processors and composters), reported 199 tons per day or less for processing capacity (68 percent of composters, 65 percent of processors), though there are facilities represented at each of the tonnage thresholds. A much smaller percentage (12 percent of composters and 9 percent of processors) report processing capacity in excess of 500 tons per day. The remaining breakdown is as follows:

- 28 percent of composters and 37 percent of processors reported 0 to 49 tons per day;
- 17 percent of composters and 13 percent of processors reported 50 to 99 tons per day;
- 23 percent of composters and 15 percent of processors reported 100 to 199 tons per day;
- 10 percent of composters and 6 percent of processors reported 200 to 299 tons per day;
- 5 percent of composters and 7 percent of processors reported 300 to 399 tons per day; and
- 5 percent of composters and 7 percent of processors reported 400 to 499 tons per day.

The processing capacity distribution reflects the breadth of facilities covered by this study. The diversity of facilities operating in California is evident, and ranges from very small municipal projects, primarily focused on diversion, to large-scale commercial facilities receiving a wide range of feedstocks and producing a wide range of products.

Additional research is needed to understand how processing capacity relates to feedstock generation and transportation needs. Survey results may give an impression of substantial organics processing capacity, but without relating this information to the amount of organic materials generated and other geographical factors, it is impossible to gauge the overall need for processing capacity in California.

Figures 6A – 6C compare the processing capacity reported in all three surveys. There are some minor differences. The processing capacity of composters appears to have increased slightly in 2008 with more facilities processing greater than 100 tons per day. This is perhaps an indication

of a maturing composting industry. Among processors, smaller facilities (less than 50 tons per day) substantially outnumber larger facilities (500+ tons per day) in 2008.

Change in Processing Capacity

In addition to identifying existing processing capacity, participants were asked if processing capacity had increased or decreased in the past year. A number of factors can lead to this, including purchase of new equipment, increased permitted acreage (which would allow a facility, especially a compost facility, to handle more material), expanding collection programs, or increased sales volume. In addition, respondents reported the closure of nearby facilities as a reason for increased throughput.

In 2000, no facility reported a decrease in processing capacity. In 2003, three facilities (for a total of 39,000 tons) reported a decrease in processing capacity. In 2008, the overwhelming majority of facilities reported no change in processing capacity. This is undoubtedly a result of the substantial uncertainty that remains in the economy. Ten composters reported an increase in processing capacity for a variety of reasons including expanded permit capacity, purchase of higher capacity equipment, increases in sales volume, and the awarding of new contracts. Only five processors reported an increase in processing capacity, mostly due to winning new contracts.

Tons Processed Annually

Survey respondents reported processing 6.4 million tons of organics in 2008, As stated previously, the data for this section come from question #5 of the survey form which asks the respondent to estimate the annual processing capacity of the facility in tons per year. This estimate is likely to be slightly less accurate (or generalized) than the specific volumes reported earlier in the survey.

Figure 7 shows facility distribution by total annual tonnage processed. The majority of facilities process 49,000 tons or less per year (76 percent of composters; 78 percent of processors), with only a few facilities processing in excess of 200,000 tons per year. The responses differ slightly from the previous surveys in that they show a wider range of tons processed annually: 34 percent of composters and 47 percent of processors reported processing less than 10,000 tons per year; 42 percent of composters and 31 percent of processors reported processing between 10,000 and 49,000 tons per year; and 12 percent of composters and 14 percent of processors reported processing between 50,000 and 99,000 tons per year. Only 7 percent of composters and 2 percent of processors report processing more than 200,000 tons per year. It is difficult to say for certain, particularly because of the five years between the last survey, but it would appear that the combined economic slowdown and the overall slowdown in the housing market may be affecting the amount of wood waste being processed, with construction and demolition wood in particular.

Figures 7A – 7C compare the changes in annual tons processed among the three surveys. Overall there are no substantial changes in the distribution of all facilities, though there is a slight increase in all facilities processing in excess of 200,000 tons per year. Among processors only, there is a significant increase in facilities processing less than 10,000 tons per year, perhaps due to the housing slowdown and the economy. The overall trend in processing facilities appears to be slightly fewer facilities in each of the other categories including facilities handling more than 200,000 tons per year.

Volumes Produced by Material Type

Figure 8 shows the total volumes of product made, by general category of material. The three products with the highest volume production are compost (4.4 million cubic yards)[7], Alternative Daily Cover (3.1 million cubic yards), and boiler fuel (2.9 million cubic yards). Unfortunately, due to the substantial inconsistencies and variation (including moisture content of given feedstocks) in converting tonnage to cubic yards, these estimates have a substantial amount of uncertainty associated with them. While the majority of organics processing and composting facilities have scales, there is little agreement in how to convert tonnage to cubic yards. Most landfills report Alternative Daily Cover in tons. Biomass plants generally work in "Bone Dry Tons" (BDTs), subtracting moisture from tonnage amounts. Compost is sold by volume, but moisture content can fluctuate substantially and have a huge effect on weight of a similar volume.

Composters produce most of the compost, while processors produce the bulk of the Alternative Daily Cover (landfill processors account for a significant portion of this volume) and the boiler fuel. Other major products include mulch (made by both processors and composters), compost feedstock (made by processors for composters), feedstock for manufactured wood products, manure, and green material that is directly applied to land. Beneficial use at landfills (material, mostly mulch that is used at a landfill, but not for Alternative Daily Cover) is a new category added in the 2003 survey and also included in 2008. The total amount of mulch used as non-ADC, beneficial use at landfills was 691,423 cubic yards in 2008. Table 6 compares these quantities between the three surveys.

[7] A number of processors reported producing "compost feedstock." Every effort was made to track this so that these tons were not double-counted.

Table 6. Quantities of Products by Type (Cubic Yards).

	2000	2003	2008
Compost	4,232,000	3,011,182	4,395,725
Mulch	1,872,000	2,325,708	1,659,101
Boiler Fuel	3,446,000	3,872,983	2,944,934
ADC	2,795,000	8,482,372	3,063,539
Beneficial Use at Landfills	N/A	258,150	691,423
Other[8]	2,608,000	469,843	545,405
Total	14,953,000	18,420,238	13,300,126

Figure 9 shows the breakout of major products by geographic region (see Figure 1 for a map of the regions). The Central Valley Region produces the most compost (2.3 million cubic yards per year) followed by the Bay Area Region (almost 1 million cubic yards per year). The Northern Region produces the least compost (80,000 cubic yards per year). The relatively low production of compost in the Northern Region is attributed to (1) the low population densities of those counties, resulting in a lower organic waste generation rate, and (2) reduced access to landscape and agricultural markets. Figure 9A shows the distribution for composters. Figure 9B shows the distribution for processors, which is dominated by ADC in the Southern Region and boiler fuel in the Bay Area Region.

Additional region-specific data is shown in Figures 10-12. These figures show the percentage of materials sold by market segment for composters and processors. Figure 9 shows that agriculture comprises the largest market for compost, followed closely by landscape markets.

Figure 10 shows the percentage of materials sold by market segment for composters. As documented by previous surveys and again in 2008, agriculture dominates the market for compost (56 percent) followed by the landscape market (25 percent), biomass fuel (which appears to have declined significantly as a market for composters, at 6 percent), the nursery market (5 percent), Alternative Daily Cover (4 percent) and all other uses (Caltrans, municipal projects, beneficial reuse at landfills, and others at less than 4 percent total).

As in previous surveys, Caltrans' use of compost appears to be consistently low, at least lower than would be hoped given the amount of outreach and effort that CalRecycle has put into developing and facilitating compost use by this market. The development of numerous "specifications" for Caltrans' use of compost was expected to help drive this market sector, but the economy and specifically the state budget crisis may have trumped these well-intentioned efforts.

Figure 11 shows the market segments used by processors. The largest market segment is use of materials as Alternative Daily Cover at landfills comprising 41 percent of all materials reported as being marketed by processors. Some of this was produced on-site at the landfills where it would

[8] "Other" includes fines, wood chips, sawdust, bulking agent, etc.

be used and some was produced by off-site processors. Biomass fuel was also a substantial market (35 percent). Agricultural markets for mulch have continued to grow and now represent 10 percent of reported products sold. Most of this represents processed green material that is directly applied to agricultural land, for example as mulch for orchard crops. Nurseries also provide a market for mulch (3 percent), with landscape (3 percent) and beneficial re-use at landfills (2 percent). Other markets for mulch (6 percent) include an increase in the number of processors selling compost feedstock, including selling bulking agent for biosolids co-composting.

Figure 12 shows the combined markets for both composters and processors. Agriculture absorbs the largest volume of the products made by composters and processors (30 percent). Use of Alternative Daily Cover is reported at 25 percent and biomass fuel is 23 percent of the total reported cubic yards. Landscape is at 12 percent and nurseries are at 4 percent. The remaining users (6 percent) include beneficial re-use at landfills, Caltrans, municipal projects, compost feedstock, and direct give-away programs.

Material Bulk Density

Respondents were asked to provide a bulk density figure with each commodity reported. This was requested as a way to convert responses given in cubic yards to tons and vice versa. Answers for the same commodities varied widely. The average bulk densities for the four major products are shown in Table 7.

Table 7. Reported Bulk Density of Products (2008).

Product	Average Bulk Density (Cubic yards per ton)	Range (Pounds per cubic yard)
Compost	2.24	465 – 2,000
Mulch	3.54	400 – 1,176
Biomass Fuel	3.57	333 – 1,197
ADC	2.69	333 – 1,800

The range of bulk densities in each material type reflects both regional processing/handling methods but also the diversity of feedstocks within a given commodity (e.g. a compost made of green material exclusively will have a lower bulk density than a compost made out of biosolids). The low end of the range in the fuel category probably reflects those facilities which screen processed material to remove the “fines” (the undersized portion falling out of the screen). “Fines” from these types of operations are often used for other purposes, sometimes as soil amendments. The Alternative Daily Cover category may also be experiencing this phenomenon, as some facilities screen the processed material, sending the “overs” to ADC. There were fewer responses in this category, perhaps because in many cases there is no incentive to carefully track the volume and/or the bulk density of the material. Also, in some cases, Alternative Daily Cover is not processed through a grinder prior to placement and is compacted after placement, so the bulk density varies significantly depending on the stage of the process. Moisture content also varies widely and can have a significant effect on bulk density.

Market Segments

California has a rich history of organic materials being used in horticultural applications (such as landscaping and nursery use). Although it is not known how much organic material was returned to agricultural uses prior to the enactment of AB 939 in 1989, the agricultural sector has substantially increased its use of urban-derived organics, particularly compost.

The survey asked producers to determine the percentage of their products that were sold to major market categories. Figures 13 and 13A show the distribution of products by market segment throughout the five regions. Figure 13 shows regional market segment information for composters. This figure highlights the dominance of agricultural markets, primarily in the Central Valley Region. A significant amount of feedstock from both the Southern Region and the Bay Area Region is collected there, but transported to the Central Valley Region for composting. The amounts of compost sold into the landscape markets are very similar in the Southern Region, the Central Valley Region, and the Bay Area Region.

Figure 13A shows the regional market segmentation for processors. The figure shows the dominant use of green material for landfill cover in the Southern Region. Because of this massive use, Alternative Daily Cover tends to dwarf all other uses by processors. Clearly, the biomass-to-energy market is still an important market for processors in the Central Valley Region, the Southern Region, and the Bay Area Region. For the first time, agriculture shows up as a significant market for the Southern Region processors. This reflects facilities that are processing material for direct land application to agricultural land.

Geographical Distribution

Organic material processing and composting is a regional rather than statewide business. Although many processing and composting facilities typically accept feedstock primarily from within the county in which they are located, increasingly feedstock goes out-of-county to be processed. This explains, to a great extent, why the Central Valley Region produces the most compost: feedstocks from the L.A. Basin, as well as from the Bay Area, are transported by truck to the Central Valley for composting. Although this has caused some friction between urban and rural jurisdictions, it also makes sense because agriculture is the single largest market for compost, and most of the production agriculture in California occurs in the Central Valley. This is especially true for more urbanized counties, which often set up transfer points to move material to less densely populated areas where the siting and operation of composting facilities are potentially easier (though emerging Air and Water Board concerns may be changing that dynamic somewhat). Siting composting and processing facilities in rural areas is easier due to lower population density, proximity to markets, and lower costs for land and water.

Figure 14 shows the geographical distribution of responding facilities by region. The trend of feedstocks from the Southern Region making their way to the Central Valley (as documented in the 2000 and 2003 surveys) continues to increase.

Figures 14A-14C compare the number of participating facilities in 2000, 2003, and 2008, by type and by region. Figure 14A shows the number of composters that participated in the three surveys.

Figure 14B shows the number of processors that participated. Figure 14C shows the comparison of all types of facilities participating in the survey over the three study periods. In general, good participation is evident from all types of facilities across all regions.

In general, there is a gross relationship between population and/or municipal solid waste tons generated; and the number of facilities in a given region. However, some areas ship material out of county, which can skew these figures significantly. The number of facilities is meaningless without some idea of the size of those facilities. Two of the largest composting facilities in the state are located in the Central Valley Region, but most of their feedstock comes from the Southern Region.

Number of Products

Figure 15 shows the number of products the surveyed facilities produce. California processors and composters are well-diversified within the existing markets. In addition to compost, most composters produce mulch and boiler fuel, and some access the Alternative Daily Cover market (typically "overs" from screening operations, or material that is contaminated).

Many processors access both the boiler fuel and mulch markets, but also produce ADC and other products (like compost feedstock, directly land-applied material, or feedstock for manufactured wood). A few facilities (9 percent of composters, 4 percent of processors) produce as many as 16 or more products, but as in past surveys, most composters and processors can be seen as wholesale manufacturing facilities, which produce five or fewer products.

Figure 16 shows the distribution of products (compost, mulch, boiler fuel, Alternative Daily Cover, beneficial reuse at landfills and other products) by processors and composters. This chart highlights the diversity of the existing markets for organic materials in California. Figure 17 shows product distribution by composters only. Composters primarily produce compost (69 percent), but composters also produce mulch, blends, boiler fuel, and ADC. Figure 18 shows the continued dominance of ADC as a market for processors (39 percent). Boiler fuel (33 percent) is also an important market. Processors also make mulch, compost feedstock, material for beneficial reuse at landfills, and other products.

Product Distribution

Figures 19-28 show the breakdown of products made by composters and processors in each region. They clearly show the regional diversity and significant differences within regions.

Figure 19 shows the breakdown for the Northern Region composters. The Northern Region is dominated by compost (74 percent), followed by boiler fuel (21 percent). Figure 20 shows the breakdown for the Bay Area Region composters. The Bay Area market is dominated by compost sales (72 percent), with mulch (21 percent) and biomass fuel (6 percent) comprising most of the remaining volume. Bay Area composers do not make significant quantities of Alternative Daily Cover. Figure 21 highlights composters' product distribution in the Central Valley Region. Like the Bay Area, the Central Valley market is dominated by compost (77 percent), but produces more biomass fuel (15 percent). This is probably due to the proximity of available biomass plants in the Central Valley compared to the Bay Area Region. Mulch (7 percent) is also an important component of the market for composters in the Central Valley. Alternative Daily Cover

comprises only 1 percent of the Central Valley market, probably because there are very few landfills in the Central Valley Region using green material as ADC. Figure 22 shows the product distribution of composters in the Central Coast Region. Composters in the Central Coast Region access similar markets as the Bay Area composters producing compost (74 percent), followed by mulch (18 percent), and biomass fuel (8 percent). Green material ADC is not a significant market on the Central Coast.

Composters in the Southern Region access the largest diversity of markets. Figure 23 shows the diversity of product distribution of products made by composters in the Southern Region. These include compost (44 percent), mulch mostly for direct land application (31 percent), ADC (18 percent), and beneficial re-use at landfills (7 percent). Interestingly, biomass fuel comprises only 1 percent of the products produced by Southern Region composters. This is probably due to two factors: fuel costs were high and variable in 2008, and most of the biomass-to-energy plants were relatively long distances from the facilities in the Southern Region.

Figures 24-28 show the product distribution among processors, which contrasts dramatically with the product distribution among composters. The volume of clean wood suitable for fuel has diminished based on the housing slowdown and the sluggish 2008 economy in general. Figure 24 shows the product distribution in the Northern Region. Boiler fuel (66 percent) is the dominant market among processors in the Northern Region. Figure 25 shows the product distribution among processors in the Bay Area Region. This figure clearly shows that processors in the Bay Area also rely heavily on the biomass-to-energy market. Most of what they produce (66 percent) ends up as biomass fuel, while Alternative Daily Cover represents 18 percent of what the Bay Area Region processors reported. Beneficial use of green material and wood material at landfills (for erosion control and slope stability) comprises 9 percent of what Bay Area Region processors make. Mulch (5 percent) is also an important component of the mix. Figure 26 shows that the products made by processors in the Central Valley Region consist predominantly of biomass fuel (66 percent) followed by ADC (23 percent). Figure 27 shows that processors on the Central Coast produce mulch largely for direct application (65 percent), boiler fuel (16 percent), material for beneficial use at landfills (14 percent) and ADC (5 percent). Figure 28 shows the continued dominance of ADC as a market for processors in the Southern Region (49 percent). The Southern Region also produces boiler fuel (18 percent), mulch (12 percent) directly applied to agricultural land, and beneficial re-use at landfills (11 percent).

The following section lists the crops listed by composters that reported selling compost. In future surveys, CalRecycle may want to investigate the types of crops that receive applications of uncomposted mulch. Generally these include orchards, but may include other crops as well.

Compost Sold to Agriculture

The 2000 survey was the first credible survey to document that agriculture was the single largest market for compost. This was important because a key to CalRecycle's organics diversion strategy was to move urban organics to farms. This was also important because early studies of the California compost industry predicted that farmers would not accept compost made from urban organics. CalRecycle spent considerable resources in the 1990s and early 2000s demonstrating the use of compost in agriculture through a series of demonstration projects, which often involved field days and workshops. These appear to have paid off. What is less well known are the specific application rate to crops that use compost in their production. California is a huge

state with an equally large and diverse agricultural production. The state contains most of the major soil types and grows an enviable array of crops. For the first time the survey asked composters who reported selling compost to agriculture to identify major crop types. The question did not ask composters to specify actual amounts per crop, which most composters probably would not have provided. The majority of composters surveyed (69 percent) report agriculture as a significant market segment. Many of these were willing to share general crop types, though some feel that this information was proprietary. Clearly agriculture is a significant market for the majority of compost produced in California. As mentioned previously in this report, there is also a trend towards direct land application of uncomposted mulch to some agricultural crops.

Table 8. Major Crop Types Using Compost in California.

Crop Type	
Alfalfa	Melons
Almonds	Olives
Apples	Orchards
Artichokes	Organic row crops
Avocado	Organic truck farms
Blueberries	Peaches
Brassicas	Pear
Broccoli	Peppers
Brussels sprouts	Permanent crops
Carrots	Pistachios
Cauliflower	Potatoes
Celery	Prunes
Chard	Rice
Cherry	Row crops
Citrus (lemons)	Shallot
Corn	Small grains
Cotton	Sod
Cucumber	Spinach
Figs	Squash
Fruit trees	Strawberries
Garlic	Sweet potatoes
Grass/hay	Table grapes
Hops	Unspecified fruit trees/orchards
Leafy vegetables	Walnuts
Leeks	Watermelon
Lettuce	Wine grapes

Services Provided

Figure 29 shows the specialized services facilities provide in addition to processing and composting. Many facilities provide multiple specialized services, such as blending, spreading, or bagging, while a surprising number (16 percent of composters and 59 percent of processors) provide none.

Survey responses regarding specialized services reveal California's organics processing and composting industry contains a mix of sophisticated, established companies offering multiple products and services and also new and emerging players providing products on a more basic level. It also highlights that, while product knowledge and testing results are an important component of running a composting business, it is not necessarily that important to a processor who produces boiler fuel or Alternative Daily Cover. Composters are six times as likely to report "product knowledge" as an additional service than processors.

Among composters, the most widely reported service is delivery (64 percent), followed closely by testing/analysis (57 percent) and product knowledge (48 percent). All composters are required to conduct, at a minimum, pathogen reduction and metals testing and most pay for traditional composition analysis. Testing and analysis appears to have become more important to composters as a marketing technique, perhaps due to recent issues with food safety. Product knowledge is of equal importance (or at least as common a "service") as blending of compost with other organic materials like topsoil, sand, or fertilizer (48 percent). Composters also identified participating in the U.S. Composting Council's Seal of Testing Assurance Program (STA). Twenty six percent identified participation in the Council's testing program as a service. A slightly larger number responded that organic certification (28 percent) was an important extra service. Organic certifiers do not actually "certify" compost as "organic," but rather identify specific compost manufacturers as allowable under their given certification process. The organic certification would appear to be more important to composters selling into agriculture whereas the testing program is more important for those selling into horticultural markets.

As shown in Figure 29A, many composting facilities reported providing more than one service. Sixteen percent report no additional services. Thirteen percent reported providing one additional service, 10 percent provided two services, 20 percent three services, 15 percent provided four services, and 14 percent provided five services. Thirteen percent reported providing six or more services.

Not surprisingly, processors reported even less, with the largest percentage (59 percent) reporting no additional services provided (Figure 29). Twenty five percent reported delivery, followed by testing and analysis, and blending at 10 percent each; and spreading and product knowledge with 7 percent each. Neither, participation in the Council's testing program nor organic certification, were reported as a significant service by processors.

Very few processors provide multiple services (Figure 29A). Twenty-two percent provide only one service, 16 percent provide two services, 7 percent provide four services, and only 2 percent provide more than four additional services. This is not surprising given the mix of processors. Most Alternative Daily Cover producers do not consider spreading of the ADC a "service" as this is handled by the landfill operator. Similarly, a processor making boiler fuel has to meet a market specification for the fuel, but there aren't really too many additional services necessary (beyond blending).

Provide Feedstock to a Compost Facility

For the first time, the survey asked a question about whether or not processors provide compost feedstock (i.e., chipped or ground green material or wood waste) to a composting facility. Although this question was added primarily as a way to avoid double-counting feedstock tons, the answers really demonstrate how increasingly inter-related the organics diversion industry has become. The majority of processors do not sell or otherwise provide feedstock to composting facilities, but an increasing minority do. The types of facilities that provide compost feedstock include landfills that have met their Alternative Daily Cover needs, processors looking for additional outlets, and even composting facilities looking to diversify homes for feedstock. Also, an increasing number of municipalities are encouraging their residents to place residential food scraps in with the green materials recycling container. Once these materials are commingled (the green material and the food scraps) they are generally not suitable for boiler fuel or Alternative Daily Cover. Thus, some processors handling this material transfer it to a composting facility.

If a facility reported providing compost feedstock and identified the facility that received the tonnage, the tonnage was subtracted from the processor's total. This will no doubt become more complicated as the organics processing and composting industry grows.

For the first time, part of the survey (which is otherwise fairly consistent with previous surveys) asked three new types of questions: (1) questions relating to facility ownership/purpose; (2) questions related to facility expansion: and (3) questions relating to employment. The results of these questions are presented below.

Facility Ownership

For the first time, the survey queried respondents as to the ownership structure of their facilities. Figure 30 lists the ownership structure of both composting and processing facilities. Figure 30A lists the ownership structure of composting facilities. Not surprisingly, the majority (65 percent) of composting facilities surveyed were private, stand-alone operations. The next largest category is privately-owned composters affiliated with a landfill (13 percent). Eleven percent of composting facilities were publicly owned, stand-alone operations. These could include facilities located at transfer stations. Only 9 percent of composting facilities are publicly owned and located at landfills. To date no stand-alone nonprofit or research facility operations have completed the survey. There are a few composting facilities in the "Research Notification Tier," but all of these contacted were located at permitted composting facilities or transfer stations and their tons are included with the host facility. About 2 percent of the composting facilities that responded were publicly owned and affiliated with a wastewater treatment plant (WWTP). Not surprisingly, all of these composted biosolids from the adjacent treatment plant.

Figure 30B shows the distribution of ownership for processing facilities. Processors were similarly dominated by privately owned, stand-alone operations (50 percent). However, the next largest ownership type (31 percent) was a publicly owned facility affiliated with a landfill. These include landfills that process Alternative Daily Cover. These landfills don't always consider their processing operation as separate from the landfill operation.

Facility Purpose

For the first time, the survey instrument contained a question relating to the purpose of the surveyed facility. Originally this question sought the mission statement of the organization, but during the pre-test of the survey, not a single facility responded by providing their mission statement. Thus, the question was rephrased to try to get to the issues that are of importance to the decision making-entity of the facility. In order to simplify and standardize responses, a number of possible motivations were provided. These included diversion credit, the profitability of the business, carbon credits, availability of grants or other funds, public perception, research, and/or limited options for the recycling of one or more feedstocks. The results are shown in Figures 31, 31A, and 31B. For composters (who are largely private companies), profitability (64 percent) was a bigger motivation than diversion credit (45 percent). For the majority of the processors reporting, diversion credit was more important (79 percent) than profitability (57 percent). This may be a reflection of the fact that many of the processors are publicly owned and affiliated with landfills. Public perception ranked high with both composters (48 percent) and processors (50 percent) as a motivation.

Other motivations that were provided included:

"Fits with our farming method."

"It's a green sustainable business, we need to rebuild our agricultural soils."

"Local Public Policy."

"Wanted to beneficially re-use biosolids within the community."

"Our primary motivation is to make a good product which is also our primary source of revenue."

"Maximizing landfill capacity (more diversion = optimal use of available disposal capacity)."

"We want to provide alternatives to landfill."

"This facility has numerous decision-making entities, including dozens of cities and corporate management."

"Contract requirement."

"We make compost for our own use."

"Alternatives to landfill."

"Options for self-generated materials."

Clearly there are a broad number of motivations within the complex organics processing and composting industry.

Facility Expansion

The California Integrated Waste Management Board (now CalRecycle) adopted a number of Strategic Directives[9] in February 2007 to drive its actions and policy. Strategic Directive 6.1 envisions a reduction in the amount of organics in the waste stream by 50 percent by 2020. CalRecycle has estimated that this will require an additional 50 to 100 organics processing and composting facilities.[10] CalRecycle also has identified a number of barriers to siting new organics processing and composting facilities. For the first time the survey asked questions relating to the potential for facility expansion. The survey identified four major barriers to facility expansion and provided some possible responses.

Tables 9-12 provide a summary of responses to the reported barriers to facility expansion. These were categorized as regulatory barriers, economic barriers, land use compatibility issues, and market barriers.

Regulatory Barriers to Facility Expansion

The first category of possible barriers to facility expansion was regulatory. Table 9 highlights the responses from composters and processors.

Table 9. Regulatory Barriers to Facility Expansion.

	Composters	Processors	All
Permits difficult or expensive to obtain.	48%	41%	45%
Emerging air and water issues create uncertainty.	65%	57%	62%
Other (see comments below)	13%	12%	12%
Number of Responses	86	68	154

Comments from Composters:

"Public landfills competing using tax dollars."

"Technical challenges with food and paper."

"Offsets are hard to find."

"Odor-related issues."

"Availability of green material feedstock. Local county ordinance covering land application of biosolids and potential to change biosolids treatment process in plant upgrade scheduled to be completed by 2014."

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[9] CIWMB Strategic Directives, Adopted February 2007.

[10] Organics Roadmap I and II, CIWMB, Adopted December 16, 2008.

"Compliance with permit terms, concern of LEA with level of contaminants in feedstock."

"Attention to small minor items by CIWMB."

"Trying to avoid CEQA."

"Stormwater compliance."

The only positive comment received was: *"We are working on expanding now."*

Comments from Processors:

"No one wants a composting facility in Alameda County."

"Profitability, appropriateness of process for feedstock."

"Landfill is close to capacity."

"Space."

"Permit process, bureaucracy."

"Existing permits are too restrictive."

Economic Barriers to Facility Expansion

The next identified barrier to facility expansion was economic. The results of this question are shown in Table 10. Both composters and processors found acquiring feedstock to be a challenge, though more so for composters. Similarly both composters and processors found competing with Alternative Daily Cover fees (which typically are significantly lower than the tipping fees charged for composting) difficult. Very few composters or processors reported difficulty getting loans for equipment as a barrier. A sampling of comments is shown below for composters and processors. Although there are a wide variety of comments, clearly the current economic situation is a major barrier to facility expansion.

Table 10. Economic Barriers to Facility Expansion.

	Composters	Processors	All
Acquiring feedstock is challenging.	21%	16%	19%
ADC policy is keeping tip fees too low.	22%	18%	20%
It's hard to get loans for new equipment.	5%	1%	3%
Other	22%	9%	16%
Number of responses	86	68	154

Comments from Composters:

"Difficult to sell compost at profitable price."

"Markets keep shrinking."

"Land application is cheaper than composting."

"Public landfills competing using tax dollars."

"Sheer cost."

"Marginal land application operations keep tip fees too low."

"Offsets are expensive and hard to find."

"At this time, we cannot accept green material outside of our permits."

"Sales of compost and biosolids."

"Money is tight for buyers."

"Overall economy - public revenues down."

"Cost of modifying facilities and additional staffing."

"Uncooperative garbage haulers, competition from power plants."

"Manpower/labor to clean green material."

"High costs of construction."

"Using on-site is less expensive than sending to compost facility."

"Competition creates lower prices."

"Operational cost vs. benefit ratio."

Comments from Processors:

"General market conditions."

"Not making sense at this scale."

"Finding end users for the material."

"Current economy."

"Using on-site is less expensive than sending to compost facility."

Land Use Barriers to Facility Expansion

Given the size and complexity of California, land use can be a major barrier to increasing solid waste facilities, no less so for organics processing and composting facilities. Table 11 shows the response to land use barriers to facility expansion perceived by composters and processors.

Table 11. Land Use Barriers to Facility Expansion.

	Composters	Processors	All
There is no ability to expand at this site.	29%	29%	29%
Surrounding land use is no longer compatible.	3%	4%	4%
Encroaching residential development makes it hard to expand.	19%	10%	15%
Other	17%	0%	10%
Number of responses	86	68	154

Comments from Composters:

"Public opposition to expansion."

"Traffic concerns."

"Siting a new facility too difficult."

"No problem with future expansions."

"Neighbors."

"POTW is surrounded by a school and a trailer park. Odors can be a concern."

"Pressure from agricultural neighbors due to food safety and locations of facilities."

"Coastal commission."

"Controversial with community competing uses for available land."

"Limited ability to expand at this site."

"Neighbors are concerned that food scraps would generate too may odors."

"Controversial with community competing uses for available land."

"Due to limited water supplies we do not encourage large-scale planting projects so our need for compost is low."

Processors had no comments on land use barriers to facility expansion.

Market Barriers to Facility Expansion

The final identified barrier to facility expansion was market issues. Table 12 highlights the perceived market barriers by composters and processors. In general most facilities did not categorize market conditions as a barrier to facility expansion. This may be because in the majority of processors and compost facilities the revenues on the front end (i.e., tip fees) outweigh the revenue from sales of finished products.

Table 12. Market Barriers to Facility Expansion.

	Composters	Processors	All
Would need to expand current markets for compost before committing to expansion.	31%	21%	27%
Other	6%	0%	3%
Number of responses	86	68	154

Comments from Composters:

"Would need to find market for co-compost."

"None, there are markets for the material."

"Would like the CIWMB to fund market development programs with producers."

"Cost of equipment in order to access markets (i.e., screen to meet golf course specs.)."

"Lack of knowledge about soil and the value of organics."

Processors had no comments on market barriers to facility expansion.

Employment

For the first time, the survey asked questions regarding the number of employees at organics processing and composting facilities. Because of the broad nature of these facilities, comparing employment numbers can be difficult. A stand-alone composting facility may be able to provide an exact number of employees, but it is more difficult to get an accurate estimate of the employees operating a grinding operation as part of a larger transfer station or a landfill where jobs and responsibilities may be shared.

The range of employees at organics processing and composting facilities is shown in Table 13.

Table 13. Number of Employees at Surveyed Facilities.

	Composters	Processors	All
Range of Employees	0.25 – 72	0.5 – 50	0.25 - 72
Average Number of Employees	10.60	9.73	10.26
Number of Responses	77	49	126

Based on the responses, composting facilities employ slightly more people than processors, but there is a considerable range depending on the type of facility. A relatively straightforward grinding operation at a landfill to make Alternative Daily Cover may employ far fewer people and be able to benefit from numerous shared facilities (i.e., scale, scalehouse, spotters, etc.) while a stand-alone composting facility handling multiple feedstocks and employing sales and marketing staff may need more employees.

Interestingly, 39 of 77 composting facilities (51 percent) reported employing a marketing person and about a quarter of those (10 of 39) less than a full-time person for marketing. The range was from zero to five. Only one facility reported using a marketing firm to market their compost. Far fewer processors reported any people dedicated to marketing at all. The range was similar to compost facilities, from zero to five, but only nine processor facilities (18 percent) reported any marketing function at all. Obviously a landfill making its own ADC does not need a marketing person, whereas composting would require ongoing marketing in most cases.

Reasons for Nonparticipation

Seventy-three facilities that were contacted (28 composters and 45 processors) declined to participate in the survey. This is up substantially from 2000, when only 11 facilities declined to participate and 2003 when 32 facilities declined to participate. There were more facilities (230) processing organics in 2008 than in previous years. A few of the non-participating facilities identified issues of confidentiality and a few did not perceive a value in participating in the survey, but the overwhelming reason for nonparticipation was lack of time. In fact the majority of those classified as “non-participating” did not formally decline to participate, but did not return a survey even after numerous, repeated attempts to convince them to participate. So the relative priority of completing a long survey for a State agency versus running the business day-to-day had to be a factor contributing to the lack of participation.

Many processing operations and smaller composting operations are run by a small staff who must balance operations with management responsibilities; in a few cases the person who answers the phone may also operate a loader or a grinder. A few operators indicated they were willing to participate, but indicated on their surveys that they were too busy to provide a comprehensive response. Most (but not all) of the non-participating facilities were generally smaller facilities. It is unclear exactly how this increase in non-participating facilities affected the survey data.

Some of the reasons given for non-participation are shown below. The primary reason was lack of time to devote to a complicated survey.

"We don't do surveys, we're anti-."

"Every time I do a survey it bites me in the ass."

"Want to be paid to do the survey."

"Not currently in the composting business, just can't get it done."

"No longer in the composting business, don't have time to do it."

"Strictly Ag products, no green material, no garbage."

"Sorry, but we will not be participating in the "Compost Industry Mgt. Practices and Market Conditions" survey. It is quite involved and requires some very detailed information regarding green material/organics activities at our facility. We feel that a lot of the information being requested is of a sensitive nature. Please understand."

"We are a one-man show, no time."

"Won't be participating this year."

"No time to fill out survey, no composting, just chipping."

"Just no time for survey."

"We are a private corporation and composter. We have not received any financial assistance from the CIWMB and have been trying for years; therefore we will not provide any company information for this survey. We do however believe it would be a great time for the CIWMB to begin putting programs in place that would assist those composters that have been helping the municipalities to meet the AB 939 goals now since the beginning. Those composters that are not attached to municipal contracts."

"Owner had heart attack, too busy to do survey."

Estimating Tonnage for Non-participating Facilities

To gauge the impact of the non-participating facilities, an estimate was made by distributing the number of facilities according to the distribution of the participating facilities (Figure 7). The result of this estimate is shown in Tables 14 and 15. Table 16 compares this estimated tonnage with the reported tonnage and combines the totals to adjust for those facilities that chose not to participate. The methodology used to calculate the tonnage of non-participating facilities was consistent with the methodology used in the 2004 report.

Table 14. Estimated Tonnage for Non-Participating Facilities in 2008 (Processors).

Facility Size (Thousand tons per year)	Percent Distribution*	Estimated Tons Processed Annually
<10	47%	211,500
10 – 49	31%	418,500
50 – 99	14%	472,500
100 – 149	7%	393,750
150 – 199	0%	0
200+	2%	180,000
TOTAL		1,676,250

* Percentages may not sum due to rounding.

Table 15. Estimated Tonnage for Non-Participating Facilities in 2008 (Composters).

Facility Size (Thousand tons per year)	Percent Distribution	Estimated Tons Processed Annually
<10	34%	95,200
10 – 49	42%	352,800
50 – 99	12%	252,000
100 – 149	4%	140,000
150 – 199	1%	49,000
200+	7%	392,000
TOTAL		1,281,000

Table 16. Summary of Tonnage Adjustment.

2008	Tonnage
Estimated Tonnage for Processors	1,676,250
Estimated Tonnage for Composters	1,281,000
Total Estimated Tonnage	2,957,250
Tonnage Reported by Processors	1,879,773
Tonnage Reported by Composters	4,479,393
Total Reported Tonnage	6,359,166
Adjusted Tonnage (Processors)	3,556,023
Adjusted Tonnage (Composters)	5,760,393
Total Adjusted **Tonnage**	**9,316,416**

Survey Results - Management Practices

This section summarizes the results of questions asked relating to facility management practices. These questions were generally more qualitative than questions asked in the first part of the survey. This is the first time that most of these questions have been asked in the survey process. Many of these questions relate to current challenges facing increased organics diversion in California. In general, the areas fall into four categories: impacts to air quality; impacts to water quality; techniques to minimize odor and emissions; and questions relating to the use of green material as Alternative Daily Cover.

Water Quality Issues

Composting facilities, especially green material composting facilities, exist in somewhat of a grey area when it comes to water quality regulations. Some compost facilities have site-specific Waste Discharge Permits and others don't. Many sought coverage under a previously existing statewide waiver of Waste Discharge Requirements which has expired. While it is difficult to understand the potential impacts to water quality from a specific facility without doing site-specific investigations, the survey sought to understand the "state of the industry" with regard to implementation of stormwater discharge management practices, and existing infrastructure for handling water on-site.

Stormwater Discharge Off-site

These questions related to stormwater drainage on-site. Table 17 summarizes the responses to questions regarding on-site stormwater management at composting and processing facilities. As shown below, the majority of composters and processors have applied for coverage under the General Stormwater Permit as part of the National Pollutant Discharge Elimination System. In some cases, respondents had not applied for coverage because they indicated that their facility was considered zero discharge.

Fifty-three percent of composters responded that they had site-specific Waste Discharge Requirements (WDR) from their Regional Water Quality Control Board. This seems higher than would be expected given the number of site-specific WDRs that exist for composting facilities. It is possible that some respondents were not clear on the difference between a national pollutant discharge permit and a site-specific WDR from their Regional Water Quality Control Board. A number of processors also listed site-specific WDRs, but these were probably obtained for the larger "host" facility (like a processing operation at a transfer station or a landfill), not a stand-alone WDR for a processing facility.

Table 17. Stormwater Management Infrastructure.

	Composters		Processors		All	
	Yes	No	Yes	No	Yes	No
Notice of Intent for coverage under the General Industrial Storm Water Permit	69%	31%	90%	10%	77%	23%
Site-Specific Waste Discharge Requirements	53%	47%	64%	36%	57%	43%
Stormwater Retention Pond	52%	48%	44%	56%	49%	51%
Number of Responses	78		48		126	

About half of all facilities reported having a stormwater retention pond. Many processors are probably benefiting from existing retention ponds built for a landfill or transfer station, rather than reporting retention ponds for stand-alone processors.

On-Site Stormwater Management Practices

In order to better understand the types of management practices that composters and processors use to manage stormwater on their sites, questions were asked about stormwater prevention and minimization techniques. These include the use of berms, buildings, improved surfaces, temporary barriers, grassy swales, straw wattles, retention ponds, use of covered composting systems, site grading, and others. Figure MP-1, MP-2, and MP-3 highlight the existing techniques being used by organics processors and composters to manage stormwater. Overall, composting facilities tend to have more stormwater management techniques in place than processors, though specific experience varies considerably. Processors located at transfer stations or landfills may benefit from stormwater infrastructure built for the landfill or transfer station. Composters are slightly more likely to have berms in place to manage stormwater than processors. Neither composters nor processors are likely to be operating in a building. Only 9 percent of composters report operating in a building, which is still fairly uncommon in California. Composters are just as likely to operate on an improved surface (i.e., gravel, concrete, some other form of compacted surface), as are processors. About 52 percent of composters reported using a stormwater retention pond, whereas 44 percent of processors reported stormwater retention ponds. Other techniques in use include grading (60 percent of composters, 44 percent of processors), grassy swales (24 percent of composters, 19 percent of processors), barriers (14 percent of composters, 35 percent of processors) and straw wattles (20 percent of composters, 26 percent of processors). Twenty-three percent of composters reported using a cover system of some type, whereas only 6 percent of processors reported the same.

Ground Water

The other impact composters and processers can potentially have on water quality is groundwater. To better understand this issue, the survey looked at the type of surfaces used by composters and processors for their operational areas. Figures MP-4 and MP-5 highlight the types of surfaces in use by composters and processors for their operational areas. The majority of both composters and processors operate on either compacted native soil or asphalt/concrete. Composters are

slightly more likely than processors to operate on either compacted native soil or asphalt/concrete surface. The processing itself (loading and unloading a grinder) is extremely hard on a surface, and typically is conducted on an improved pad. Composters are slightly more likely to be operating on a compacted native soil pad versus asphalt/concrete surface. While having an all-weather pad is essential for Solid Waste Facility permit compliance, the cost of paving larger composting sites can be prohibitive. Less than 20 percent of composters or processors reported some or all of their operational area being native soil. Most are operating on some combination of compacted native soil, asphalt/concrete, soil cement, base rock, clay, an engineered alternative, or final or intermediate landfill cover. Surveying is not a particularly effective way of understanding the potential threat to groundwater from a given facility. Other factors beyond just the operating surface come into play when evaluating a given facility's potential to cause harm to groundwater, especially given the broad range of annual rainfall in California. Soil type, depth to groundwater, material retention time, and feedstock type are all important variables.

Air Quality Issues

As with water quality issues, there is substantial uncertainty in California in regard to air quality regulations and the potential impact of composting and processing facilities on air quality. Recently a number of Air Quality Management Districts, seeking to comply with the Federal Clean Air Act, began investigating emissions from the composting piles themselves as potential sources of air pollution. The South Coast Air Quality Management District was the first to regulate ammonia from biosolids and manure composting operations. Other air districts followed suit, including the San Joaquin Valley Unified Air Pollution Control District, the Mojave Desert Air Quality Management District, and most recently the Antelope Valley Air Quality Management District. Other air districts have been watching these pioneer districts to see whether or not these measures prove to be effective. Similarly the South Coast Air Quality Management District was the first to raise the possibility of regulating Volatile Organic Compound (VOC) emissions from green material composting. The South Coast Air Quality Management District has not finalized its rulemaking process as of the date of this report.

Composting Conditions

In order to understand what types of management practices might be realistic for composters, you need to understand the dominant method. In California, as in other states, the predominant method of composting is the open, turned windrow process. Seventy-seven percent of respondents listed windrow their predominant processing method (some facilities operate multiple composting systems on the same site). Windrows outweigh all other methods combined, with aerated static pile (about 10 percent) and non-aerated static pile (12 percent) the closest competitors. A few other systems are in operation in California, but not in numbers approaching windrowing. These include agitated beds, fully enclosed in-vessel techniques, Ag-Bags, and/or the Compost Technologies International (CTI) system, and others. The use of aerated static pile systems for some or all of the composting appears to be on the rise.

Windrow Turning Frequency

Figure MP-6 shows the responses to the question regarding the windrow turning frequency. Windrow turning frequency is a rough indicator of management intensity, because typically, the more you turn the piles, the faster the process goes (to a point). Of the facilities that reported using windrows, 23 percent turn the piles five or fewer times, 27 percent turn the piles 6 to 15

times, 29 percent turn their piles 16 to 20 times over the life of a windrow, and 17 percent turn the piles 21 to 30 times. Only 4 percent of windrow composters reported turning the piles more than 30 times over the life of the windrow. This shows a very broad application of turned windrow technology.

Composting Process

Composting is a complex bio-chemical process. While microorganisms conduct the majority of the decomposition, compost facility operators can manage key composting process variables to speed up the process. Some air districts have suggested that closely managing key compost process variables (i.e., carbon to nitrogen ratio, moisture content, temperature, oxygen content, particle size, and/or pH) may have a measurable impact on Volatile Organic Compound (VOC) production and that simple, low-cost "Best Management Practices" may offer a cost-effective solution to VOC emissions. In order to better understand existing compost practice with regards to key process variables, a series of questions was devised to elicit management practice. Figure MP-8 summarizes the responses to the key compost process variables questions. The survey form response options A, B or C are slightly different for each process variable, so one needs to use the following text to help interpret Figure MP-8: A is defined as "As Delivered"; B is defined as "Adjust Mix"; and C is defined as "Other." For more detail, please see the survey form in Appendix A.

CARBON TO NITROGEN RATIO

Carbon to nitrogen ratio relates to the balance between carbon and nitrogen in the composting mass. Every feedstock can be expressed in terms of its carbon to nitrogen ratio. Woody particles like shrubs, branches, and wood have relatively high carbon content. Materials like food scraps and biosolids have relatively low carbon content. Most composting literature suggests 30 to 1 as a starting carbon to nitrogen ratio, but that is really just a "rule of thumb." Both higher and lower carbon to nitrogen ratios can work. As shown in Figure MP-7, 38 percent of composters don't manage the carbon to nitrogen ratio at all, though 49 percent provided a target starting carbon to nitrogen ratio. This ranged from <15 to 1 and as high as 40 to 1.

Comments provided in this section are as follows:

"Blend woody material with grass when necessary."

"Very consistent feedstock."

"We have two labs test and inspect."

"Buy bulking agent and mix in."

MOISTURE CONTENT

Maintaining moisture content can be one of the biggest challenges in composting in many parts of California, especially in the Central Valley and Southern Region. As shown in Figure MP-8, 66 percent of respondents adjusted starting moisture content. The range of starting moisture content was from 25 percent on the low side to 60 percent on the high side. Twenty percent of respondents reported not managing moisture of the incoming feedstock at all, while 14 percent provided an alternative method of maintaining moisture content. The types of alternative methods are detailed in the "Comments" section below.

Comments provided in this section are as follows:

"Always adding water for process and dust."

"Added at the grinder, varies by time of year."

"We visually inspect moisture content."

"Use squeeze method."

"Dry to 50 percent before composting."

"Bulking agent, feedstock comes in at 80 moisture."

TEMPERATURE

Temperature is an indicator of composting activity as much as a parameter to be managed. As shown in Figure MP-8, most respondents manage or track temperature at some level. Thirty-five percent of respondents answered that they complete and document the pathogen reduction process, but otherwise do not manage temperature. Fifty- one percent of composters listed a site-specific process for measuring temperature. Some of those methods are captured in the comments listed below.

Comments provided in this section are as follows:

"Thermometer two times per week for the first three weeks, after the pile is made/turned."

"Track daily throughout cycle."

"Document temperature during the entire active composting phase."

"Temperatures are taken and recorded daily."

"During pathogen reduction process; temps recorded daily, otherwise temps collected once per week."

"Every day for minimum 45 days."

"We monitor each windrow daily at 12" and 24" depth at eight stations throughout the composting process."

"We manage temps and record in computer compost management system."

"We document PFRP and manage temps through aeration control."

OXYGEN CONTENT

Oxygen content is important to microbial evolution and can be used as a measure of compost maturity. Some literature suggests maintaining oxygen contents above 5 percent for efficient composting. However, most California composters do not measure pile oxygen content very closely. Figure MP-8 shows the range of opinions on oxygen content. Eighty-five percent of

composters responded that they either do not measure oxygen content at all or manage oxygen by providing adequate porosity at the start of the composting process. Facilities that do actively measure oxygen content are the aerated static pile facilities and some of the smaller agricultural facilities.

Comments provided in this section are as follows:

"Periodically test CO_2 to make sure we are getting the CO_2 out and the O_2 in the windrows."

"Monitor with CO_2 meter."

"Adjust blower schedule based on temperature readings."

"Blowers under rows add oxygen and temperature control."

IMPORTANCE OF COMPOST PROCESS VARIABLES

The following question asked respondents to rank each of the key process variables in order of importance to the composting process. Figure MP-9 graphically displays the results. The majority of composters would rank temperature and moisture content as very important, with little dissent. Carbon to nitrogen ratio is somewhat more ambiguous, with more composters ranking it as somewhat important to very important. This may reflect the comments from the previous question that saw many composters reporting that they processed whatever came in with little regard to a specific target carbon to nitrogen ratio. Oxygen content was somewhat less ambiguous with many composters (47 percent) ranking it very important, a slightly smaller group ranking it somewhat important (32 percent) and less than half as many (14 percent) ranking it unimportant. Particle size followed a similar pattern, though more composters thought particle size was somewhat important to unimportant than thought particle size was very important. The responses regarding pH follow a bell-shaped curve pattern with a small percentage thinking that pH is very important, but the majority of respondents listing it as unimportant or somewhat important.

Odor/Emissions Control

The third section of Facility Management Practice questions dealt with odor and emissions control. Previous surveys have asked questions about odors, but the focus on emissions—both small particulate matter (dust) and VOCs—is relatively new. The survey asked questions related to odor control practices, the impact of new diesel particulate rules, particulate emissions controls, and VOC emission controls.

ODOR CONTROL MEASURES

Previous surveys have asked questions about odor management practices. This survey expanded a little on the scope of odor management practices. The first question asked about specific odor management techniques. Figures MP-10, MP-10A, and MP-10B show the responses to this question by composters and processors. The most common response (78 percent of composters) was that optimizing compost parameters are a key odor management technique. After optimizing process variables, specific management practices are commonly used. Some of these are listed below in the comments section. Composters also reported using odor neutralizers (10 percent), biofilters (13 percent), compost inoculants (5 percent)), and enclosures (5 percent). Processors differed somewhat in their responses. Most processors do not keep material on-site for more than

a week, so moving material rapidly off the site is a key management practice (12 percent), though not all processors recognize this as an odor management practice. Interestingly, 7 percent of processors use an odor neutralizer.

IMPACT OF DIESEL PARTICULATE RULES

Figure MP-11 details the impacts that composters and processors expect from the implementation of new California Air Resources Board diesel particulate rules. The majority of respondents feel that the new diesel particulate rules would impact them, primarily by increasing costs and tying up capital that would otherwise be spent on business expansion. Processors are slightly more aware of whether or not the new diesel particulate rules might impact their business, but about 30 percent of respondents who did not comprehend what the impact might be. Fewer than 20 percent of respondents felt that the diesel particulate rules would not affect them. Composters (47 percent) and processors (63 percent) clearly see a negative impact of the new diesel particulate rule, as reflected in the following comments.

Comments from Diesel Particulate question:

"Older processing equipment may be lost."

"New grinder rules necessitating new equipment."

"Recently electrified all stationary equipment. Future changes for mobile grinding for ARB."

"Will require electric processing equipment."

"We will be required to limit the use of major equipment or convert to electric power."

"Costly to upgrade equipment."

"The cost of replacing two engines and retrofitting five tier 2 engines will be approximately $100,000."

"Because of the new diesel ruling I will have to replace my fleet of 13 trucks (this includes support equipment, spreaders, and haul trucks) in the next 5 years because most of our equipment is outdated according to the new diesel ruling. Because of only being seasonal we do not accumulate a lot of mileage on our equipment. The majority of our equipment has less than 500,000 miles on it and was purchased used to keep cost down. Currently we only own three trucks that can accept the new PM filter properly but at a cost of $20,000 to $40,000 each that will only be good for four years and we will still have to either retrofit the trucks with a new motor at about $30,000 to $35,000 or sell the equipment out of state at discounted rate to where it is only worth scrap value. It is not worth us trying to install the filters; just run the trucks and try to replace them with newer units. Because of this new ruling and having to replace my whole fleet I have passed on purchasing a 250 acre property at $1 million that is needed to expand my business, now I be using this money to try to replace my fleet of trucks just to stay in business and not expanding."

"Very costly and not enough time to recapitalize equipment. Completely devalued current equipment assets poor program."

"Will affect the fleet, not the compost operations."

"Ties capital to equipment instead of development"

PARTICULATE EMISSION CONTROL MEASURES

Figures MP-12, MP-12A, and MP-12B highlight the implementation of particulate control measures at composting and processing facilities. For both types of facilities the overwhelmingly particulate reduction technique in use is a water spray (64 percent for composters, 43 percent for processors) or a misting system (20 percent for composters, 13 percent for processors). Enclosure, biofilter, compost blanket, or other techniques are reported respectively by fewer than 10 percent of composters and processors.

CONTROL OF PARTICULATE MATTER

This question asked for a description of how particulate matter was controlled from the time material arrived at the facility to when compost is removed from the facility. The vast majority of respondents use a water truck and/or water spray.

VOC EMISSIONS CONTROLS

Figure MP-13 lists the VOC control measures employed by composters (no processors are regulated for—or likely to be—intentionally reducing VOCs from their operations). Currently VOCs from green material composting are regulated formally by only one air district (the Yolo-Solano Air Quality Management District), but several others have draft rules they are pursuing (including the San Joaquin Valley Air Pollution Control District and the South Coast Air Quality Management District). The South Coast Air Quality Management District and the San Joaquin Valley Air Pollution Control District also regulate VOCs (and ammonia) from manure and biosolids composting. This question inventoried current practices of existing composters and processors. Most proposed VOC reduction rules exempt processors, at least so far. Nonetheless, some processors have VOC reduction methods in place. This consists predominantly of water spray and misting systems. One processing facility reported using a biofilter for emissions control. Most composters also report use of water spray and/or misting systems to control dust and VOCs. Although composters optimize carbon to nitrogen ratio (50 percent), manage moisture content (74 percent), manage particle size (45 percent), and manage porosity (31 percent), it is unknown whether this has any effect on VOCs. Fewer than 10 percent of composters are using a compost blanket or a biofilter to control VOC emissions. However, as discussed in a previous section, the use of aerated static pile composting systems (which generally allow for the use of a biofilter) is slowly becoming more common in California.

Alternative Daily Cover

Prior surveys have asked questions about the use of green material as Alternative Daily Cover (ADC). This practice continues to be controversial in California, though opinions vary considerably. As seen in previous figures, ADC represents a significant portion of the market in some regions, particularly the Southern Region and the Bay Area, but less so in other regions (Northern, Central Coast, and Central Valley). The following describes the responses to questions about ADC use and its impact on the particular organics processing and composting facility and documents whether or not contracts were given to ADC as opposed to composting facilities. The respondent was asked to describe the impact that hypothetical situations might have on their

business: (1) if the diversion credit for ADC was removed; and (2) if tip fees were equal for ADC to landfilled waste.

Impact of ADC on Business

Alternative Daily Cover continues to be a controversial issue among organics processors and composters. Figure MP-14 shows the response to the question "Has ADC had an impact on your business?" Responses are split roughly 60 percent (No)/40 percent (Yes). Those who answered affirmatively to this question were asked to explain how it had affected their business. The responses included losing the ability to get feedstock, ADC costs less to produce than composting, landfill tip fees lower than their gate fee (for green material), and other various responses. Figures MP-15, MP-15A, and MP-15B highlight how companies affected by ADC answered this question. The most popular answer was that ADC costs less to produce than compost (29 percent of composters). Losing the ability to get feedstock (23 percent of composters) was next, followed by landfill tip fees lower than gate fees, with 16 percent of composters choosing this as a reason that ADC is affecting their business.

Following the Alternative Daily Cover contract issue were open-ended questions regarding the direct or indirect impact of ADC. The first asked the hypothetical question regarding removing diversion credit for ADC. Selected comments (both positive and negative) are listed below.

"Because we do not use green material for ADC it would have little impact."

"We'd be able to accept additional materials and undergo a possible permit revision."

"The impact would be severe."

"We would quickly maximize our permitted maximum tonnage."

"Not much at our site, but would increase real recycling options."

"More material at a lower cost."

"Some increase in business."

"ADC is not used in Kern County."

"Very little."

"It would be positive, more bulking agent available."

"Would force compliance with pending air and water regulations. Regardless of cost."

"It would be positive, more bulking agent available."

"More material would be available, might cause tip fees to go up.

"Direct impact would provide incentive for cities, municipalities etc. to recycle instead of landfilling. This would increase feedstock sources in our area."

"We don't sell ADC; we wouldn't get credit on tons going towards 50 percent diversion rate."

"More possible feedstocks."

"Increase feedstock, but it will also increase amount of finished product for sale."

"We would be out of business."

"None."

"None primary desire is to reuse biosolids."

"We would get more feedstock."

"We would be able to compost more material and match with other feedstocks like biosolids."

"Less temptation to use yard waste for ADC."

"More material would be available for composting."

"In our area burning has now taken the place of ADC."

"No local landfills."

"Glut of dirty feedstocks pushed into compost marketplace."

"Would have more companies in need of our services."

"Additional feedstocks, more profit potential."

"Far more feedstocks and profitability."

"Flood the market."

"Some cities might turn to biomass or composting."

"Less competition from ADC."

"As a result of the ban, (Alameda County) diversion credit is no longer an option."

"Could flood the market with more product than it could use if ADC was not permitted."

"Start a compost facility."

"Might get more feedstock."

"Tonnage would increase."

"We use dirty wood (i.e., plywood), furniture painted wood, and shingles for ADC."

"Material would end up in landfill with no beneficial re-use."

"It would reduce the amount of green material available at the landfill as local jurisdictions attempt to haul green materials to other facilities that would allow them to retain the diversion credit. It would also increase the cost of landfill operations as the amount of soil or other more expensive ADC materials are used as daily and intermediate cover. It would increase transportation cost and environmental impacts as green material is transported to facilities farther from their origin for composting and/or re-use. This creates additional precedent for altering waste management and recycling policies based on individual preference rather than solid technical and managerial principles."

"Not much at this facility."

"Facility generates ADC. Loss of diversion would push us further away from ADC to Ag. Land application and to composting. Possibly to anaerobic digestion."

"Suppliers that are required to receive diversion credit would demand a use that earns the credits, causing fees to be raised. Fee charged to suppliers (waste haulers, cities, gardeners, etc.)

will have to be raised to compensate for additional processing and transportation costs to far away markets, which are not guaranteed. Their response would not be favorable to a cost increase. Some suppliers may look for other composting facilities that have excess capacity and would deliver feedstock there. This could provide for increased traffic and vehicle emissions generated from transportation vehicles traveling farther distances. If we are unable to market materials from certain customers and still retain the diversion credit, we may be forced to stop accepting materials from the customers. This could cause us to reduce our workforce."

The second hypothetical question pondered the idea of raising ADC tip fees equivalent to landfilling. Selected comments (both positive and negative) are listed below.

"Since we no longer use green material for ADC it would have little impact."

"The impact would drive customers away."

"We would quickly maximize our permitted throughput."

"More feedstock would be available, more directed to composting."

"Increase green material diversion."

"ADC is not used in Kern County."

"It would be positive, more bulking agent available."

"There would be more capital available in our operation to deal with air board requirements which are potentially unbearable."

"This ideally would help, but would landfills follow suit?"

"More possible feedstocks."

"It would allow us to increase our tipping fee and increase our capital investment."

"None. We don't use green material as ADC."

"We would get more feedstock."

"This would increase compost feedstock in both green material and others. Part of the ADC fee should be used for market development like a statewide compost marketing plan similar to those plans used in agriculture like milk, raisins, strawberries, etc. To create a higher demand for compost."

"Increased feedstock, increased tip fee = more revenue = better economics."

"None. No local landfills."

"That might make some higher quality, clean and carbonaceous materials available."

"No impact."

"Could raise the tipping fees (we're close to a landfill) and sell the finished product for less to leverage sales."

"Exceed site capacity."

"It would or could possibly be as much for hydroseeding; so why try to recycle the material if its cost goes up. Initially we have tried to take green material and grind some for biofuel; then some green material mulch comes from a transfer station/trucking services their material is off-spec to use as composting; we take that material and mix with a loader the biosolids sludge and spread on inside slopes to assist as vegetation layer in place of hydroseeding."

"Composting and other recycling could charge enough to pay for the cost of operating the business."

"None because of ban."

"Would not get any ADC."

"Would increase feedstock at this yard."

"Start a compost facility."

"Might get more feedstock."

"Same as above."

"None, we do not use 'compostable' green material for ADC."

"More illegal dumping."

"It would eliminate the cost benefit to individual jurisdictions or separate collection of green materials potentially resulting in the commingling of green materials with other MSW. Thereby increasing the cost of landfill operations as the amount of soil or other more expensive ADC materials are used as daily an intermediate cover. It would also eliminate the incentive for haulers to remove contamination from dirty green material. Dirty loads of green material are charged as solid waste disposal."

"Not much at this facility."

"Green material could be lost to trash system if there was less motivation for customer to separate."

"It would impact me indirectly by increasing the sell price of green material compost, which would help me in sales of our agriculture commodity compost which tends to be a bit more pricier than that of green material."

"The most obvious result would be that we would need to be compensated at least an amount equal to the landfill increase. This would result in all suppliers (including curbside programs) being charged higher tipping fees. Again, their response would not be supportive. We would then continue to evaluate any other markets available for cost-efficiencies. However, there would probably be a trade-off here of ADC being removed from the landfill but more traffic and vehicle emissions generated from transportation vehicles traveling further distances and there is no guarantee that other markets will exist to absorb the newly available green material ADC product.

"Either of these scenarios (C or D) would require an advanced notice of at least 5-10 years to have any realistic shot at putting together the proper infrastructure to handle this type of situation. More permitted composting facilities will need to be developed which is very difficult at best. The acreage needed to process all curbside feedstock would be astronomical and could not be located near the point of origin (the generating homeowners' cities). The only restriction that

should even be considered for green material ADC is that the product be originated from a municipality or their contractor. Feedstock from gardeners, landscapers, tree trimmers, etc. would be excluded from using the ADC markets of landfills. Landfills are already restricted from using too much green material ADC at their locations."

Conclusion

Surveying an industry as varied as California's compost and mulch producing infrastructure is an endless challenge. Perhaps the most significant challenge is the relative immaturity of the industry and the difficulty in getting small, owner/operator type facilities to provide a comprehensive response to a complicated survey instrument. This has become more difficult over time. There are more facilities than in the past, a growing number of small facilities, and additional integrated facilities. California's broad geography and significant regional differences also make it challenging to come up with meaningful generalizations about the composting and processing industries. Adding the management practice questions to the core survey document more than doubled the length of the survey. Even though many of the management practice questions were not necessarily as time consuming to answer as some of the other questions, the overall appearance of the 10-page survey may have discouraged some respondents. Clearly this was a factor for some of the 73 facilities that chose not to participate, but it also shows up in facilities that answered some, but not all, of the questions. The current economic downturn also clearly played a role as composters were forced to do more with less, and several non-respondents mentioned simply not having sufficient time.

While it is difficult to draw too many conclusions from the current survey, a few points are clear:

- California processors and composters continue to access an enviable diversity of end product markets. It would appear that, at least on a statewide basis, there is not a reliance on a single market. Regionally, however, some markets are dominated by a single large market (as the Southern region is by the green material Alternative Daily Cover "market"). Some smaller processors also tend to rely almost exclusively on the boiler fuel (waste-to-energy) market.
- There is still considerable room for diversification in markets. The majority of facilities manufacture five or fewer products.
- As documented in the 2001 and 2004 reports, agriculture continues to be the largest single market for compost in the 2010 report (not only green material, but all material processed into compost). This represents a significant achievement, because many observers doubted conventional agriculture would accept compost made from urban organics. Although CalRecycle has done an enviable job promoting these markets, there is still much that is not known and potentially a great deal of capacity within this market segment.
- Very few facilities reported an increase in processing capacity in 2008. This is undoubtedly linked to the slumping economy, both nationally and in California. The current economic crisis is making it harder for composters or processors to get capital to purchase land, buy equipment or otherwise make investments in facilities. Similarly, a number of planned collection programs or expansions of collection programs have been put on hold. One waste stream in particular—construction and demolition materials specifically, and wood waste in general—experienced a sharp downturn in volume during 2008.
- New and emerging air and water regulations are causing considerable uncertainty for California's organics processing and composting industry. Compliance with proposed rules is expected to increase the cost of doing business, which further minimizes the capital available for facility or program expansion.

- Because of the large volume of food scraps and/or liquid wastes being disposed, an opportunity appears to exist for new and existing facilities to process these types of nontraditional feedstocks. Only 16 facilities surveyed reported processing food scraps or liquid wastes, though, collection programs for these materials (especially food scraps) have been delayed by some jurisdictions.

- The organics processing and composting industry has continued to grow and has become more complicated. Future survey efforts may want to divide the survey universe into smaller subsets (i.e., composting facilities, stand-alone chipping and grinding facilities, landfills, etc.) in order to avoid sending one comprehensive survey form to a diverse group of facilities. For example, the current survey had some very specific questions about composting which were not intended for the processor (i.e., non-composters) universe. Similarly, many Alternative Daily Cover processors do not regard their operations as separate facilities from the landfills they operate, nor do many of them consider ADC to be a "product" with a "market." Individualized surveys to different targeted groups may help to alter some of these distinctions. This may also make surveying more efficient and increase the overall response rate.

Areas for further study:

- Agriculture continues to represent the largest potential market expansion for composted products. A number of composters provided agricultural crop types into which compost is sold. CalRecycle should investigate these crop types to understand the motivations for purchasing compost and which crops are more likely to purchase compost. Continuing to increase the use of compost by conventional and organic agricultural growers is key to continuing the sustainability of the composting industry in California.

- CalRecycle has done extensive outreach to Caltrans (and similar entities) to identify erosion control and other market opportunities for using compost. CalRecycle should continue its work toward increasing markets and reducing barriers for Caltrans to purchase recycled-content organic products. This could include additional workshops, demonstration sites, additional specification, and ongoing outreach.

- The largest gap in this and previous surveys is reconciling "facility" data with city and county (generator) tonnage collection records. There are still no reliable data on, for example, the number or extent of curbside, green material collection programs in California. Although we now have fairly reliable records of the production facilities, the full picture of green material recycling in California cannot be fully understood without understanding the collection infrastructure. Tying city and county collection programs to facilities, then facilities to end markets, would provide a more complete picture of the specific regional needs for market and facility development.

- Senate Bill 1016 (Wiggins, Chapter 343, Statutes of 2008) fundamentally changes the way jurisdictions calculate diversion rates. It is unclear exactly what type of impact this might have on the organics processing and composting industry, but it would seem that periodic surveys of the organics processing and composting industry may be helpful on the emerging policy issues and to understand industry trends.

Appendix A: Survey Form

SURVEY AND ANALYSIS OF COMPOSTING INDUSTRY
MANAGEMENT PRACTICES AND MARKET CONDITIONS

Facility Name: _____ **Date:** _____

Person Filling in Form: _____ **Phone:** _____

PART 1 - FACILITY INFORMATION

A. FEEDSTOCKS

1. **What types of feedstock does this facility accept (check as many that apply)?**
2. **Is feedstock volume constant or is it seasonal (Fill in appropriate circle)**

Green material

Residential:	☐ Brush	_____tons/year,	**Constant**	**Seasonal**
	☐ Grass clippings	_____tons/year,	**Constant**	**Seasonal**
	☐ Other: _____	_____tons/year,	**Constant**	**Seasonal**
Commercial	☐ Brush	_____tons/year,	**Constant**	**Seasonal**
	☐ Grass clippings	_____tons/year,	**Constant**	**Seasonal**
	☐ Other: _____	_____tons/year,	**Constant**	**Seasonal**
☐ **Wood waste**		_____tons/year,	**Constant**	**Seasonal**
☐ **Construction & Demo. Wood**		_____tons/year,	**Constant**	**Seasonal**
☐ **Manure**		_____tons/year,	**Constant**	**Seasonal**

Agricultural residue

☐ Grape pomace	_____tons/year,	**Constant**	**Seasonal**
☐ Cannery waste	_____tons/year,	**Constant**	**Seasonal**
☐ Other: _____	_____tons/year,	**Constant**	**Seasonal**

Food scraps

☐ Residential	_____tons/year,	**Constant**	**Seasonal**
☐ Commercial	_____tons/year,	**Constant**	**Seasonal**
☐ **Liquid waste**	_____tons/year,	**Constant**	**Seasonal**
☐ **Biosolids**	_____tons/year,	**Constant**	**Seasonal**
☐ **Other:** _____	_____tons/year,	**Constant**	**Seasonal**

Comments:

3. **What are the major sources of feedstocks for this facility? Please provide the percentage of your total volume that comes from these sources (this should add up to 100%)**

   a. Municipally hauled ____% (delivered by City)
   b. Commercial hauled ____% (material hauled by a commercial contractor)

c. MRF Generated ____% (delivered from MRF or Transfer Station)
d. Self-haul ____% (delivered by commercial or residential entity)
e. Agricultural sources ____% (farm or ag. processing source)
f. Waste water treatment plant ____%
g. Institutional sources ____% (delivered from schools, parks, golf courses, hospitals, prisons, army bases,
h. Other: _____ ____%

4. What is the incoming processing capacity of this facility?

- 0 – 50 tpd
- 50 – 100 tpd
- 100 – 200 tpd
- 200 – 300 tpd
- 300 – 400 tpd
- 400 – 500 tpd
- +500 tpd

5. The facility processes about _____ tons per year.

6. The site is approximately_____ acres.

7. Has this facility's processing capacity changed in the past year?

☐ No, processing capacity has stayed the same.

☐ No, it has decreased by _____ tons per day/year.

☐ Yes. Processing capacity has increased by _____ tons per day/year, because we:

☐ Purchased higher capacity equipment
☐ Curbside program expanded
☐ Increased our permitted acreage
☐ Increased sales volume
☐ Increased processing contracts
☐ Other:

B. QUANTITY OF ORGANIC PRODUCTS SOLD

1. What general types of products does this facility produce by volume?

☐ Compost	_____ cu. yds per yr.	Average bulk density _____ yds/ton
☐ Mulch	_____ cu. yds per yr.	Average bulk density _____ yds/ton
☐ Boiler fuel	_____ cu. yds per yr.	Average bulk density _____ yds/ton
☐ Alternative Daily Cover	_____ cu. yds per yr.	Average bulk density _____ yds/ton
☐ Beneficial reuse at landfills	_____ cu. yds per yr.	Average bulk density _____ yds/ton
☐ Other: _____	_____ cu. yds per yr.	Average bulk density _____ yds/ton

2. How many different products does this facility produce?

¶ 1 – 5 ¶ 5 – 10 ¶ 10 – 15 ¶ 16 or more

3. What percentage of your production is sold into these market segments and how has this changed in the past 12 months?

☐ Agriculture _____%	¶ Increased or ¶	decreased by _____%
☐ Landscape _____%	¶ Increased or ¶	decreased by _____%
☐ Nursery ____%	¶ Increased or ¶	decreased by _____%
☐ CalTrans ____%	¶ Increased or ¶	decreased by _____%
☐ ADC ____%	¶ Increased or ¶	decreased by _____%
☐ Boiler Fuel ____%	¶ Increased or ¶	decreased by _____%
☐ Municipal projects ____%	¶ Increased or ¶	decreased by _____%
☐ Beneficial reuse at landfills ____%	¶ Increased or ¶	decreased by _____%
☐ Other: _____ _____%	¶ Increased or ¶	decreased by _____%

4A. Of the products made, what percentage is sold wholesale, retail, or given away? (Should add up to 100%)

A. WHOLESALE	B. RETAIL	C. GIVE AWAY
☐ Agriculture ___%	☐ Directly to consumers __%	☐ Contractual to City ___%
☐ Landscapers ___%		☐ On-site give away ___%
☐ Nurseries ___%		☐ Used in-house ___%
☐ Boiler fuel ___%		
☐ CalTrans ___%		
☐ ADC ___%		
☐ Beneficial reuse at landfills ___%		
☐ Bagging plant ___%		
☐ Other _____ ___%		

4B. If you are selling compost into agriculture, what are the major crop types you sell to? (For example, table grapes, citrus, etc.) Please list.

5. What additional services (e.g., bagging, spreading, delivery, etc.) Do you provide at the point of sale?

- ☐ Blending
- ☐ Spreading
- ☐ USCC STA participation
- ☐ Delivery
- ☐ Testing/Analysis
- ☐ Product Knowledge
- ☐ Bagging
- ☐ Certified Organic Registration
- ☐ Other _____

6. Does this facility send any processed or unprocessed material to a composting facility?

☐ No. ☐ Yes, Please list _____

C. OWNERSHIP/PURPOSE

1. Please identify the category below that best describes the organization that operates the facility (check <u>only</u> one):

- ☐ Private, stand-alone facility
- ☐ Private facility affiliated with a landfill
- ☐ Publicly owned stand-alone facility
- ☐ Publicly owned facility affiliated with a landfill
- ☐ Nonprofit organization or research facility
- ☐ Other: _____

2. Please check all the following that appear to be important to the decision-making entity regarding the current operation of this organic material processing facility: (Please choose the top three)

- ☐ Diversion credit
- ☐ Profitability of business (tipping fee and/or markets)
- ☐ Carbon credits
- ☐ Availability of grants/funds
- ☐ Public perception
- ☐ Research
- ☐ Limited available options for recycling one or more feedstocks
- ☐ Other: _____

D. FACILITY EXPANSION

CIWMB Strategic Directive #6 hopes to increase the amount of compostables diverted by 50 percent by the year 2020.

1. What do you see as the biggest barriers to your facility expanding?

Regulatory

- ☐ Permits are too difficult or expensive to obtain.
- ☐ Emerging air and/or water board regulations create uncertainty.
- ☐ Other: _____

Economic

- ☐ Acquiring feedstocks is challenging
- ☐ ADC policy is keeping tip fees too low
- ☐ It's hard to get loans for new equipment.
- ☐ Other: _____

Land Use

- ☐ There is no ability to expand at this site.
- ☐ Surrounding land use is no longer compatible
- ☐ Encroaching residential development makes it hard to expand.
- ☐ Other: _____

Markets

- ☐ Would need to expand current markets for compost before committing to expansion
- ☐ Other: _____

E. EMPLOYMENT

1. How many employees does this facility employ?

Full-time: _____ Part-time or Full-time equivalents:_____

2. What part of the operation are they affiliated with?

A. Management – Number of employees _____

B. Process – Number of employees _____

C Marketing/sales – Number of employees _____

PART 2 SITE MANAGEMENT QUESTIONS

The following questions are important to the CIWMB and the industry in responding to pending and proposed regulations by air, water, and other regulatory agencies:

A. WATER QUALITY ISSUES

1. <u>Stormwater Discharge Off-Site</u>

a. Have you filed a Notice of Intent for coverage under the General Industrial Storm Water Permit (or filed a Notice of non-applicability?)

YES NO

b. Does your facility have a site-specific Waste Discharge Requirement?

YES NO

c. Does the facility have a stormwater retention pond?

YES NO

d. What steps have you taken to reduce contamination of stormwater run-off? (check all that apply)

- ☐ Berms
- ☐ Improved surface
- ☐ Grassy swales
- ☐ Retention pond
- ☐ Site has been graded
- ☐ Other: _____
- ☐ Compost in a building
- ☐ Temporary barriers
- ☐ Use of wattles
- ☐ Use covered composting system

2. <u>Ground Water</u>

a. What is the surface area of the <u>operational area</u> (i.e., windrows, piles, etc) of your site: (If only part of your site is improved, please indicate which part and to what extent)

- ☐ Native soil ____%
- ☐ Compacted native soil ____%
- ☐ Compacted base rock with native soil ___%
- ☐ Landfill final cover ____%
- ☐ Other: _____ ____%
- ☐ Soil Cement ____%
- ☐ Engineered alternative ____%
- ☐ Asphalt or concrete ____%
- ☐ Compacted clay ___%

IF THIS FACILITY ONLY CONDUCTS CHIPPING AND GRINDING (NO COMPOSTING), YOU CAN SKIP TO THE ODOR CONTROL SECTION, ON PAGE 9

B. AIR QUALITY ISSUES

1. COMPOSTING CONDITIONS

a. What type of composting system do you use?

☐ No Composting, just Chipping/Grinding/Processing

☐ Minimally Managed Piles ☐ Static Windrows

☐ Turned Windrows ☐ Ag-Bag/CTI or similar

☐ Aerated Static Pile ☐ Agitated Bed

☐ Enclosed Aerated Static Pile ☐ In-Vessel

☐ If your composting process does not fit one of the above categories, please describe below:

b. FOR WINDROW FACILITIES ONLY: How often is a windrow turned in the course of its life from start to finish?

¶ 0 – 5 turns ¶ 6 – 15 turns ¶ 16 – 20 turns ¶ 21 – 30 turns ¶ +31 turns

c. Do you anticipate any major changes in your composting process?

¶ No ¶ Yes

If "Yes", please explain:

2. COMPOSTING PROCESS

a. How do you manage the Carbon to Nitrogen (C:N) ratio at the beginning of the composting process?

☐ We don't manage this, we take what comes in.

☐ We try to have a C:N ratio of ___ to 1 in our starting compost mix (Example 30 to 1).

☐ Other method:

b. How do you manage moisture at the beginning of the composting process?

☐ We don't manage moisture at the beginning of the composting process.

☐ We add water to make sure our starting mix is between __% and __% moisture.

☐ Other method:

c. How do you track temperature over the life of the compost process?

- ☐ We don't track temperature at all.
- ☐ We complete and document the pathogen reduction process, but otherwise don't manage or track temperature
- ☐ Other method:

d. How do you manage oxygen content of the composting process?

- ☐ We don't measure oxygen content.
- ☐ We manage oxygen by ensuring adequate particle size of the starting compost and by regular turning.
- ☐ Other method:

e. Rank the degree of importance of the following variables to the composting process from 1 to 5; (1 = very important, 2 = somewhat important, 3 = unimportant, 4 = very unimportant, 5 = Not sure)

	RANK				
	1	2	3	4	5
Carbon to Nitrogen ratio	☐	☐	☐	☐	☐
Moisture content	☐	☐	☐	☐	☐
Temperature	☐	☐	☐	☐	☐
Oxygen content	☐	☐	☐	☐	☐
Particle size	☐	☐	☐	☐	☐
pH	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐

3. ODOR/EMISSIONS CONTROL

a. Which of the following odor control measures does the facility employ?

- ☐ Adding an odor neutralizer
- ☐ Biofilter
- ☐ Adding a compost innoculant
- ☐ Enclosure
- ☐ Optimizing compost process variables (particle size, aeration, moisture content, etc)
- ☐ Management practice. Please specify:

- ☐ Other:

b. Do you see the new diesel particulate rules affecting your ability to operate or expand?

- ☐ No
- ☐ Don't know
- ☐ Yes, Explain:

c. Which of the following particulate emission control measures does the facility use?

- ☐ Biofilter
- ☐ Pseudo Biofilter/compost blanket
- ☐ Water spray
- ☐ Enclosure/screening
- ☐ Misting system
- ☐ Other:

d. How is particulate matter (fine dust) controlled from when the material arrives at the facility to when the composting material is removed from the facility?

Please explain:

e. Which of the following Volatile Organic Compound (VOC) emission control measures does the facility use:

Optimize compost process variables

- ☐ Carbon to Nitrogen ratio
- ☐ Moisture content
- ☐ Particle size
- ☐ Porosity
- ☐ Pseudo-biofilter/compost blanket
- ☐ Biofilter
- ☐ Other:

Dust control

- ☐ Water spray
- ☐ Misting system

4. ALTERNATIVE DAILY COVER (ADC)

a. Do you think the ability to use green material as ADC has had an effect on your business?

☐ No. ☐ Yes. Because:

- ☐ ADC costs less than composting
- ☐ We have lost ability to get feedstock
- ☐ Landfill tip fee is lower than gate fee
- ☐ Other:

b. Can you cite instances where contracts that would have provided you compost feedstock were instead given to ADC operations?

- No
- Yes. Please explain:

c. What direct or indirect impact on your operation might result if there was no diversion credit given for ADC made from green materials?

d. What direct or indirect impact on your operation might result if landfill-tipping fees were increased so that the cost for green material ADC was equal to that for landfilling?

Appendix B: Figures

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Figure 1
Survey Regions

Figure 2
Percentage of Composters and Processors Using Specific Feedstocks

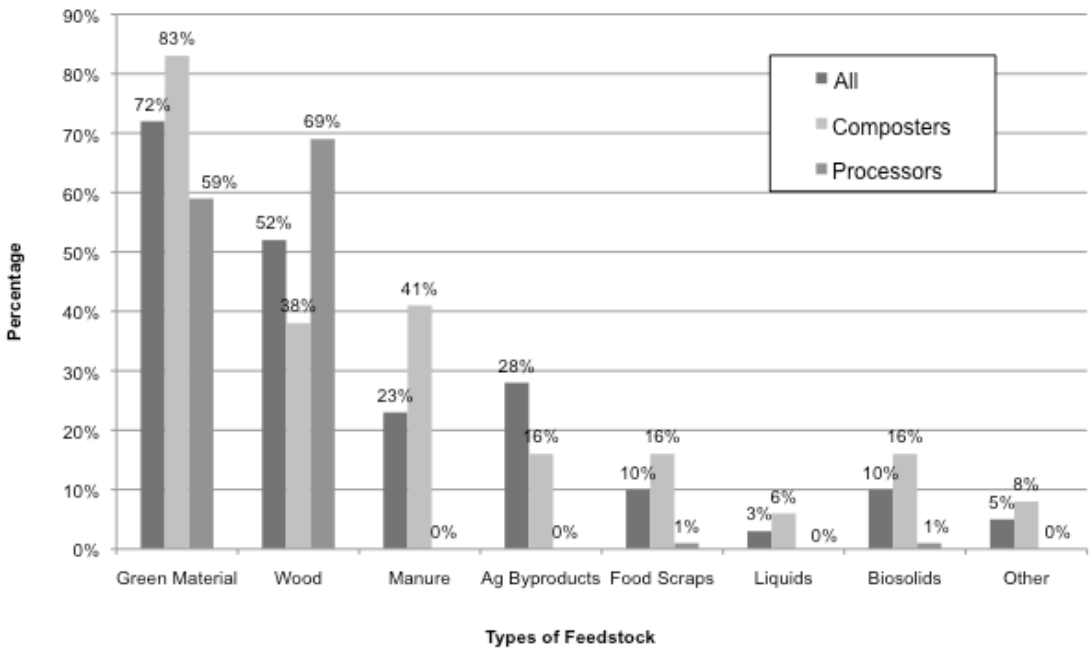

Figure 2
Percentage of Composters and Processors Using Specific Feedstocks (2008)

	All	Composters	Processors
Green Material	72%	83%	59%
Wood	52%	38%	69%
Manure	23%	41%	0%
Ag Byproducts	28%	16%	0%
Food Scraps	10%	16%	1%
Liquids	3%	6%	0%
Biosolids	10%	16%	1%
Other	5%	8%	0%

Figure 2A
Feedstock Use Over Time (All)

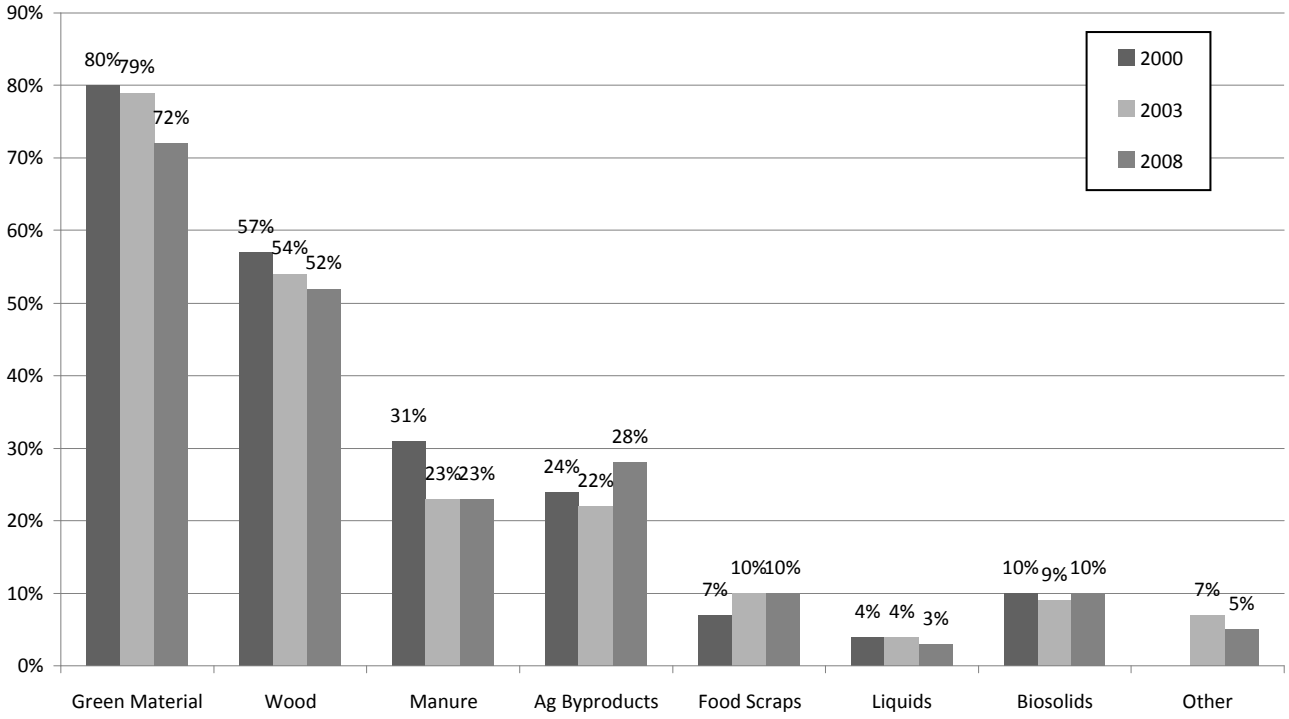

Figure 2A
Feedstock Use Over Time (All)

	2000	2003	2008
Green Material	80%	79%	72%
Wood	57%	54%	52%
Manure	31%	23%	23%
Ag Byproducts	24%	22%	28%
Food Scraps	7%	10%	10%
Liquids	4%	4%	3%
Biosolids	10%	9%	10%
Other	–	7%	5%

Figure 2B
Feedstock Use Over Time (Composters)

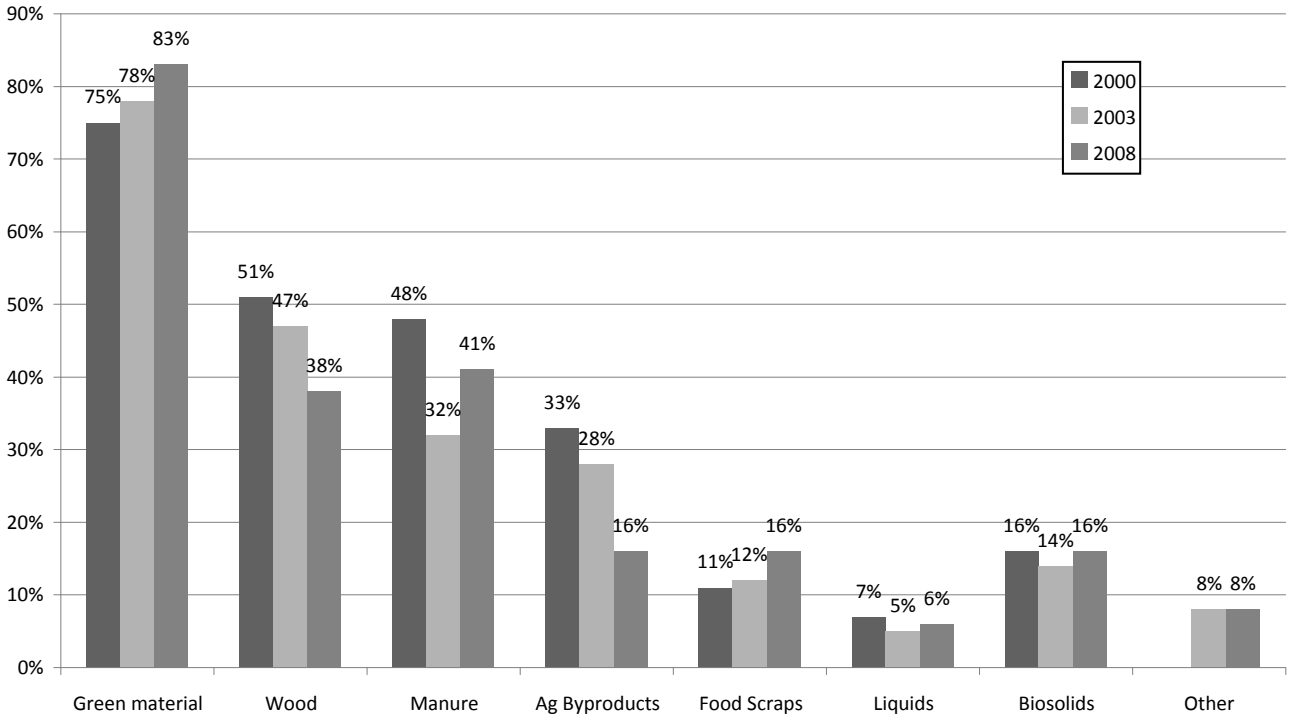

Figure 2B
Feedstock Use Over Time (Composters)

	2000	2003	2008
Green Material	75%	78%	83%
Wood	51%	47%	38%
Manure	48%	32%	41%
Ag Byproducts	33%	28%	16%
Food Scraps	11%	12%	16%
Liquids	7%	5%	6%
Biosolids	16%	14%	16%
Other	–	8%	8%

Figure 2C
Feedstock Use Over Time

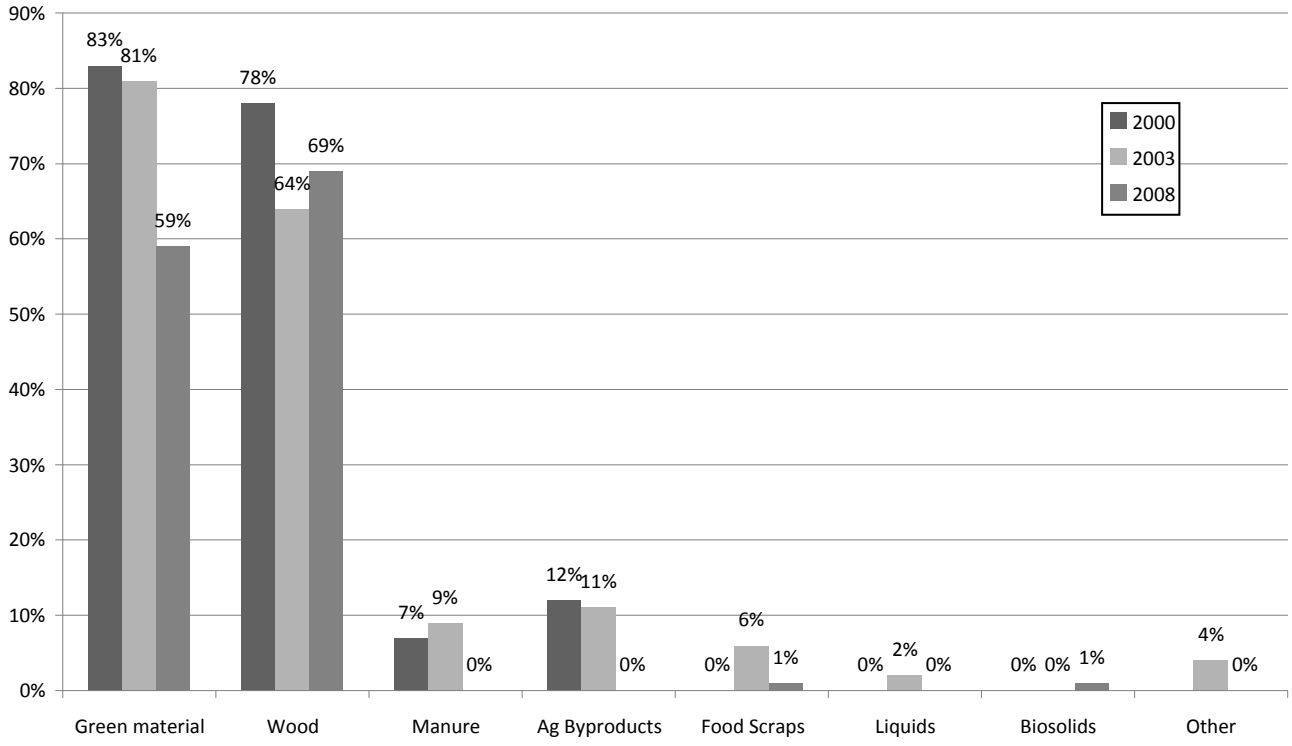

Figure 2C
Feedstock Use Over Time (Processors)

	2000	2003	2008
Green Material	83%	81%	59%
Wood	78%	64%	69%
Manure	7%	9%	0%
Ag Byproducts	12%	11%	0%
Food Scraps	0%	6%	1%
Liquids	0%	2%	0%
Biosolids	0%	0%	1%
Other	–	4%	0%

Figure 3
Seasonality of Collected Green Material, City of Sacramento

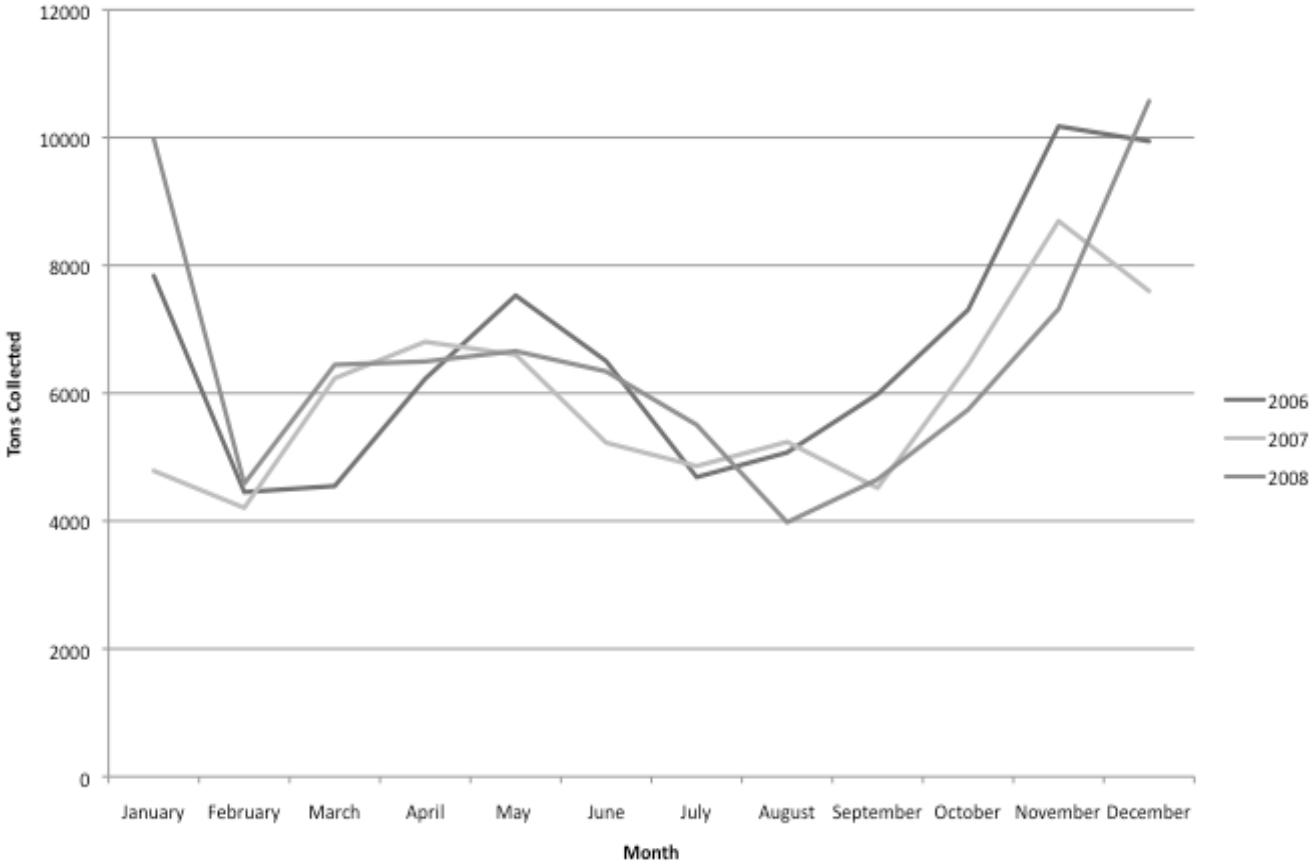

Figure 3
Seasonality of Collected Green Material, City of Sacramento

	2006	2007	2008
January	7,836	4,785	9,976
February	4,452	4,205	4,583
March	4,547	6,233	6,444
April	6,225	6,803	6,495
May	7,528	6,602	6,658
June	6,501	5,224	6,340
July	4,686	4,858	5,504
August	5,071	5,236	3,979
September	5,986	4,517	4,652
October	7,304	6,438	5,741
November	10,175	8,693	7,317
December	9,942	7,598	10,570

Figure 4
Percentage of Composters and Processors Using Feedstocks from Specific Sources

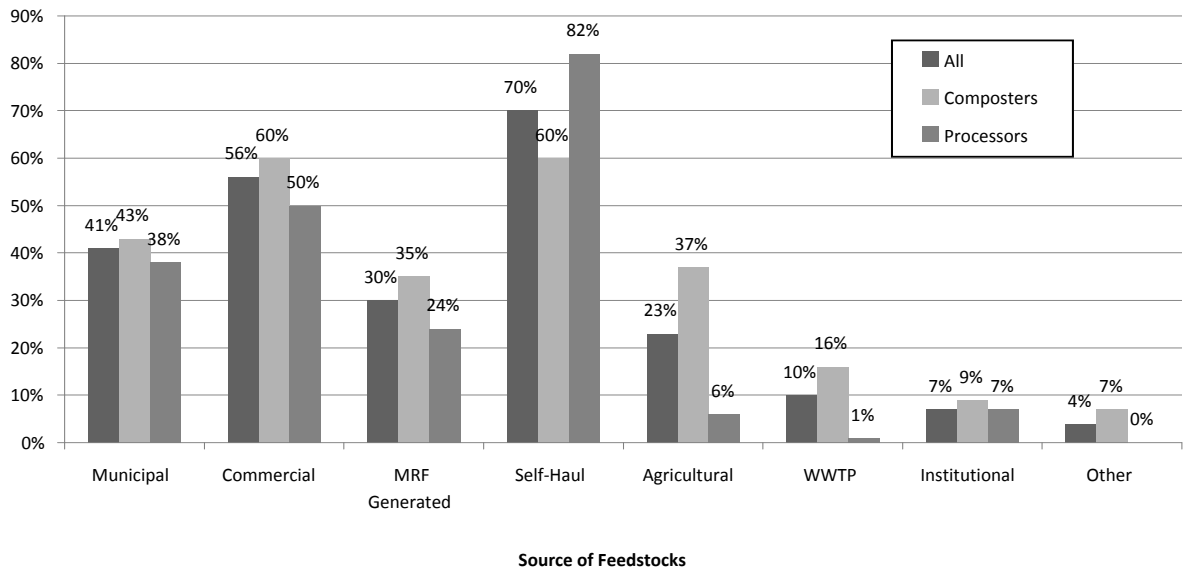

Figure 4
Percentage of Composters and Processors Using Feedstocks From Specific Sources

	All	Composters	Processors
Municipal	41%	43%	38%
Commercial	56%	60%	50%
MRF Generated	30%	35%	24%
Self-Haul	70%	60%	82%
Agricultural	23%	37%	6%
WWTP	10%	16%	1%
Institutional	7%	9%	7%
Other	4%	7%	0%

Figure 4A
Comparison of Composters and Processors Using Feedstocks from Specific

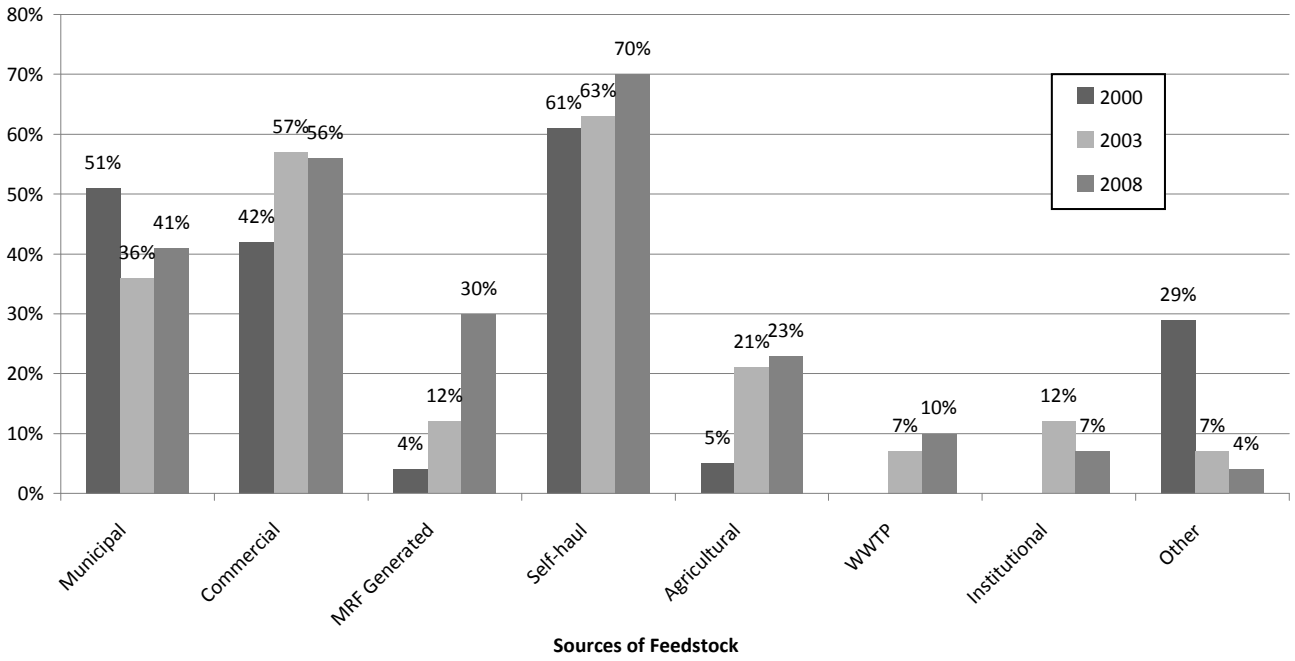

Figure 4A
Comparison of Composters and Processors
Using Feedstocks from Specific Sources

	2000	2003	2008
Municipal	51%	36%	41%
Commercial	42%	57%	56%
MRF Generated	4%	12%	30%
Self-haul	61%	63%	70%
Agricultural	5%	21%	23%
WWTP	–	7%	10%
Institutional	–	12%	7%
Other	29%	7%	4%

Figure 5
Feedstock Sources (All)

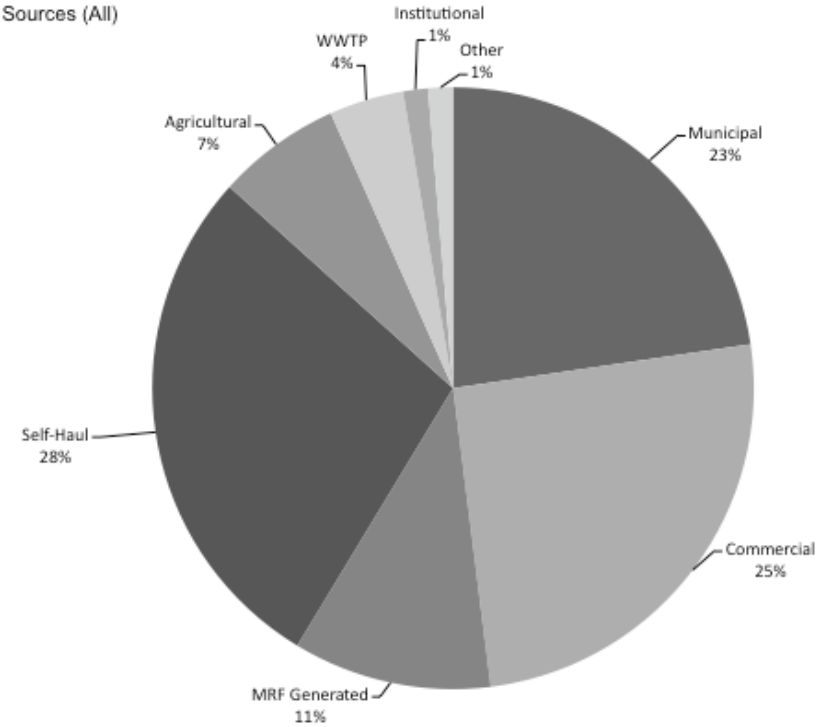

Figure 5	
Feedstock Sources (All)	
Municipal	23%
Commercial	25%
MRF Generated	11%
Self-Haul	28%
Agricultural	7%
WWTP	4%
Institutional	1%
Other	1%

Figure 5A
Feedstock Sources (Composters)

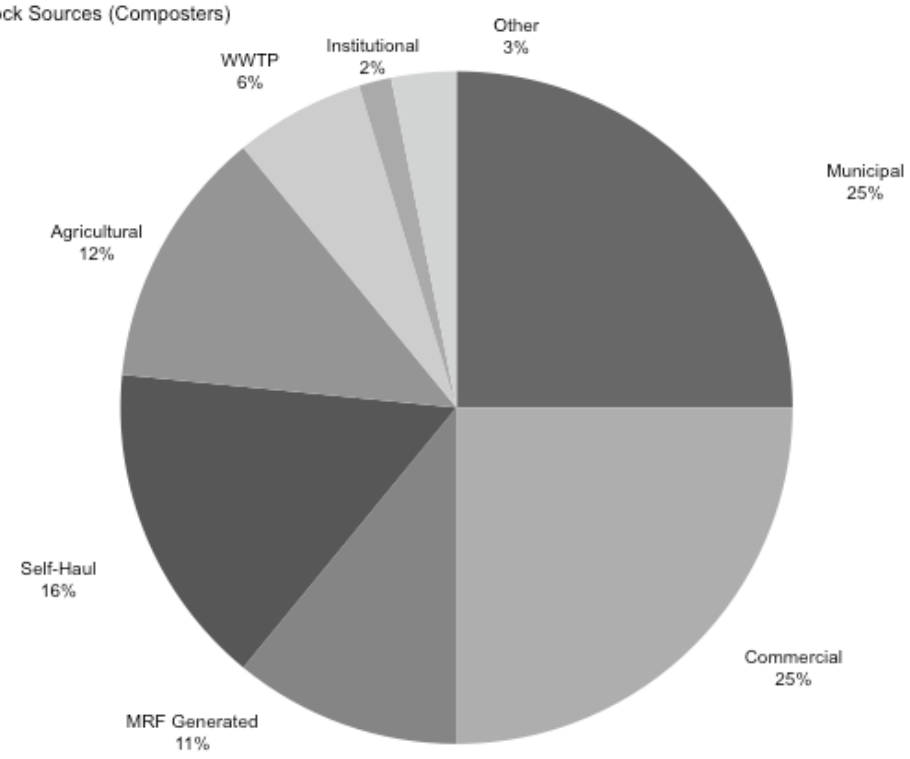

Figure 5A
Feedstock Sources (Composters)

Municipal	25%
Commercial	25%
MRF Generated	11%
Self-Haul	16%
Agricultural	12%
WWTP	6%
Institutional	2%
Other	3%

Figure 5B
Feedstock Sources (Processors)

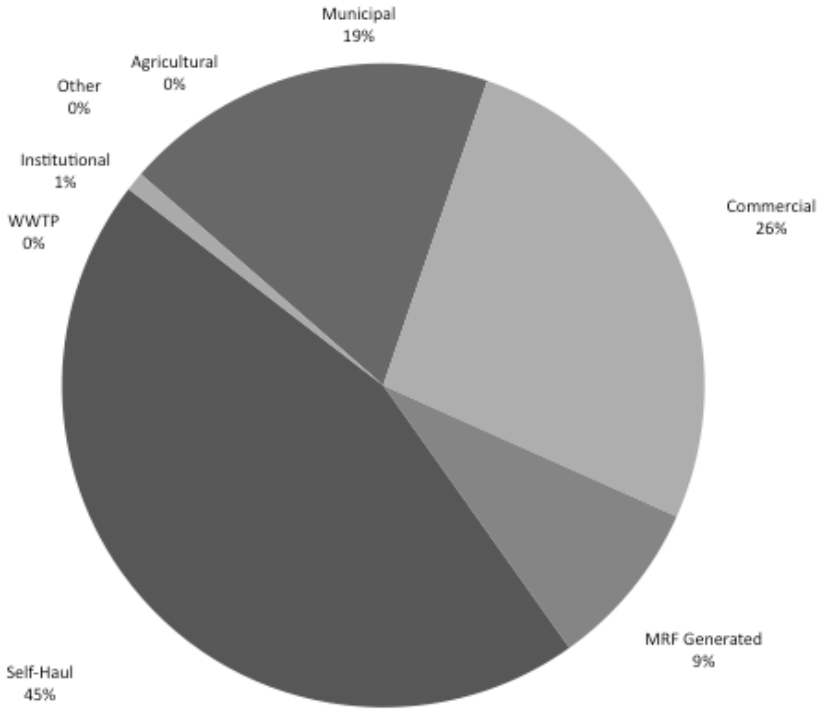

Figure 5B	
Feedstock Sources (Processors)	
Municipal	19%
Commercial	26%
MRF Generated	9%
Self-Haul	45%
Agricultural	0%
WWTP	0%
Institutional	1%
Other	0%

Figure 6
Processing Capacity

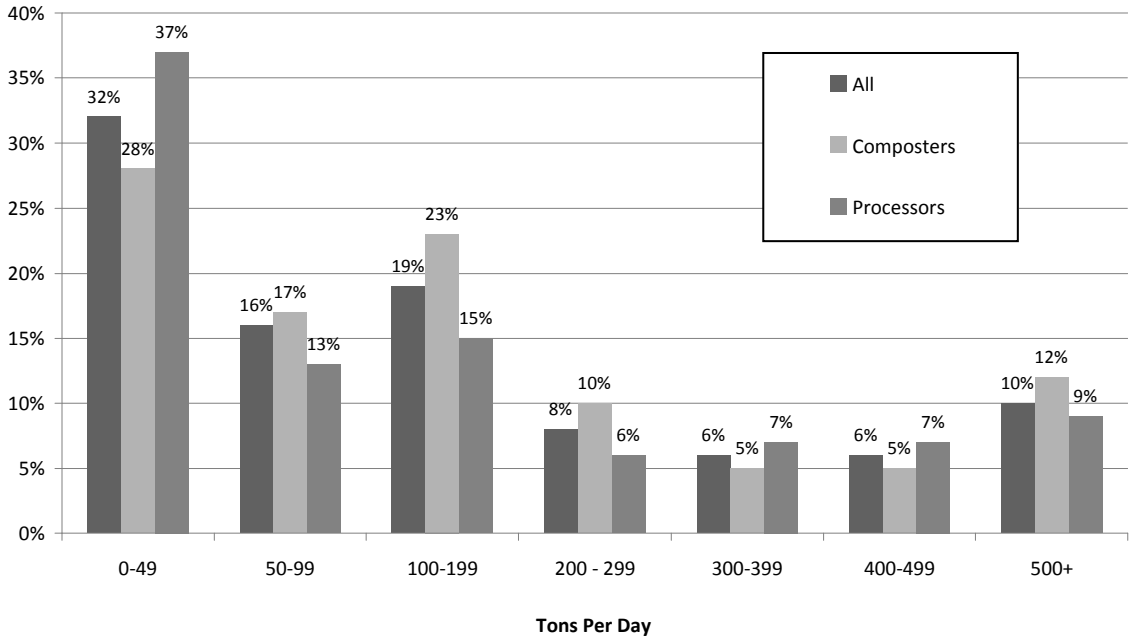

Figure 6
Processing Capacity

	All	Composters	Processors
0-49	32%	28%	37%
50-99	16%	17%	13%
100-199	19%	23%	15%
200 - 299	8%	10%	6%
300-399	6%	5%	7%
400-499	6%	5%	7%
500+	10%	12%	9%

Figure 6A
Comparson of Processing Capacity (All)

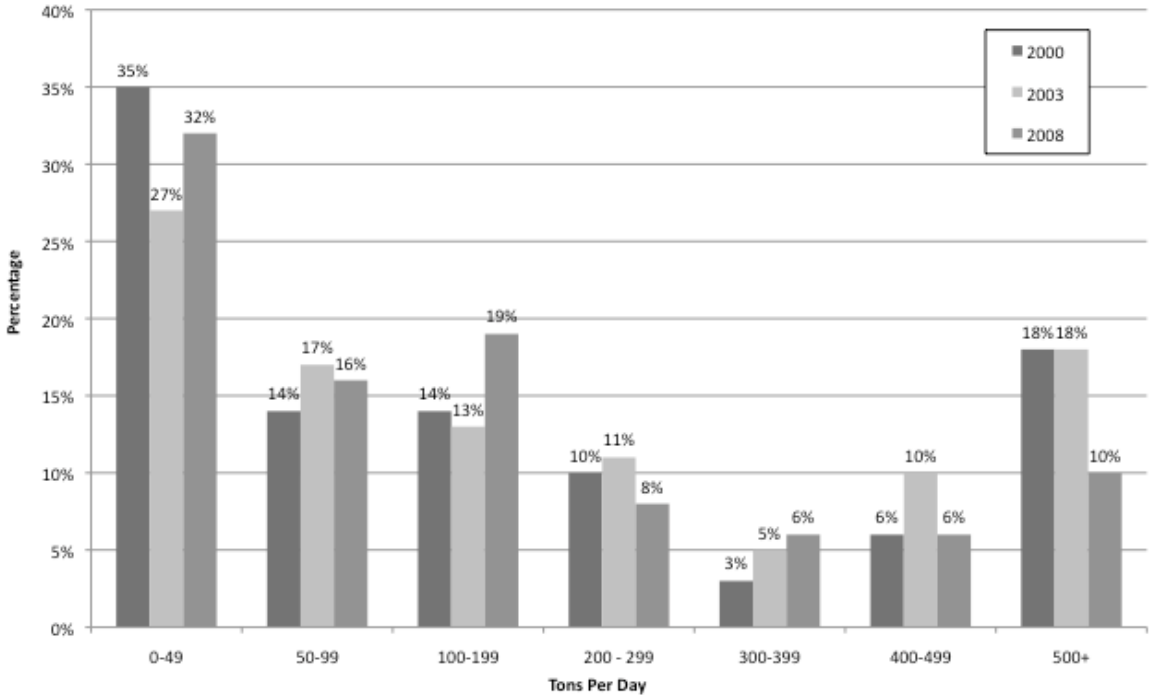

Figure 6A
Comparison of Processing Capacity (All)

	2000	2003	2008
0-49	35%	27%	32%
50-99	14%	17%	16%
100-199	14%	13%	19%
200 - 299	10%	11%	8%
300-399	3%	5%	6%
400-499	6%	10%	6%
500+	18%	18%	10%

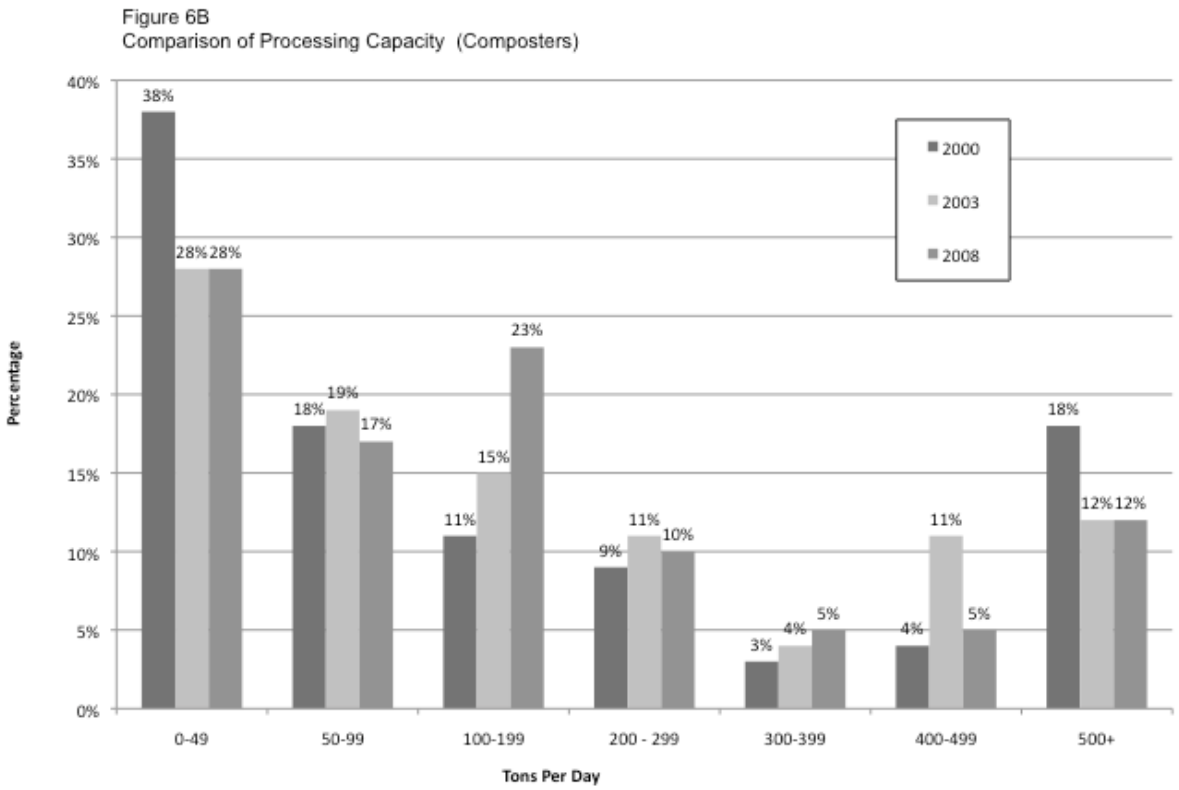

Figure 6B
Comparison of Processing Capacity (Composters)

	2000	2003	2008
0-49	38%	28%	28%
50-99	18%	19%	17%
100-199	11%	15%	23%
200 - 299	9%	11%	10%
300-399	3%	4%	5%
400-499	4%	11%	5%
500+	18%	12%	12%

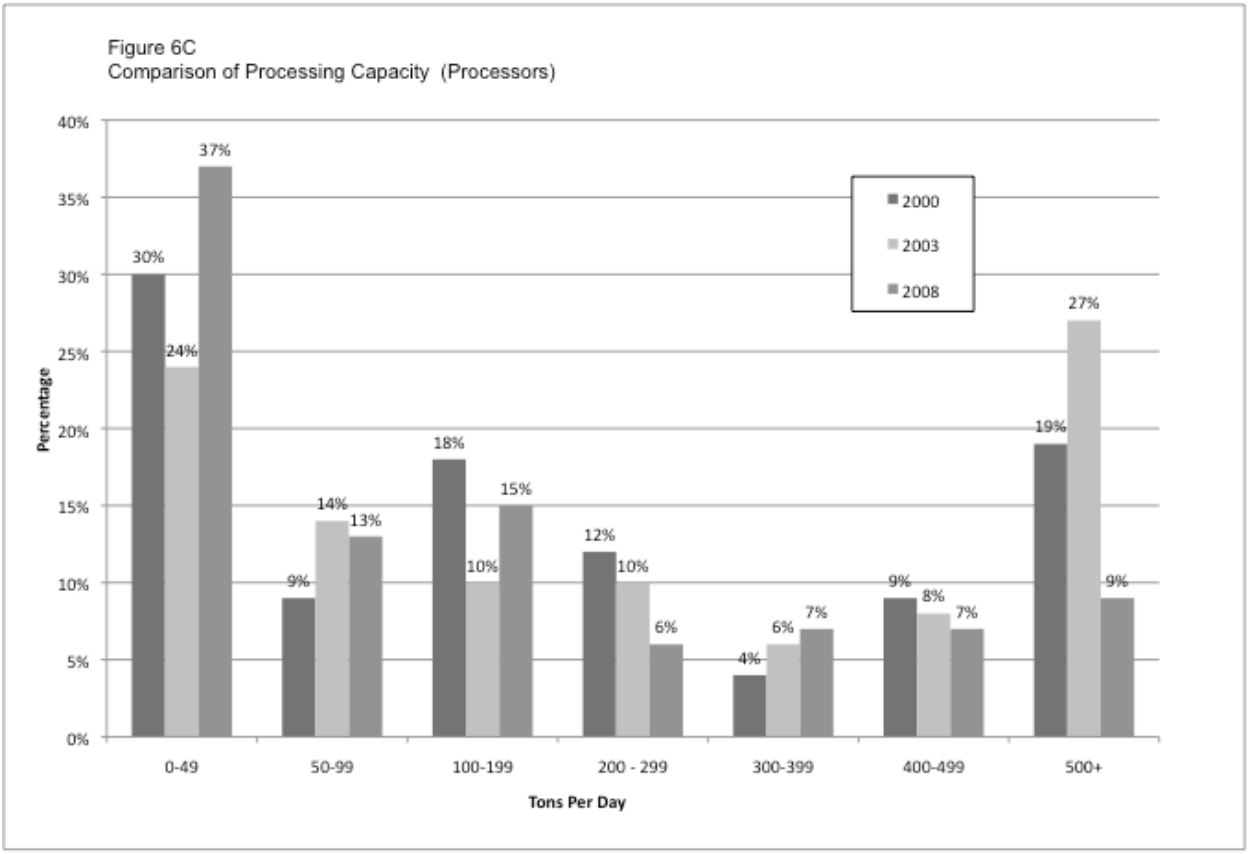

Figure 6C
Comparison of Processing Capacity (Processors)

	2000	2003	2008
0-49	30%	24%	37%
50-99	9%	14%	13%
100-199	18%	10%	15%
200 - 299	12%	10%	6%
300-399	4%	6%	7%
400-499	9%	8%	7%
500+	19%	27%	9%

Figure 7
Tons Processed Annually

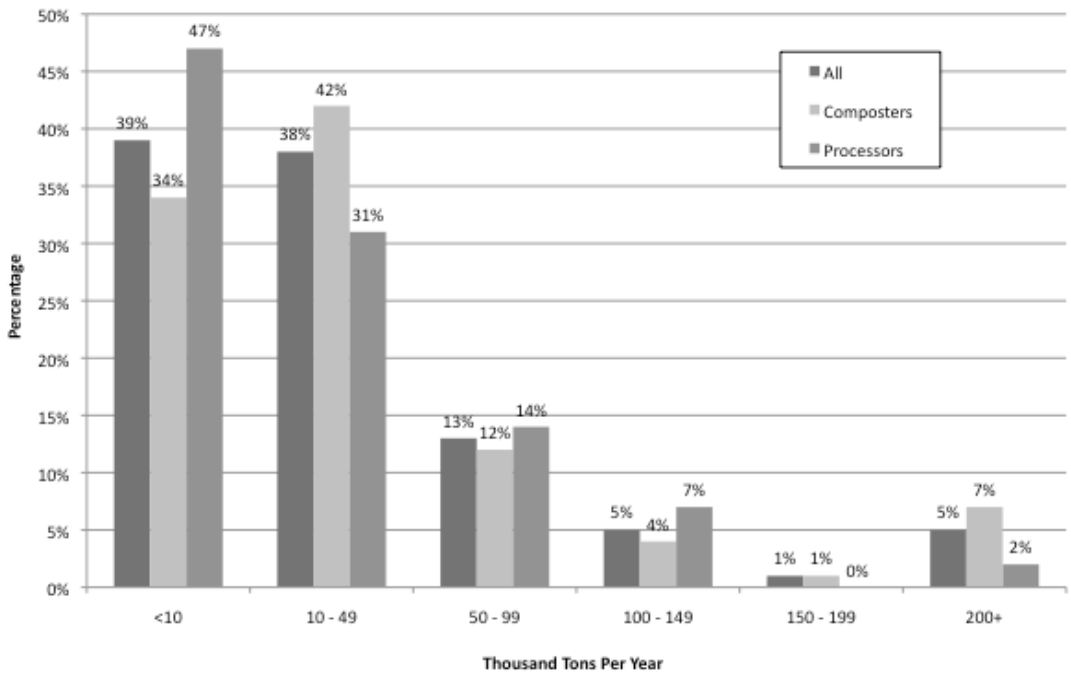

Figure 7
Tons Processed Annually

	All	Composters	Processors
<10	39%	34%	47%
10 - 49	38%	42%	31%
50 - 99	13%	12%	14%
100 - 149	5%	4%	7%
150 - 199	1%	1%	0%
200+	5%	7%	2%

Figure 7A
Comparison of Tons Processed Annually (All)

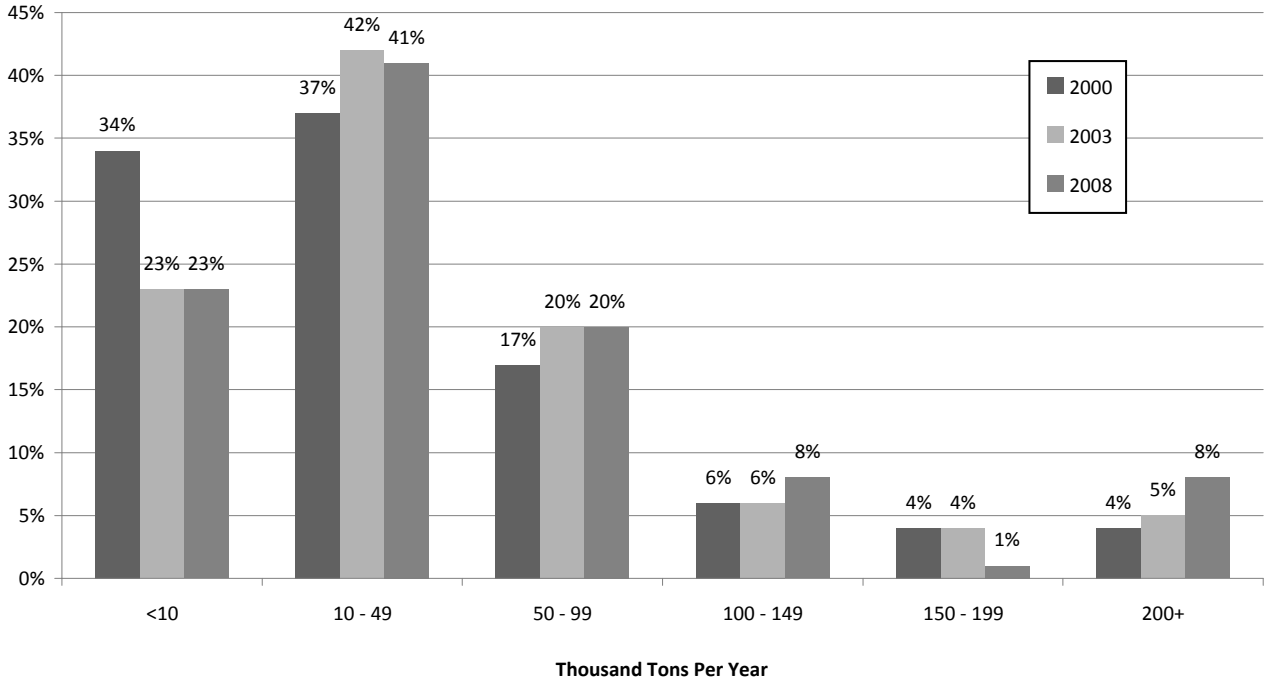

Figure 7A
Comparison of Tons Processed Annually (All)

	2000	2003	2008
<10	34%	23%	23%
10 - 49	37%	42%	41%
50 - 99	17%	20%	20%
100 - 149	6%	6%	8%
150 - 199	4%	4%	1%
200+	4%	5%	8%

Figure 7B
Comparison of Tons Processed Annually (Composters)

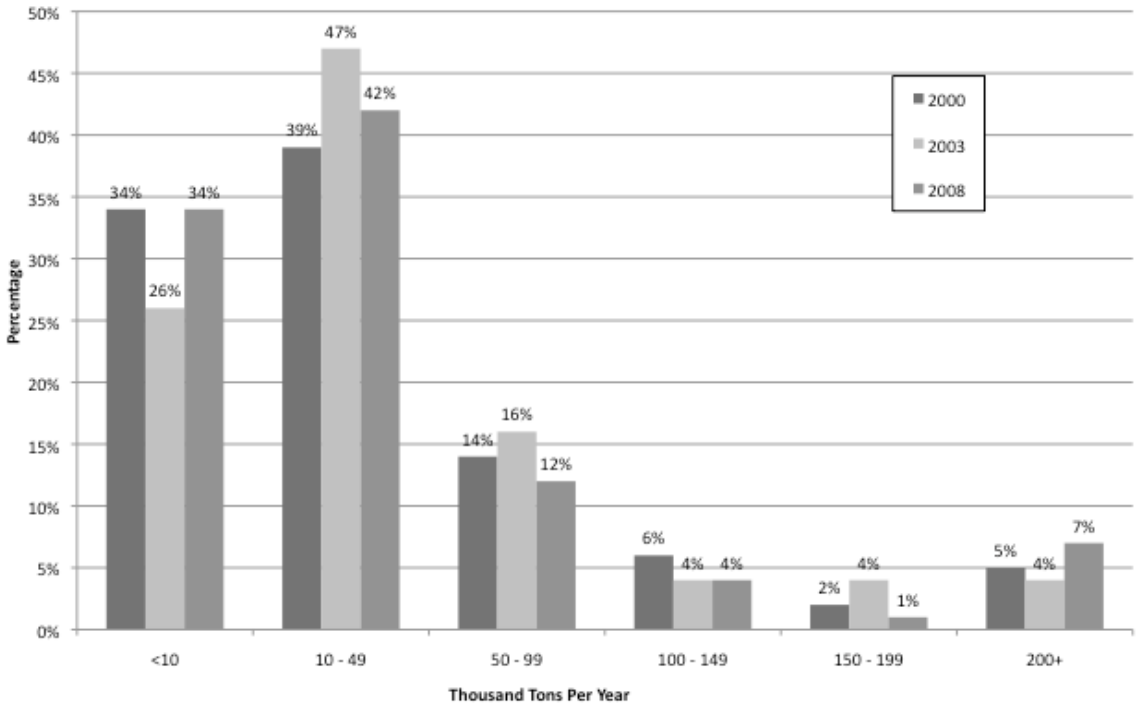

Figure 7B
Comparison of Tons Processed Annually (Composters)

	2000	2003	2008
<10	34%	26%	34%
10 – 49	39%	47%	42%
50 – 99	14%	16%	12%
100 – 149	6%	4%	4%
150 – 199	2%	4%	1%
200+	5%	4%	7%

Figure 7C
Comparison of Tons Processed Annually (Processors)

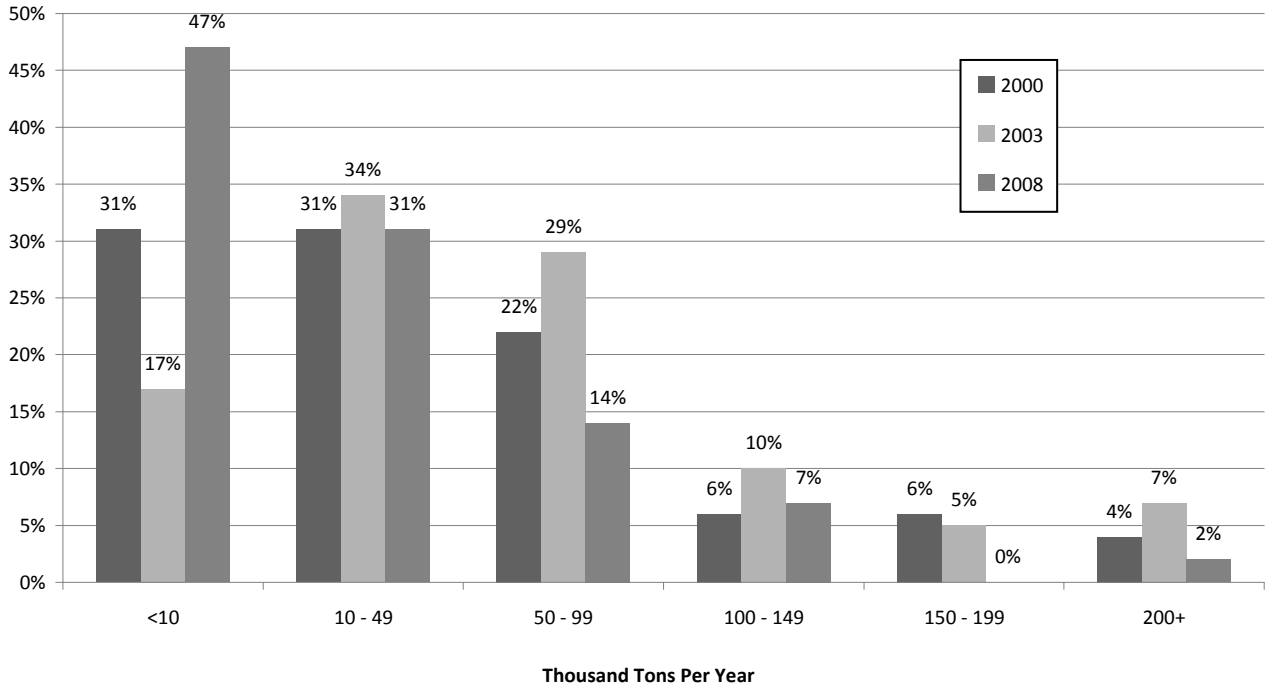

Figure 7C
Comparison of Tons Processed Annually (Processors)

	2000	2003	2008
<10	31%	17%	47%
10 - 49	31%	34%	31%
50 - 99	22%	29%	14%
100 - 149	6%	10%	7%
150 - 199	6%	5%	0%
200+	4%	7%	2%

Figure 8
Volume of Product by Type

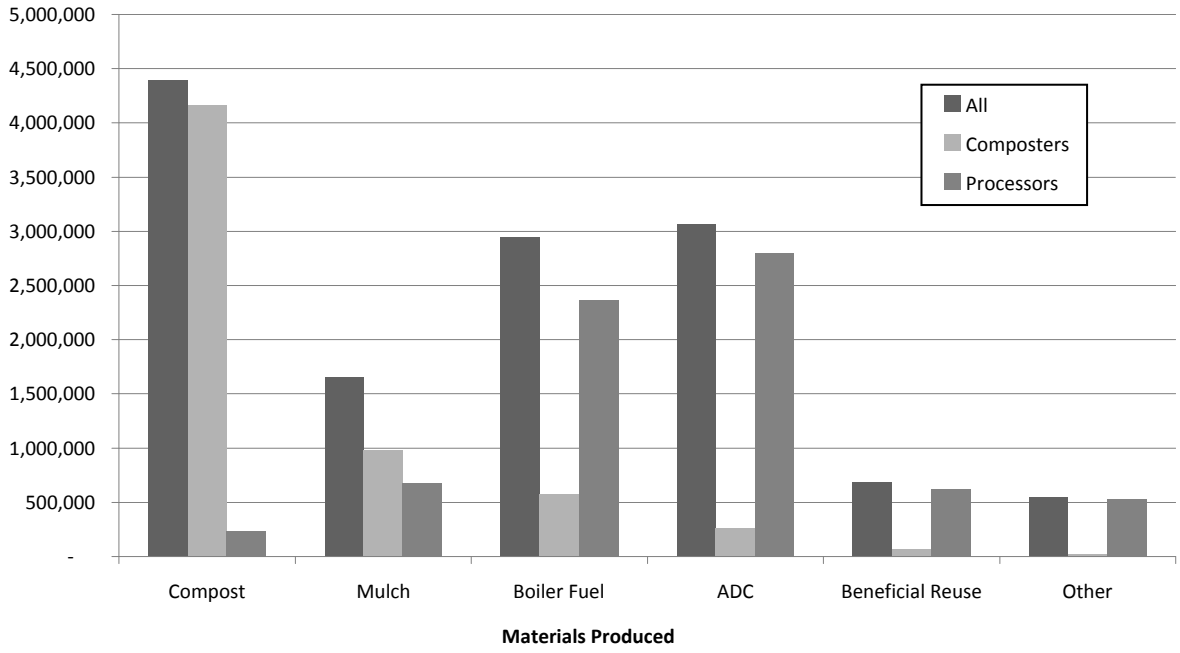

Figure 8
Volume of Product by Type (Cubic yards)

	All	Composters	Processors
Compost	4,395,725	4,162,265	233,460
Mulch	1,659,101	978,001	681,100
Boiler Fuel	2,944,934	580,520	2,364,414
ADC	3,063,539	264,424	2,799,115
Beneficial Reuse	691,423	72,048	619,375
Other	545,405	19,070	526,335
TOTAL	13,300,127	6,076,328	7,223,799

Figure 9
Types of Products by Region (All)

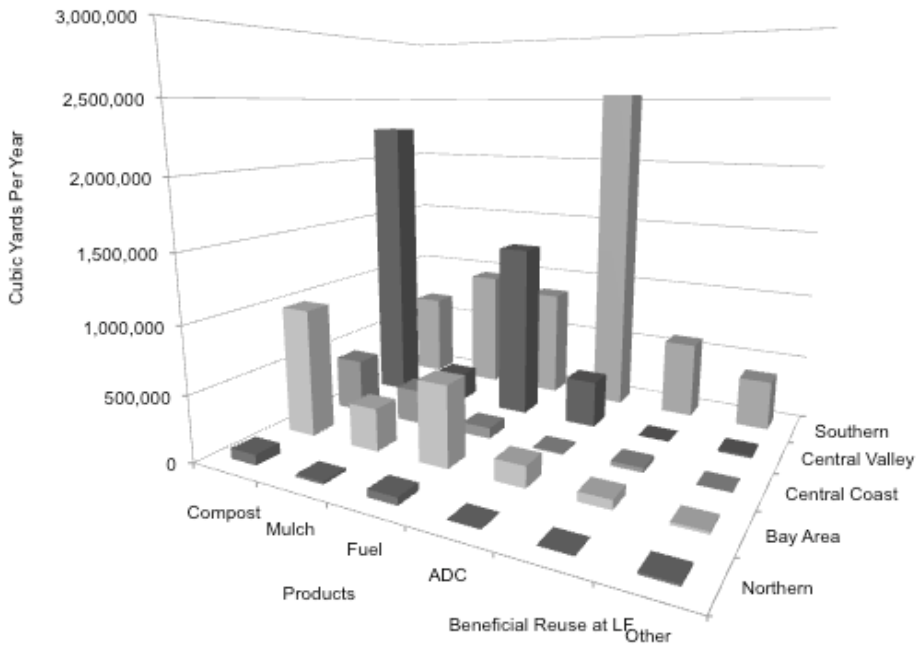

Figure 9
Types of Products by Region (All)

	Northern	Bay Area	Central Coast	Central Valley	Southern
Compost	79,315	976,319	415,969	2,253,456	670,666
Mulch	20,320	325,184	263,300	219,410	942,887
Fuel	57,440	610,603	82,940	1,342,811	851,140
ADC	2,974	159,680	11,600	359,300	2,529,985
Beneficial Reuse at LF	423	70,000	34,000	0	587,000
Other	15,600	19,700	0	17,817	380,288

Figure 9A
Types of Products by Region (Composters)

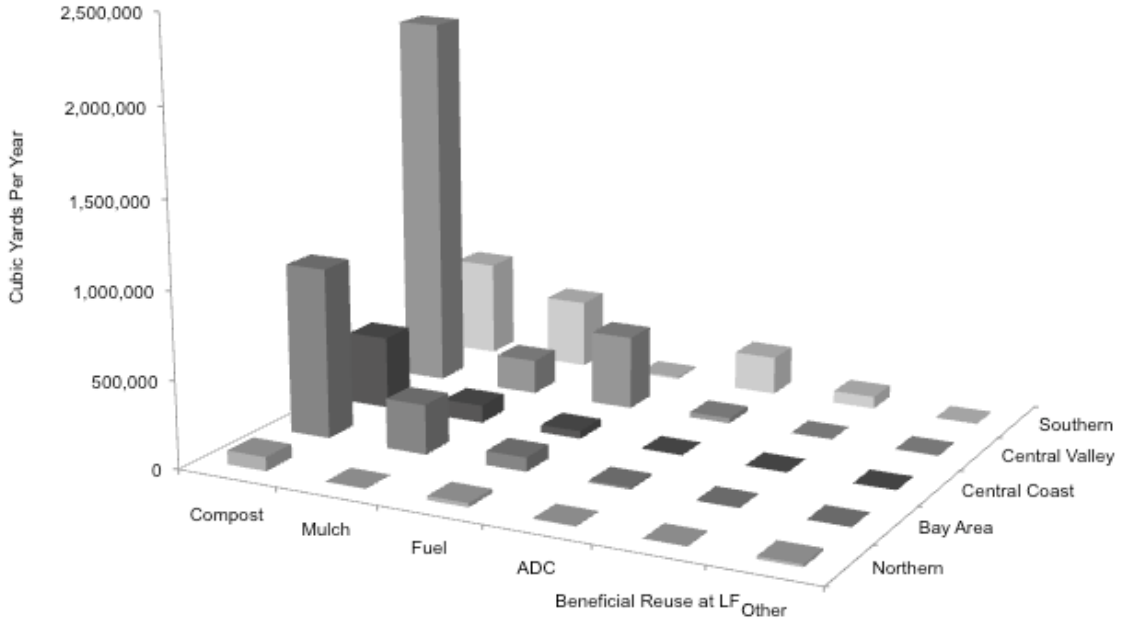

Figure 9A
Types of Products by Region (Composters)

	Northern	Bay Area	Central Coast	Central Valley	Southern
Compost	79,315	976,319	415,969	2,139,996	550,666
Mulch	2,400	285,184	102,000	196,410	392,007
Boiler Fuel	22,940	80,667	43,940	421,973	11,000
ADC	2,974	12,400	0	30,300	218,750
Beneficial Reuse at LFs	423	2,000	-	0	69,625
Other	15,600	300	-	3,170	0

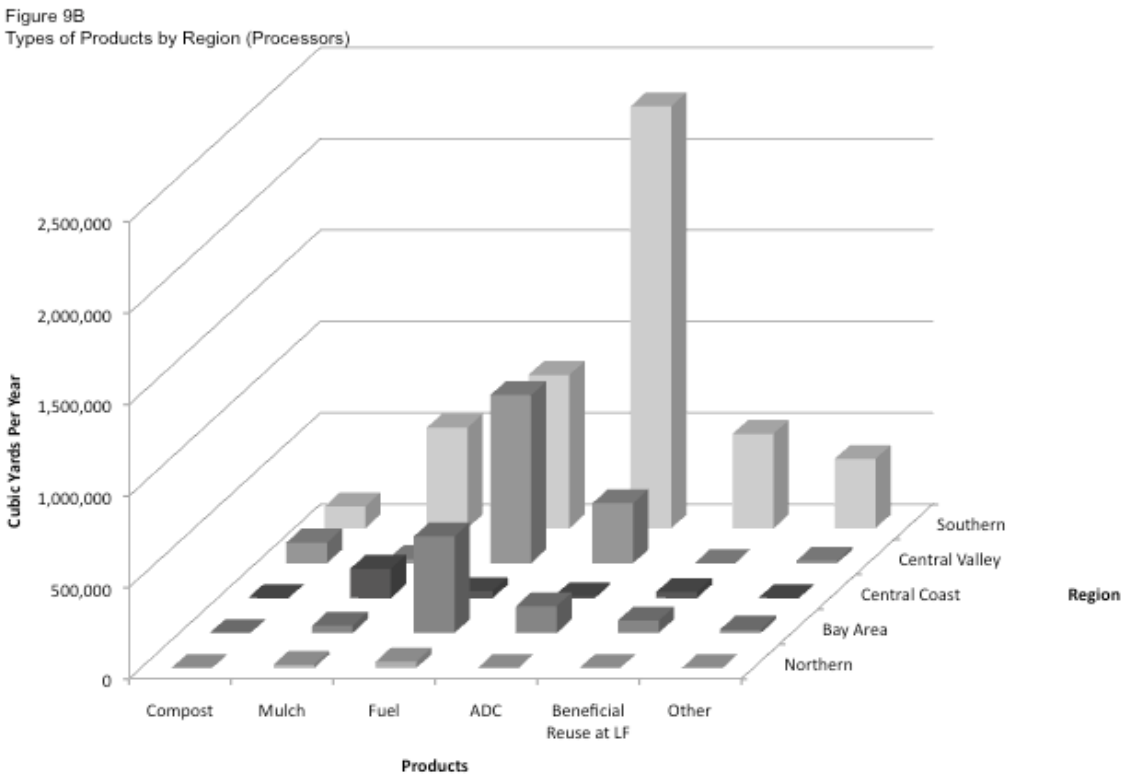

Figure 9B

Types of Products by Region (Processors)

	Northern	Bay Area	Central Coast	Central Valley	Southern
Compost	0	-	-	113,460	120,000
Mulch	17,920	40,000	161,300	23,000	550,880
Boiler Fuel	34,500	529,936	39,000	920,838	840,140
ADC	0	147,280	11,600	329,000	2,311,235
Beneficial Reuse at LF	0	68,000	34,000	-	517,375
Other	0	19,400	-	14,647	380,288

Figure 10
Percentage of Materials Sold by Market Segment (Composters)

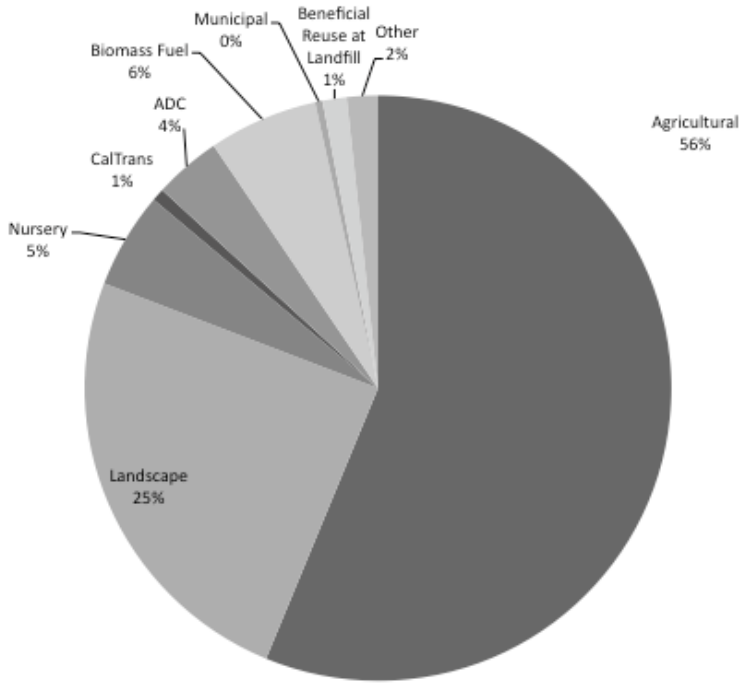

Figure 10

Percentage of Materials Sold by Market Segment (Composters)

Agricultural	Landscape	Nursery	Caltrans	ADC	Biomass Fuel	Municipal	Beneficial Reuse at Landfills	Other
56%	25%	5%	1%	4%	6%	0%	1%	2%

Figure 11
Percentage of Materials Sold by Market Segment (Processors)

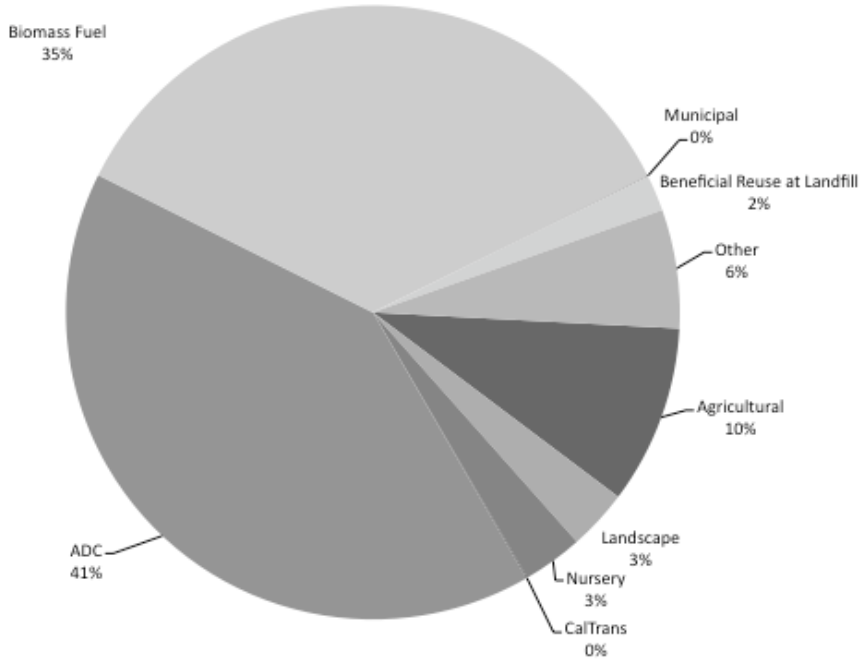

Figure 11

Percentage of Materials Sold by Market Segment (Processors)

Agricultural	Landscape	Nursery	Caltrans	ADC	Biomass Fuel	Municipal	Beneficial Reuse at Landfill	Other
10%	3%	3%	0%	41%	35%	0%	2%	6%

Figure 12
Percentage of Materials Sold by Market Segment (Composters and Processors)

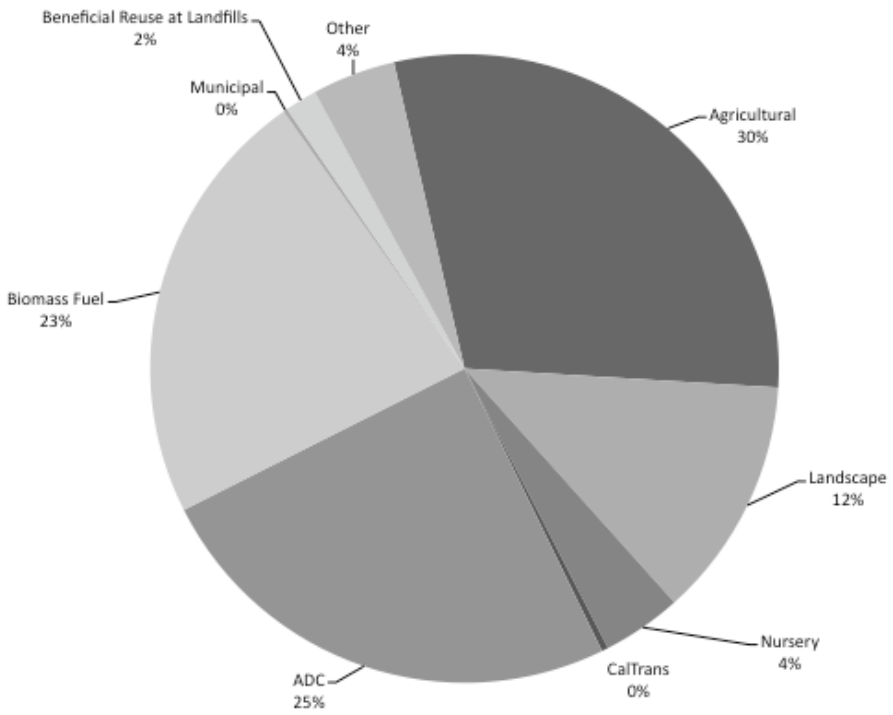

Figure 12
Percentage of Materials Sold by Market Segment (All)

Agricultural	Landscape	Nursery	Caltrans	ADC	Biomass	Municipal	Beneficial Reuse at Landfills	Other
30%	12%	4%	0%	25%	23%	0%	2%	4%

Figure 13
Distribution of Products Sold by Region (Composters)

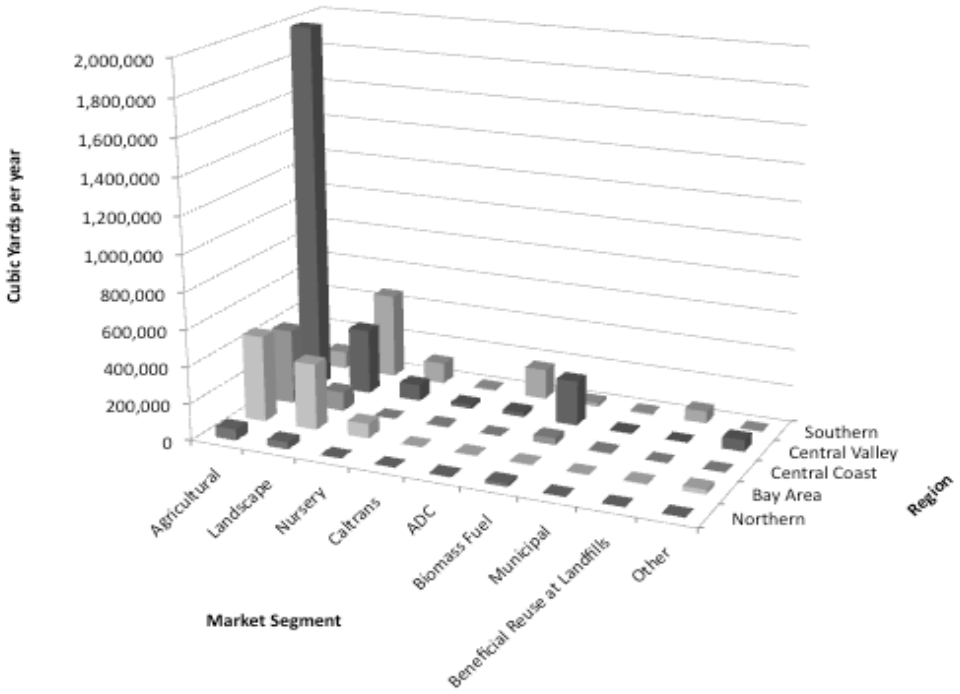

Figure 13
Distribution of Products Sold by Region (Composters)

	Agricultural	Landscape	Nursery	Caltrans	ADC	Biomass Fuel	Municipal	Beneficial Reuse at Landfills	Other
Bay Area	468,669	361,031	79,335	0	5,435	5,435	0	5,435	25,110
Central Coast	406,661	103,511	2,313	6,200	0	36,163	6,334	0	727
Central Valley	1,990,061	355,316	88,071	21,560	24,461	243,492	6,337	0	62,550
Northern	60,900	38,295	1,350	0	4,095	17,556	1,000	228	0
Southern	93,575	462,704	114,060	9,978	164,625	20,519	8,300	65,715	3,200
TOTAL	3,019,866	1,320,857	285,129	37,738	198,616	323,165	21,971	71,378	91,587

Figure 13A
Distribution of Products Sold by Region (Processors)

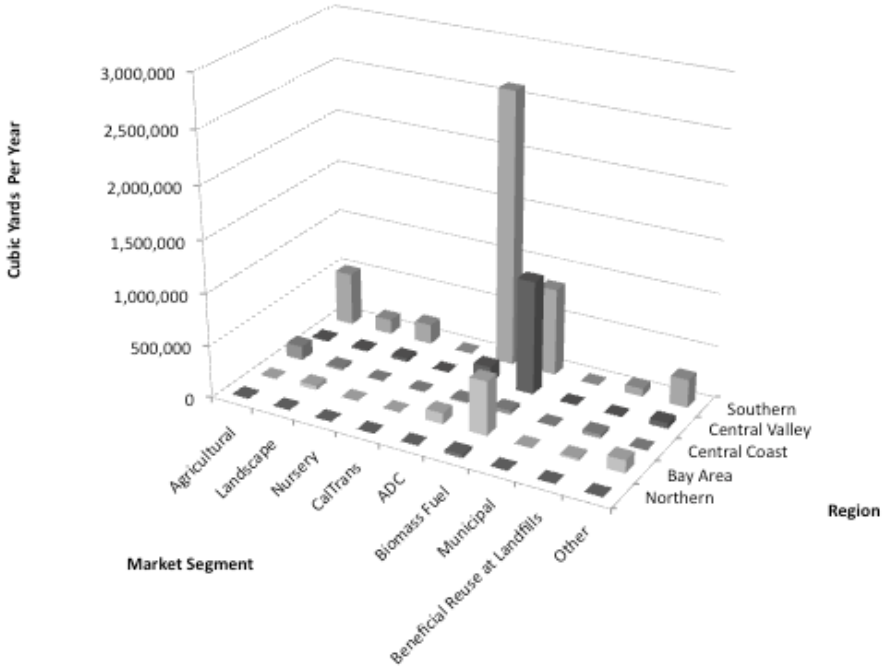

Figure 13A
Distribution of Products Sold by Region (Processors)

	Agricultural	Landscape	Nursery	Caltrans	ADC	Biomass Fuel	Municipal	Beneficial Reuse at Landfills	Other
Bay Area	0	40,000	0	0	104,032	517,536	0	21,280	121,768
Central Coast	134,000	23,845	0	0	14,135	37,420	0	36,500	0
Central Valley	17,000	17,000	34,000	0	159,400	1,083,718	0	0	52,680
Northern	7,176	3,588	1,196	0	0	31,960	0	0	0
Southern	511,648	140,482	190,037	4,913	2,614,295	833,318	5,280	75,825	269,242

Figure 14
Participating Facilities By Region

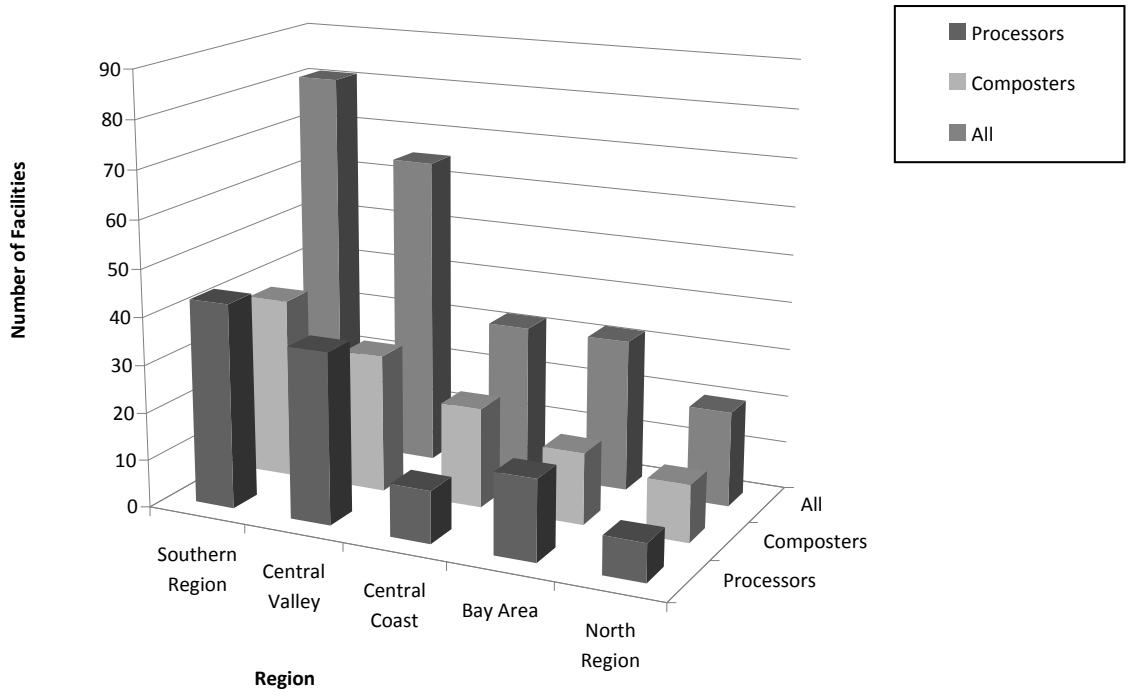

Figure 14
Participating Facilities by Region

	Processors	Composters	All
Southern Region	43	38	81
Central Valley	36	29	65
Central Coast	11	21	32
Bay Area	17	15	32
North Region	8	12	20

Figure 14A
Comparison of Participating Composters by Region

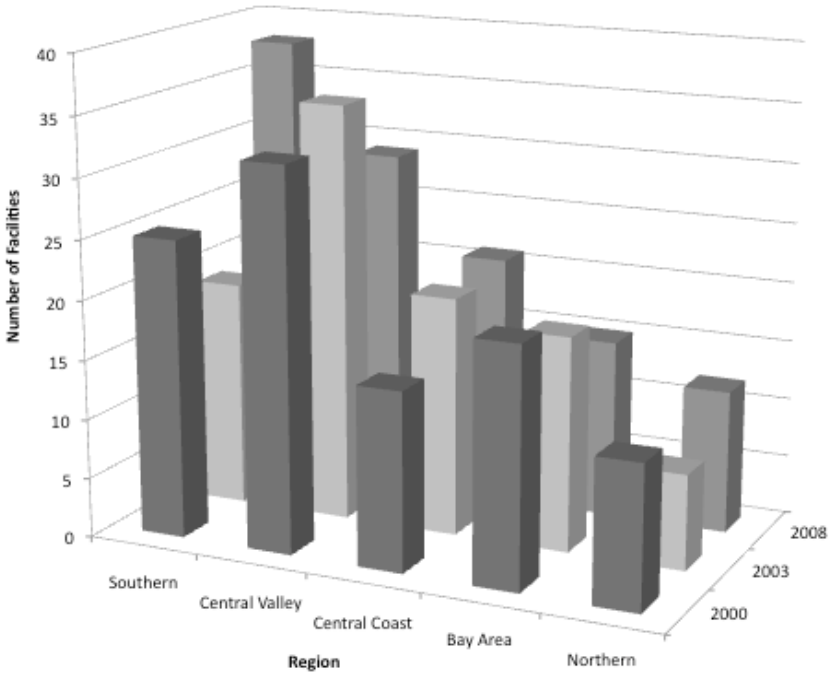

Figure 14A
Comparison of Participating Composters by Region

	2000	2003	2008
Southern	25	19	38
Central Valley	32	35	29
Central Coast	15	20	21
Bay Area	20	18	15
Northern	12	9	12

Figure 14B
Comparison of Participating Processors by Region

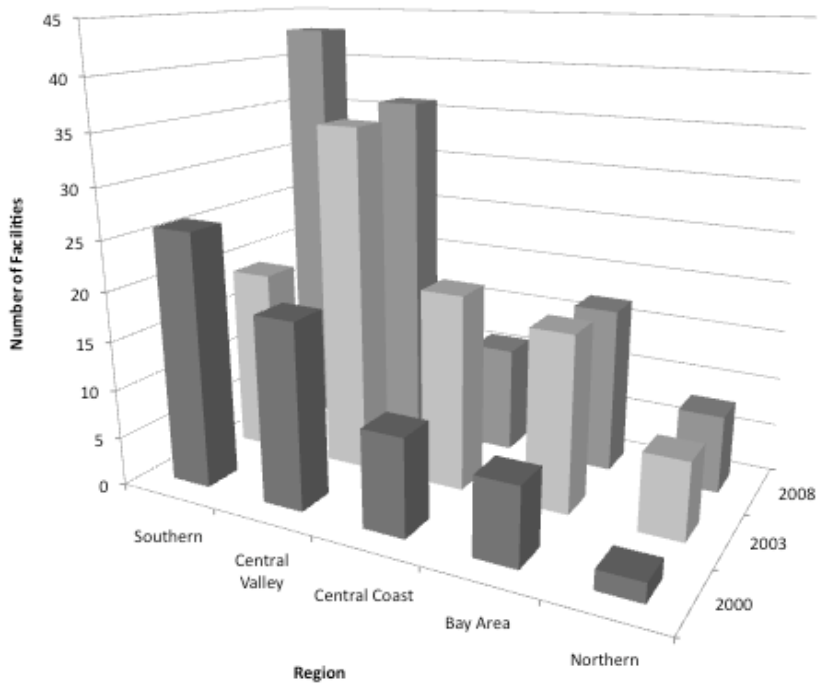

Figure 14B
Comparison of Participating Processors by Region

	2000	2003	2008
Southern	26	19	43
Central Valley	19	35	36
Central Coast	10	20	11
Bay Area	8	18	17
Northern	2	8	8

Figure 14C
Comparison of All Participating Facilities 2000, 2003, & 2008

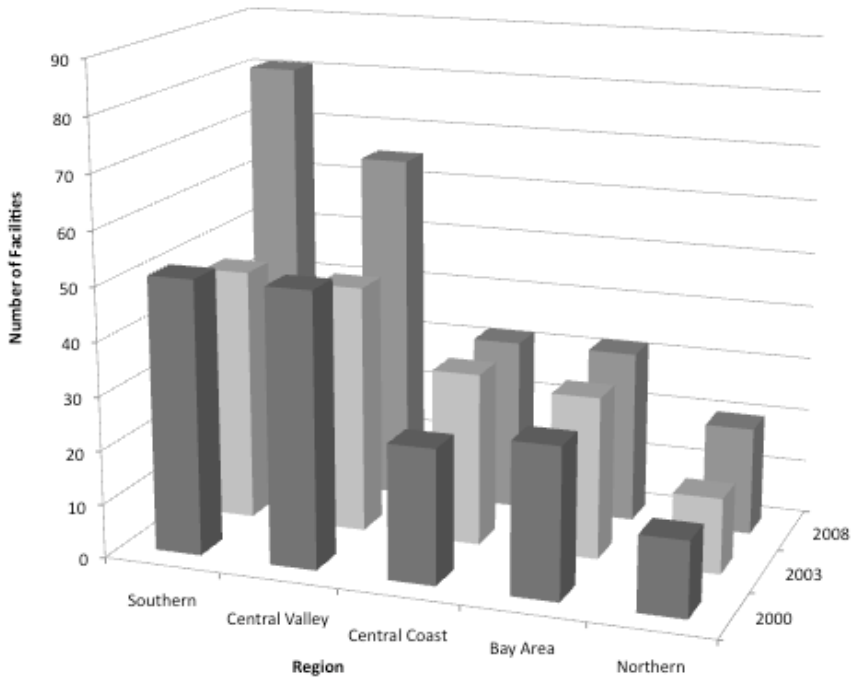

Figure 14C
Comparison of All Participating Facilities

	2000	2003	2008
Southern	**51**	**47**	**81**
Central Valley	**51**	**46**	**65**
Central Coast	**25**	**32**	**32**
Bay Area	**28**	**30**	**32**
Northern	**14**	**14**	**20**

Figure 15
Percentage of Composters and Processors Producing Specified Numbers of Products

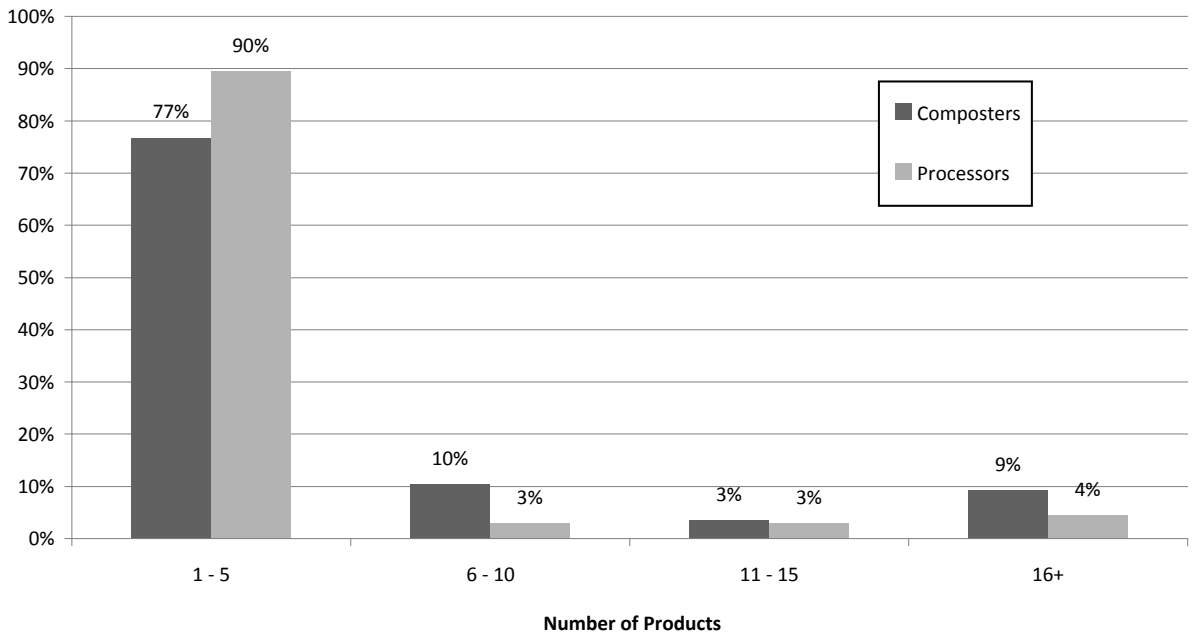

Figure 15
Percentage of Composters and Processors
Producing Specified Number of Products

	Composters	Processors
1 - 5	77%	90%
6 - 10	10%	3%
11 - 15	3%	3%
16+	9%	4%

Figure 16
Product Distribution (All)

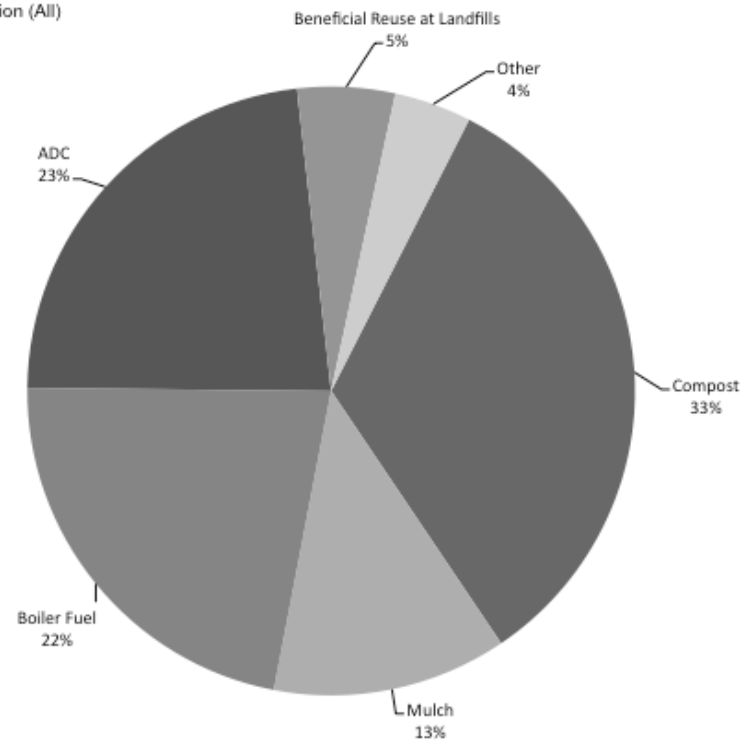

Figure 16	
Product Distribution (All)	
Compost	33%
Mulch	13%
Boiler Fuel	22%
ADC	23%
Beneficial Reuse at Landfills	5%
Other	4%

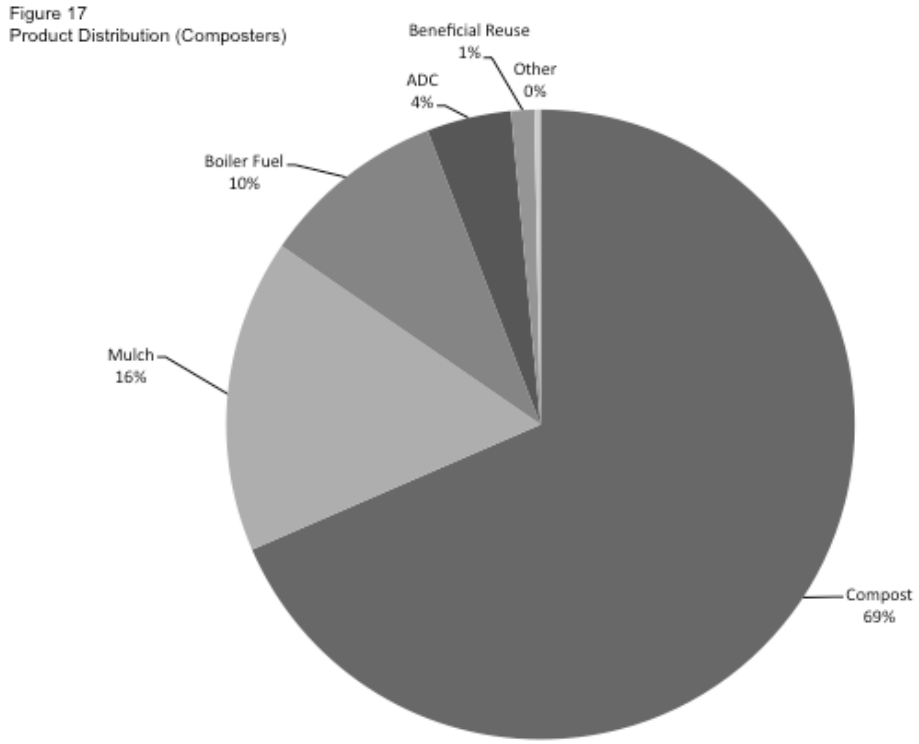

Figure 17
Product Distribution (Composters)

Compost	69%
Mulch	16%
Boiler Fuel	10%
ADC	4%
Beneficial Reuse at Landfills	1%
Other	0%

Figure 18
Product Distribution (Processors)

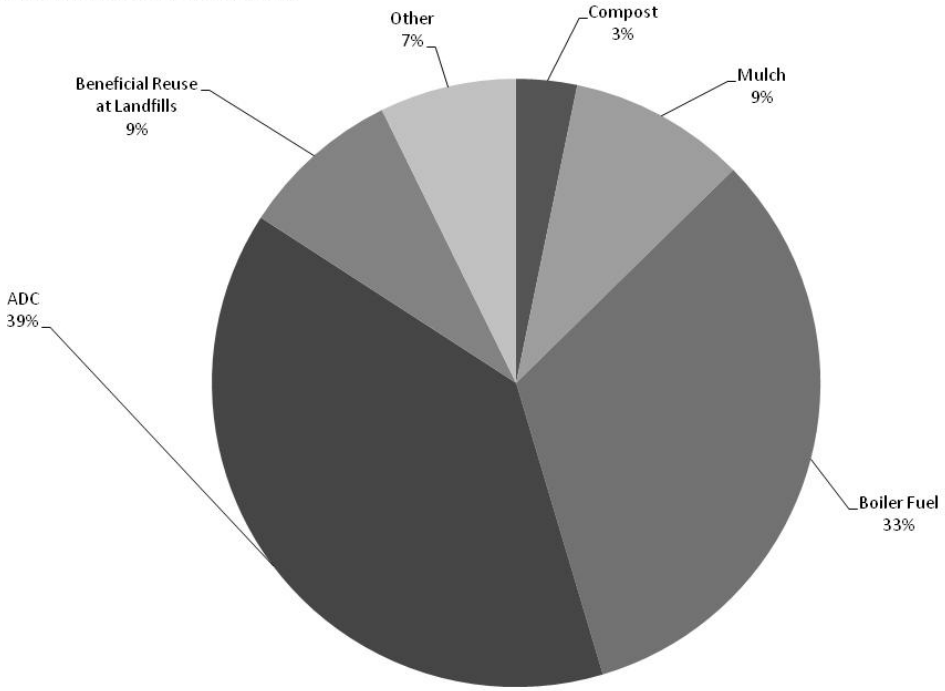

Figure 18	
Product Distribution (Processors)	
Compost	3%
Mulch	9%
Boiler Fuel	33%
ADC	39%
Beneficial Reuse at Landfills	9%
Other	7%

Figure 19
Product Distribution (Composters - Northern Region)

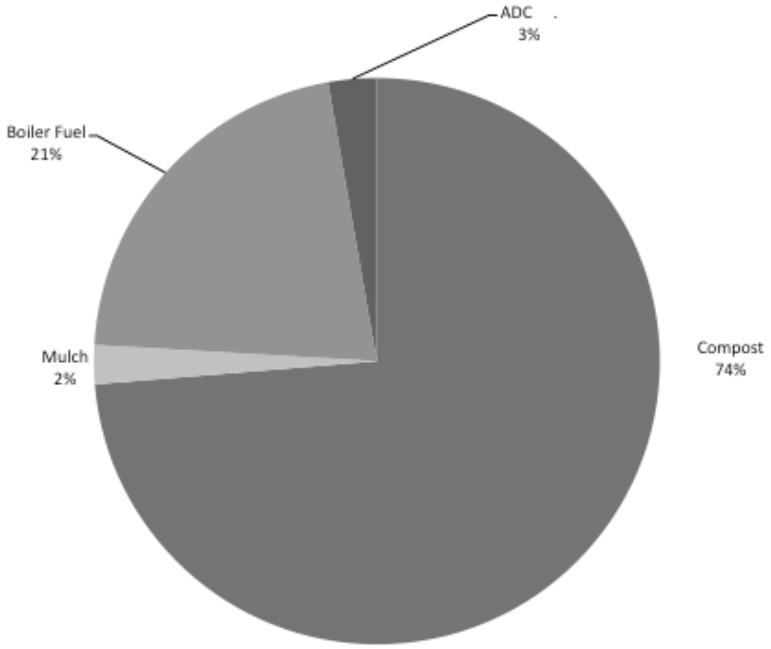

Figure 19	
Product Distribution (Composters - Northern Region)	
Compost	74%
Mulch	2%
Boiler Fuel	21%
ADC	3%
Other	0%

Figure 20
Product Distribution (Composters - Bay Area Region)

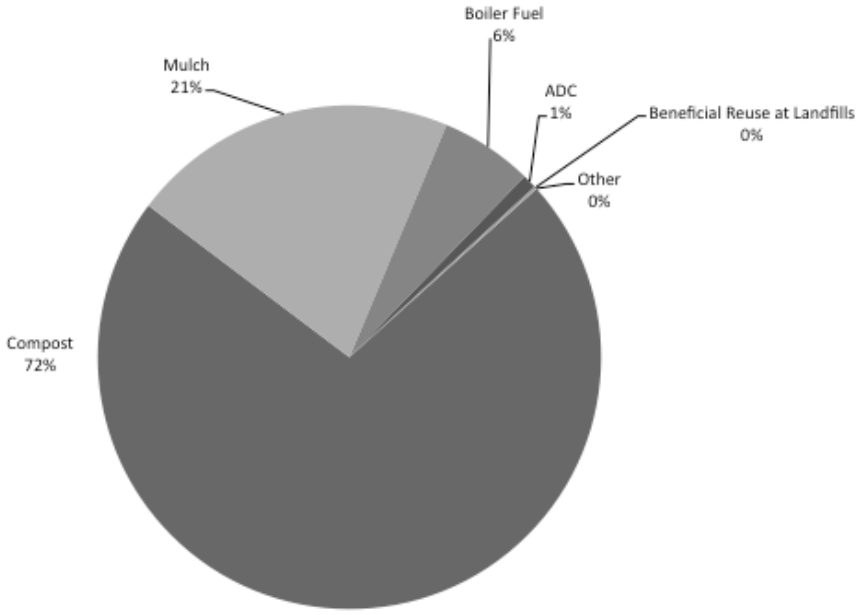

Figure 20	
Product Distribution (Composters- Bay Area Region)	
Compost	72%
Mulch	21%
Boiler Fuel	6%
ADC	1%
Beneficial Reuse at Landfills	0%
Other	0%

Figure 21
Product Distribution (Composters - Central Valley)

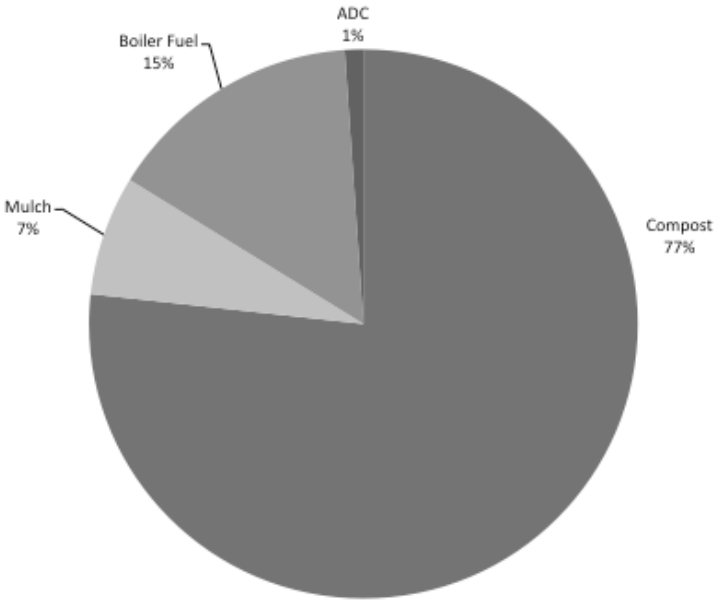

Figure 21
Product Distribution (Composters - Central Valley)

Compost	77%
Mulch	7%
Boiler Fuel	15%
ADC	1%
Other	0%

Figure 22
Product Distribution (Composters - Central Coast)

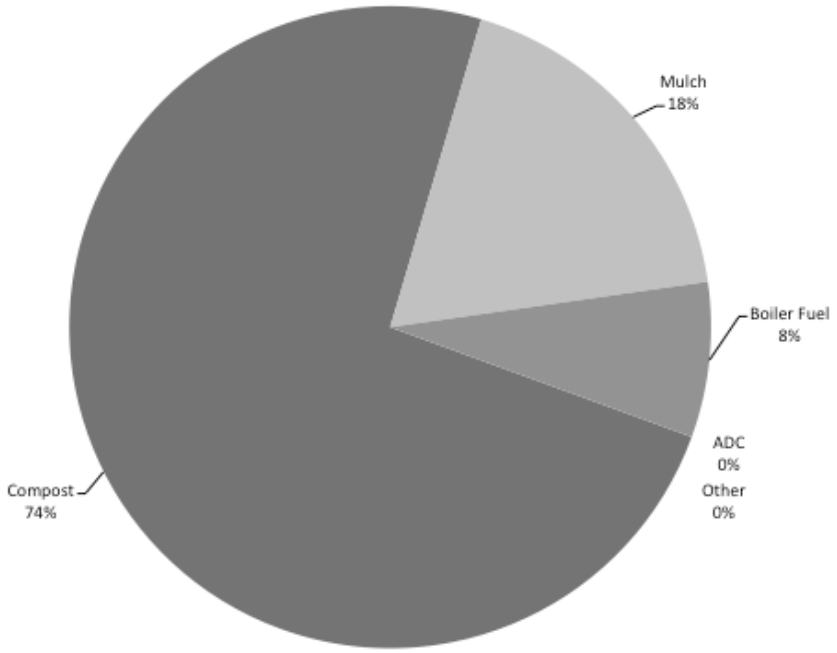

Figure 22	
Product Distribution (Composters - Central Coast)	
Compost	74%
Mulch	18%
Boiler Fuel	8%
ADC	0%
Other	0%

Figure 23
Product Distribution (Composters - Southern Region)

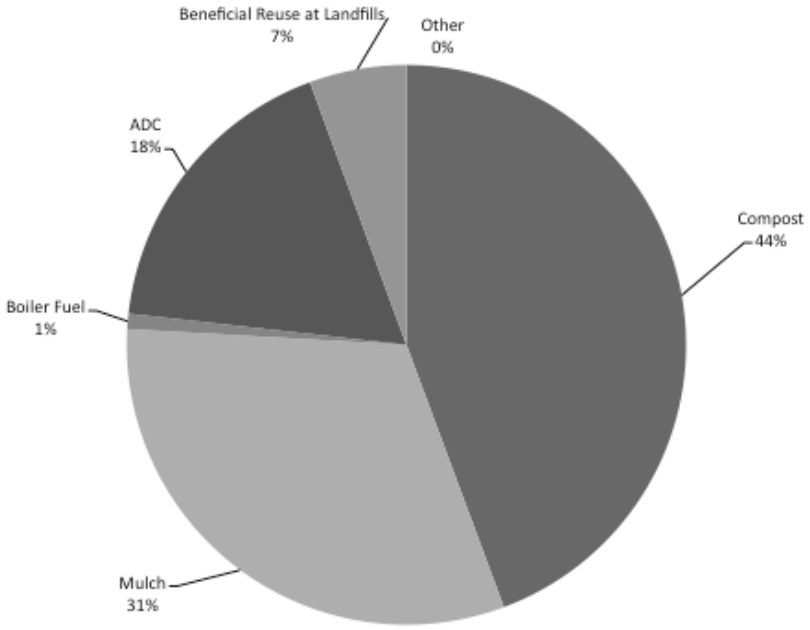

Figure 23	
Product Distribution (Composters - Southern Region)	
Compost	44%
Mulch	31%
Boiler Fuel	1%
ADC	18%
Beneficial Reuse at Landfills	7%
Other	0

Figure 24
Product Distribution (Processors - Northern Region)

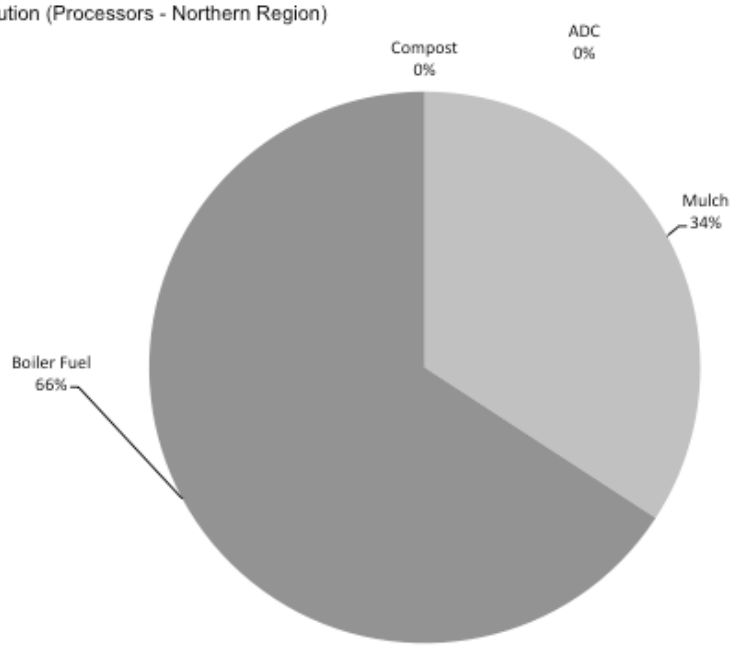

Figure 24	
Product Distribution (Processors - Northern)	
Compost Feedstock	0
Mulch	34%
Boiler Fuel	66%
ADC	0

Figure 25
Product Distribution (Processors - Bay Area Region)

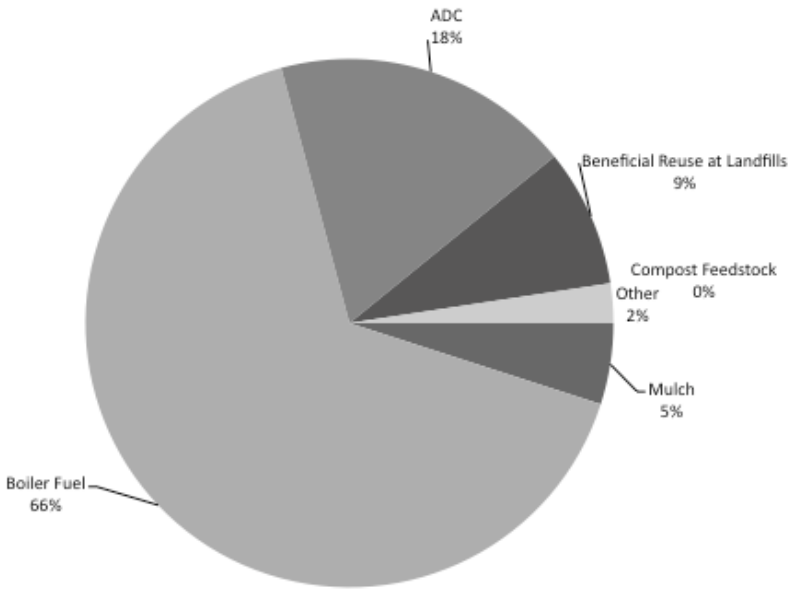

Figure 25
Product Distribution (Processors - Bay Area Region)

Mulch	5%
Boiler Fuel	66%
ADC	18%
Beneficial Reuse at Landfills	9%
Compost Feedstock	0%
Other	2%

Figure 26
Product Distribution (Processors - Central Valley)

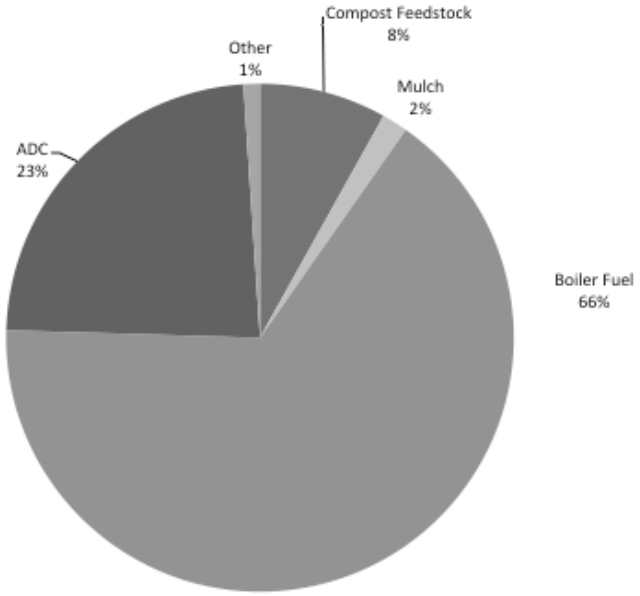

Figure 26
Product Distribution (Processors - Central Valley)

Compost Feedstock	8%
Mulch	2%
Boiler Fuel	66%
ADC	23%
Other	1%

Figure 27
Product Distribution (Processors - Central Coast)

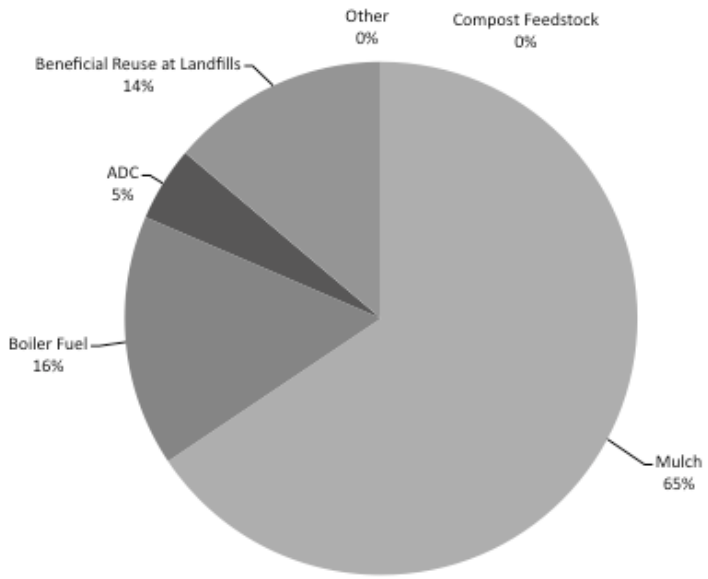

Figure 27
Product Distribution (Processors - Central Coast)

Compost Feedstock	0%
Mulch	65%
Boiler Fuel	16%
ADC	5%
Beneficial Reuse at Landfills	14%
Other	0%

Figure 28
Product Distribution (Processors - Southern Region)

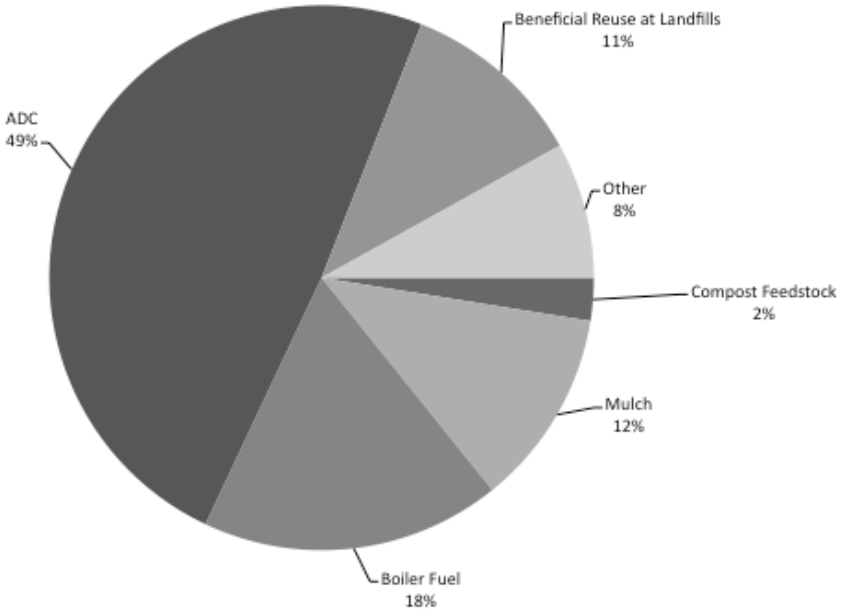

Figure 28	
Product Distribution (Processors - Southern Region)	
Compost Feedstock	2%
Mulch	12%
Boiler Fuel	18%
ADC	49%
Beneficial Reuse at Landfills	11%
Other	8%

Figure 29
Percentage of Processors and Composters Providing Specialized Services

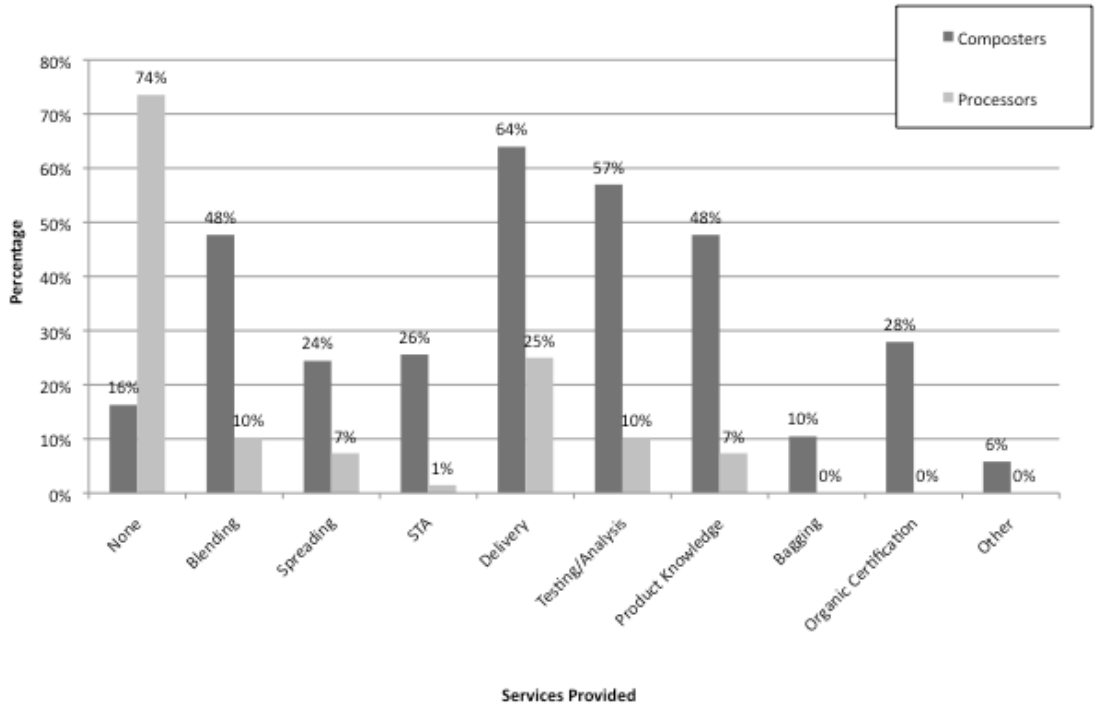

Figure 29
Percentage of Composters and Processors
Providing Specialized Services

	Composters	Processors
None	16%	74%
Blending	48%	10%
Spreading	24%	7%
STA	26%	1%
Delivery	64%	25%
Testing/Analysis	57%	10%
Product Knowledge	48%	7%
Bagging	10%	0%
Organic Certification	28%	0%
Other	6%	0%

Figure 29A
Number of Services Provided by Composters and Processors

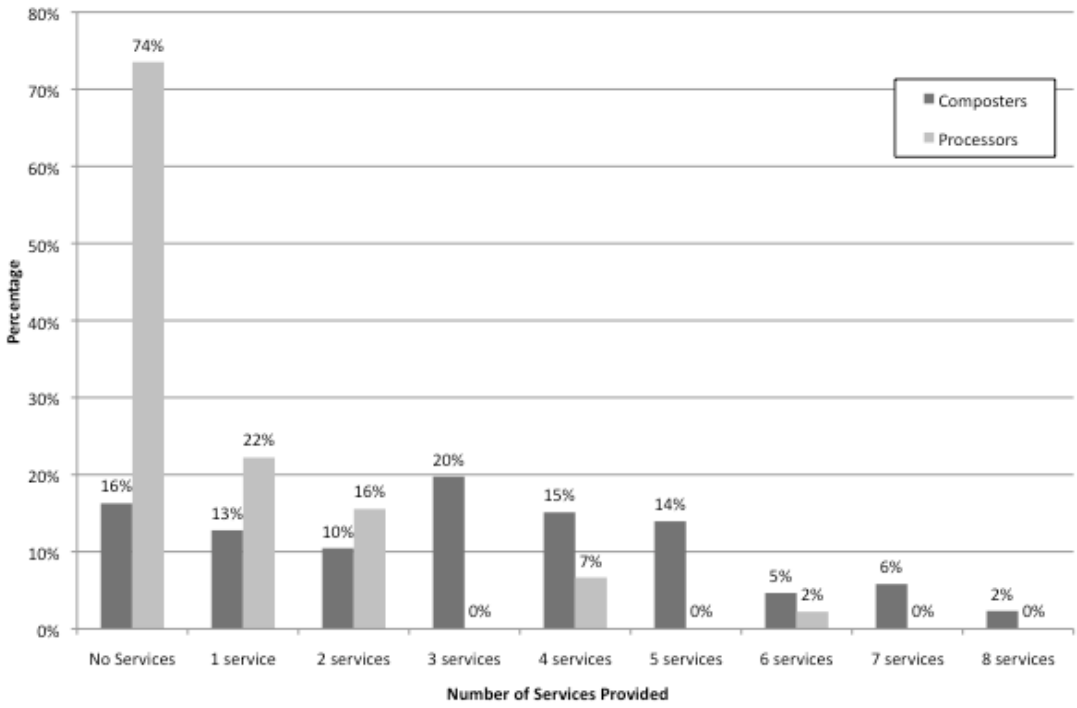

Figure 29A
Number of Services Provided by Composters and Processors

	Composters	Processors
No Services	16%	74%
1 service	13%	22%
2 services	10%	16%
3 services	20%	0%
4 services	15%	7%
5 services	14%	0%
6 services	5%	2%
7 services	6%	0%
8 services	2%	0%

Figure 30
Facility Ownership (Composters and Processors)

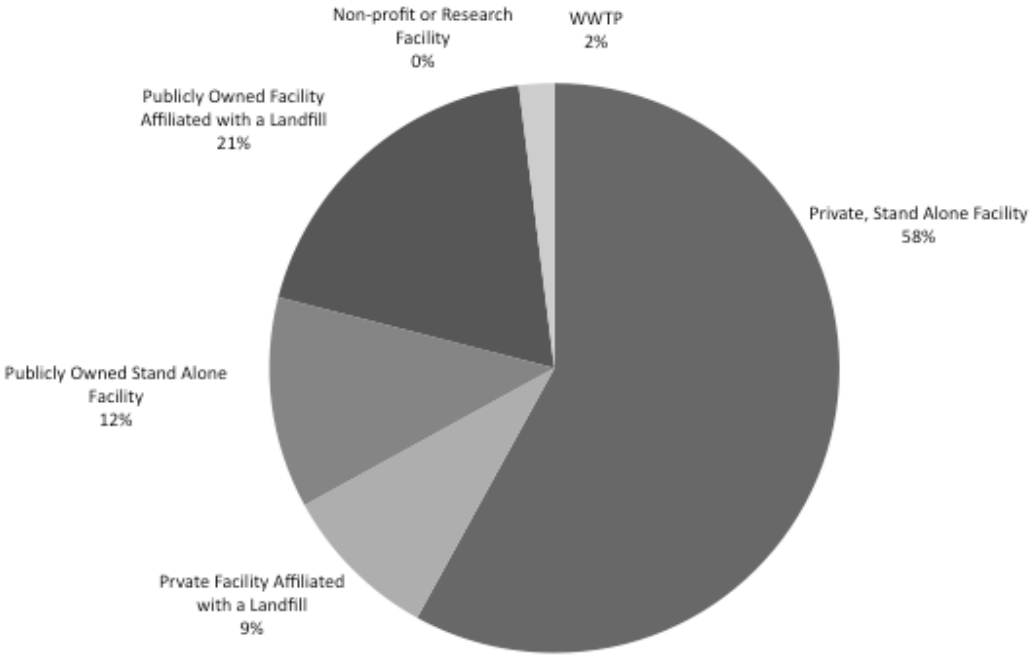

Figure 30	
Facility Ownership (All)	
Private, Stand Alone Facility	58%
Private Facility Affiliated with a Landfill	9%
Publicly Owned Stand Alone Facility	12%
Publicly Owned Facility Affiliated with a Landfill	21%
Non-profit or Research Facility	0%
WWTP	2%

Figure 30A
Ownership of Composting Facilities

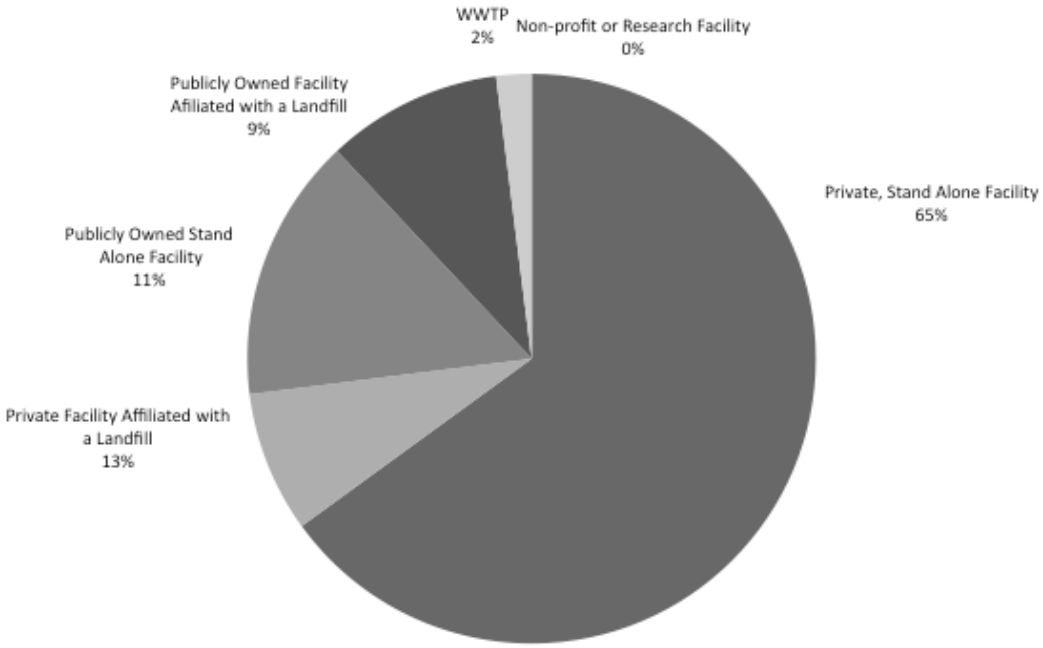

Figure 30A Ownership of Composting Facilities	
Private, Stand Alone Facility	65%
Private Facility Affiliated with a Landfill	13%
Publicly Owned Stand Alone Facility	11%
Publicly Owned Facility Affiliated with a Landfill	9%
Nonprofit or Research Facility	0%
WWTP	2%

Figure 30B
Ownership of Processors

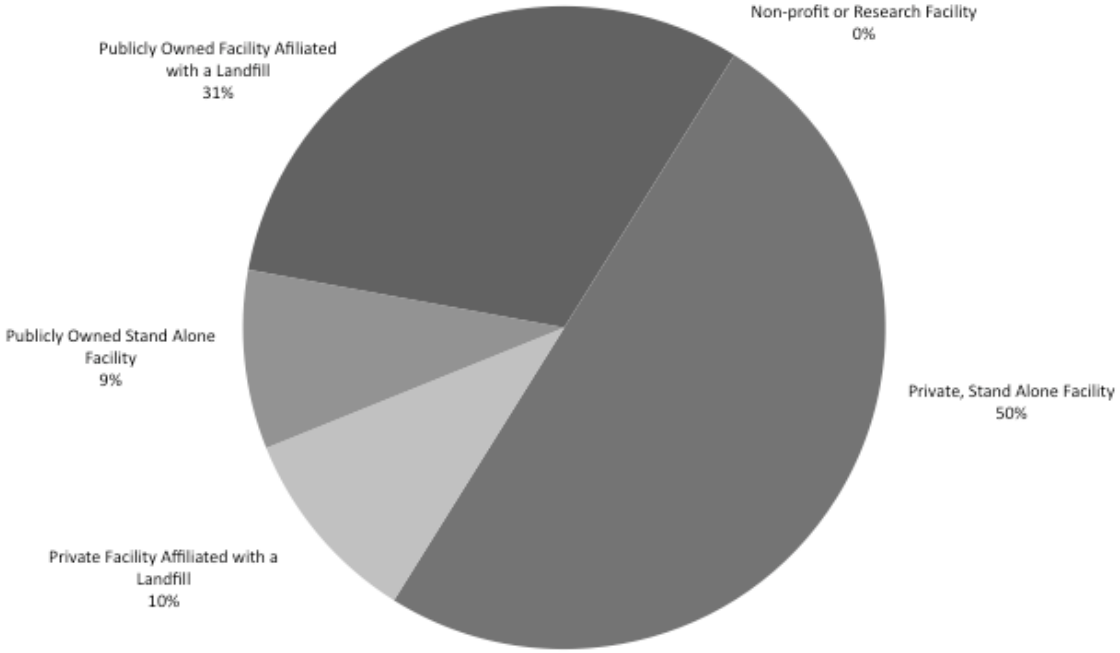

Figure 30B Ownership of Processing Facilities	
Private, Stand Alone Facility	50%
Private Facility Affiliated with a Landfill	10%
Publicly Owned Stand Alone Facility	9%
Publicly Owned Facility Affiliated with a Landfill	31%
Nonprofit or Research Facility	0%

Figure 31
Motivations for Facility/Operation (All)

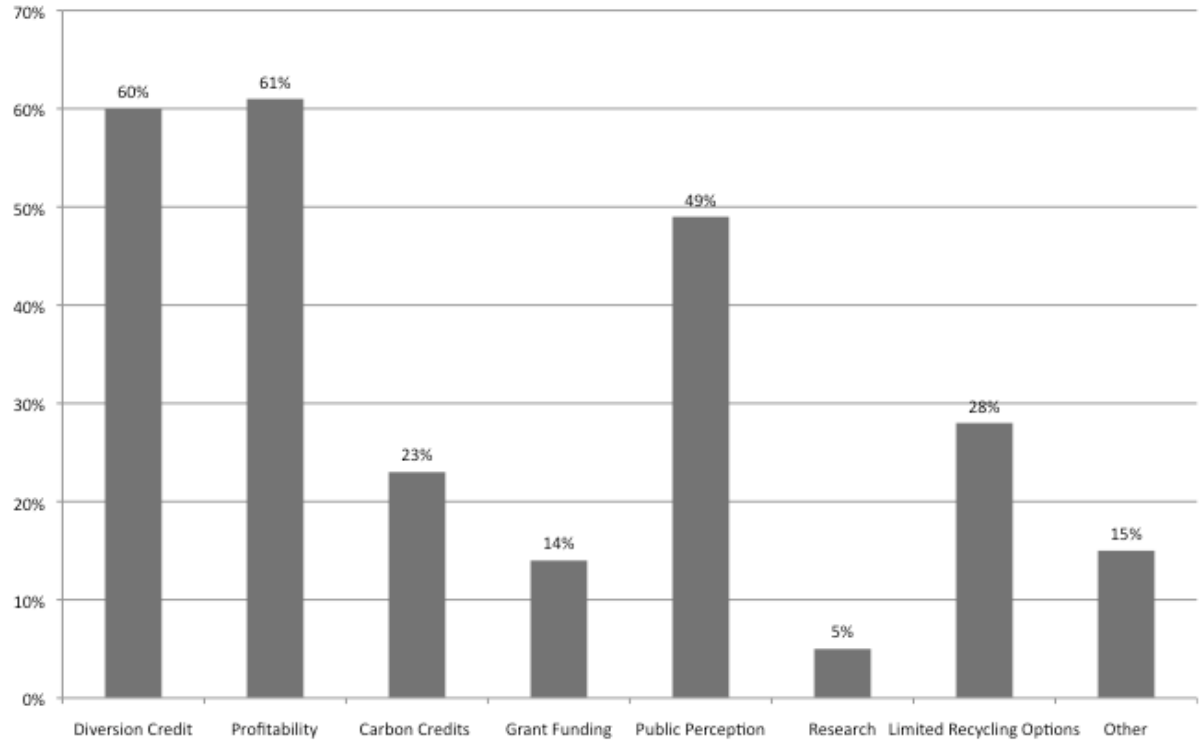

Figure 31 Motivations for Facility/Operation (All)	
Diversion Credit	60%
Profitability	61%
Carbon Credits	23%
Grant Funding	14%
Public Perception	49%
Research	5%
Limited Recycling Options	28%
Other	15%

Figure 31A
Motivations for Facility/Operation (Composters)

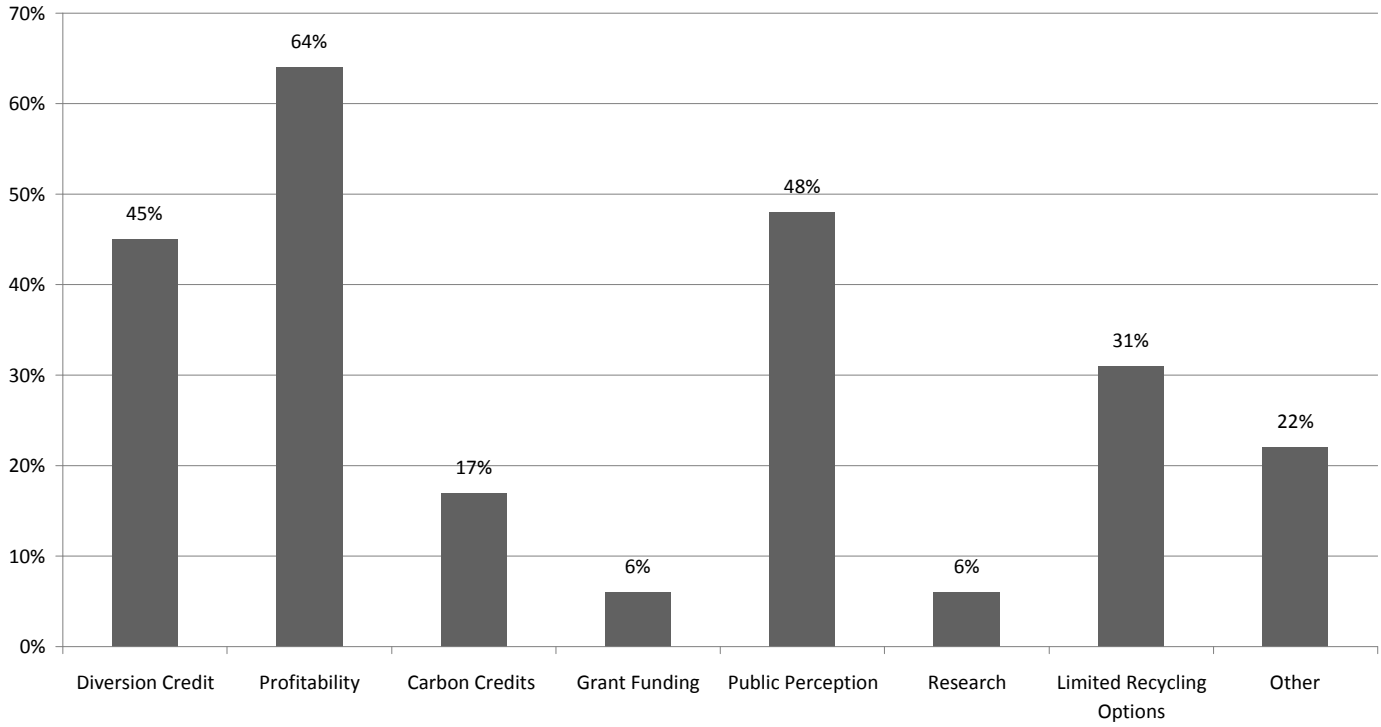

Figure 31A
Motivations for Facility/Operation (Composters)

Diversion Credit	45%
Profitability	64%
Carbon Credits	17%
Grant Funding	6%
Public Perception	48%
Research	6%
Limited Recycling Options	31%
Other	22%

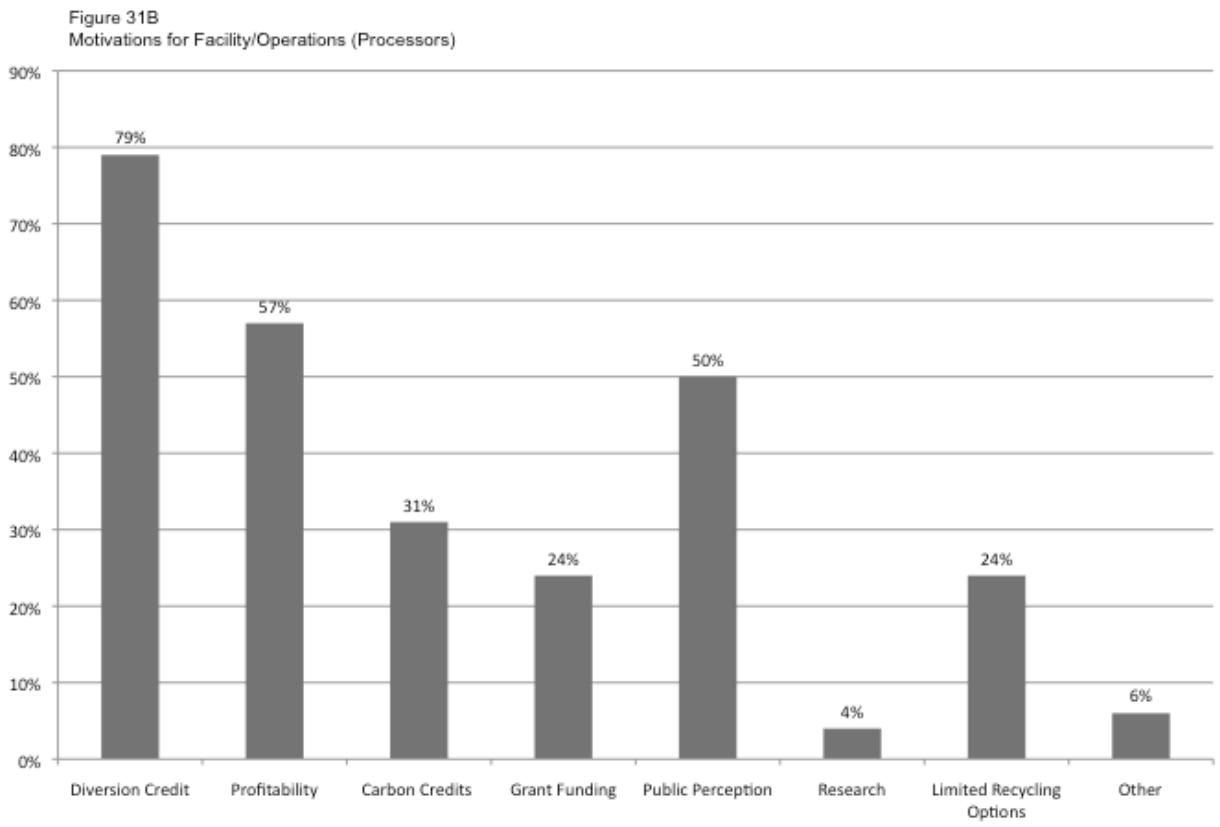

Figure 31B Motivations for Facility/Operations (Processors)	
Diversion Credit	79%
Profitability	57%
Carbon Credits	31%
Grant Funding	24%
Public Perception	50%
Research	4%
Limited Recycling Options	24%
Other	6%

Figure MP-1
Stormwater Management Techniques (Composters & Processors)

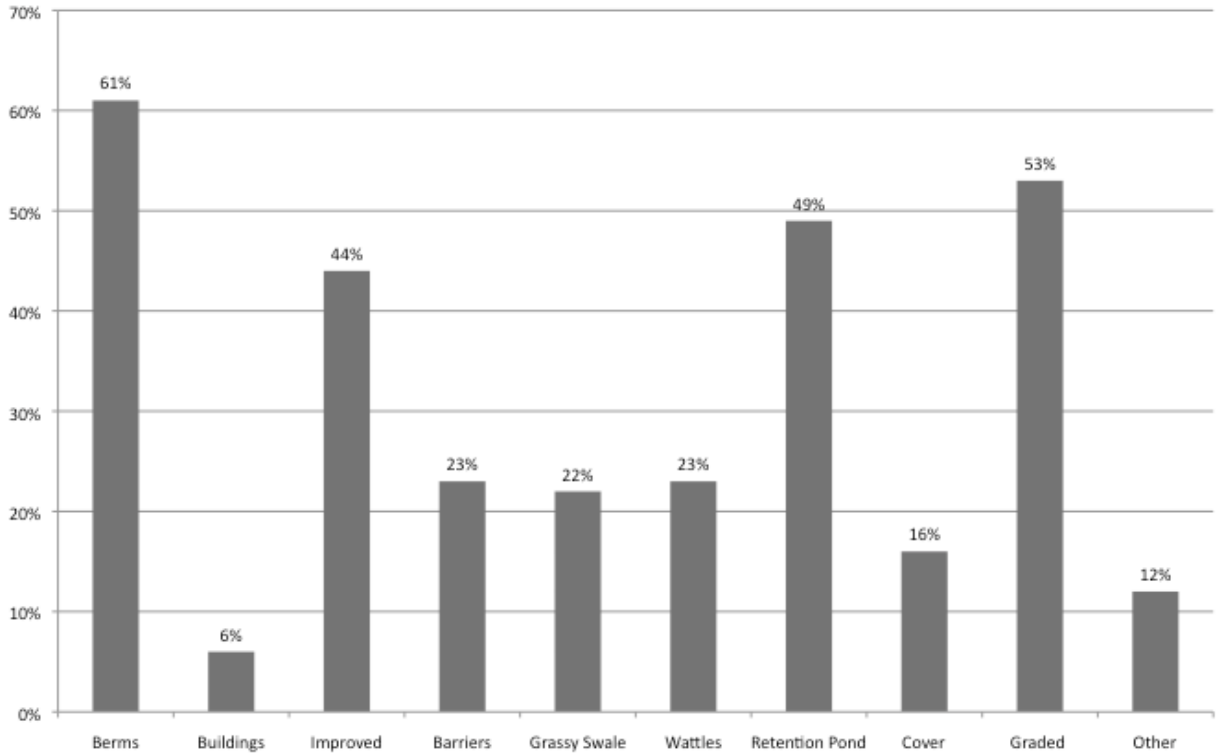

FIGURE MP-1
Stormwater Management Techniques (All)

Berms	61%
Buildings	6%
Improved	44%
Barriers	23%
Grassy Swale	22%
Wattles	23%
Retention Pond	49%
Cover	16%
Graded	53%
Other	12%

Figure MP-2
Stormwater Management Techniques (Composters)

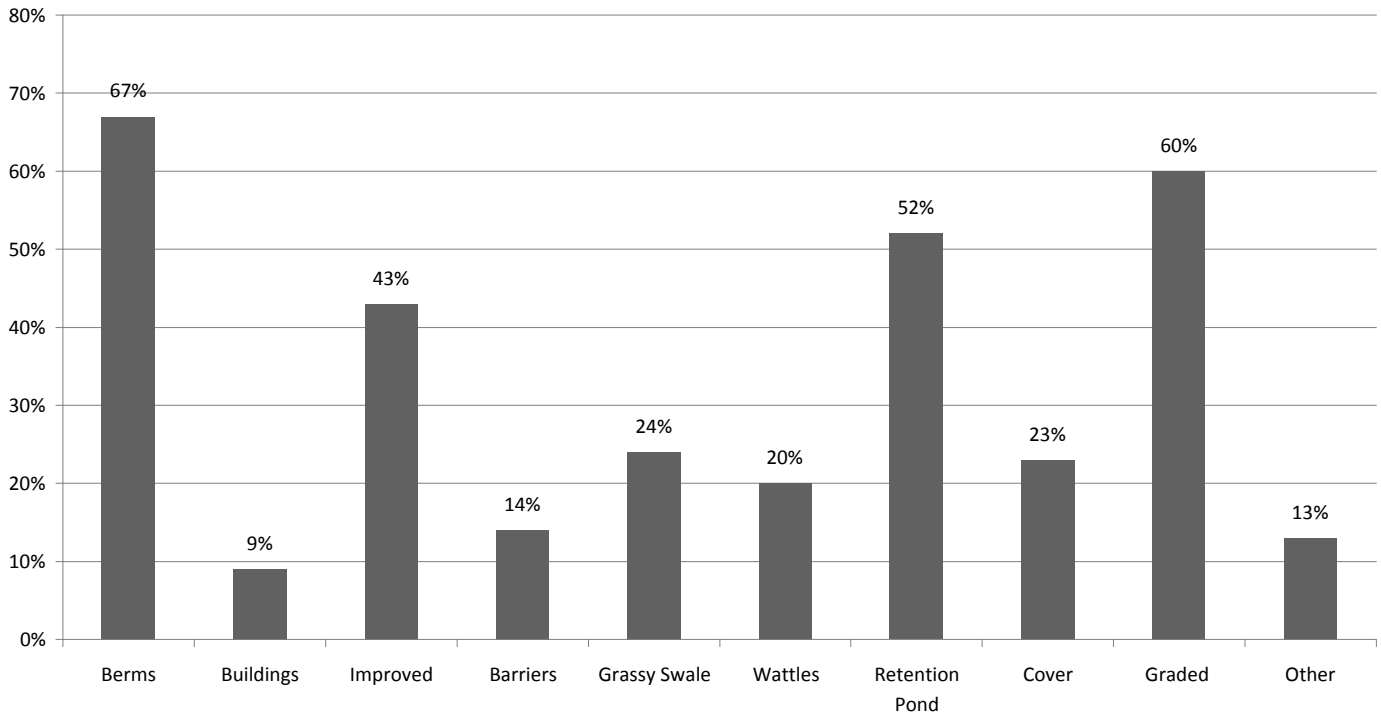

Figure MP-2
Stormwater Management Techniques (Composters)

Berms	67%
Buildings	9%
Improved	43%
Barriers	14%
Grassy Swale	24%
Wattles	20%
Retention Pond	52%
Cover	23%
Graded	60%
Other	13%

Figure MP-3
Stormwater Management Techniques (Processors)

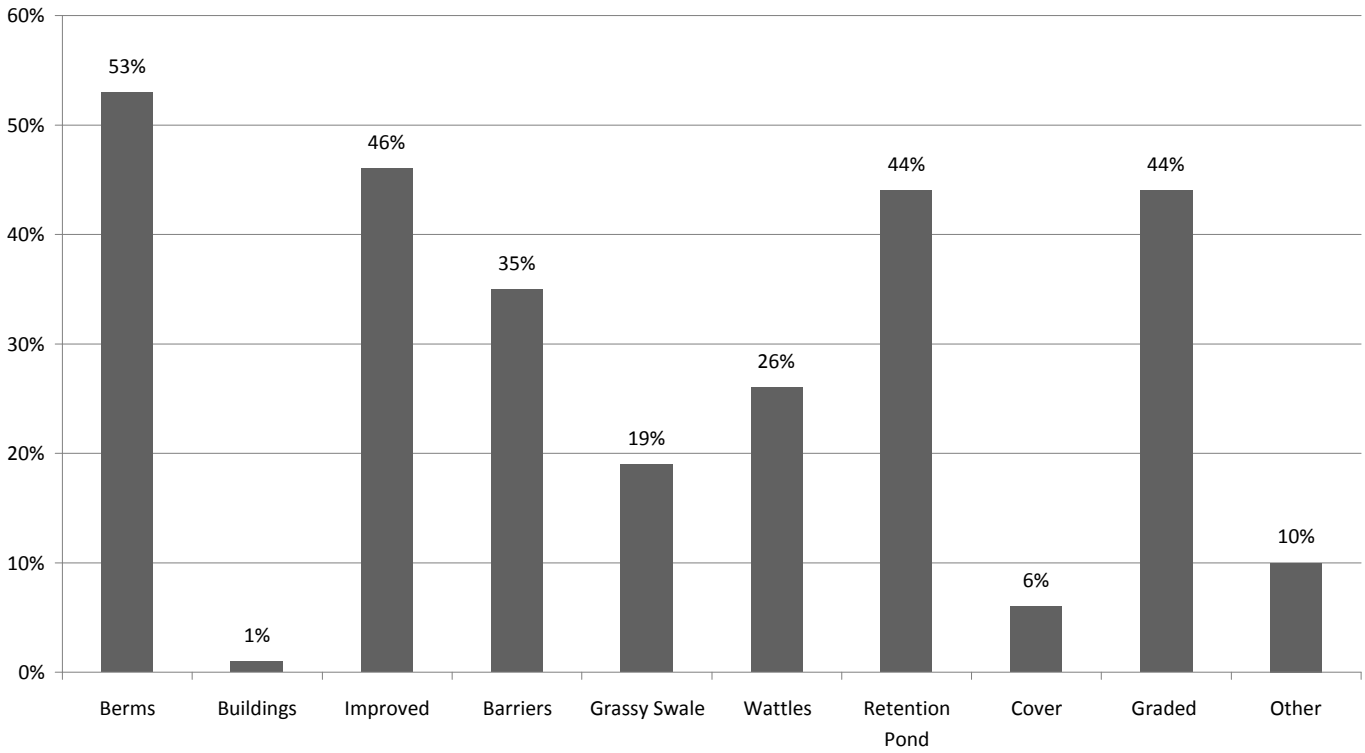

Figure MP-3
Stormwater Management Techniques (Processors)

Berms	53%
Buildings	1%
Improved	46%
Barriers	35%
Grassy Swale	19%
Wattles	26%
Retention Pond	44%
Cover	6%
Graded	44%
Other	10%

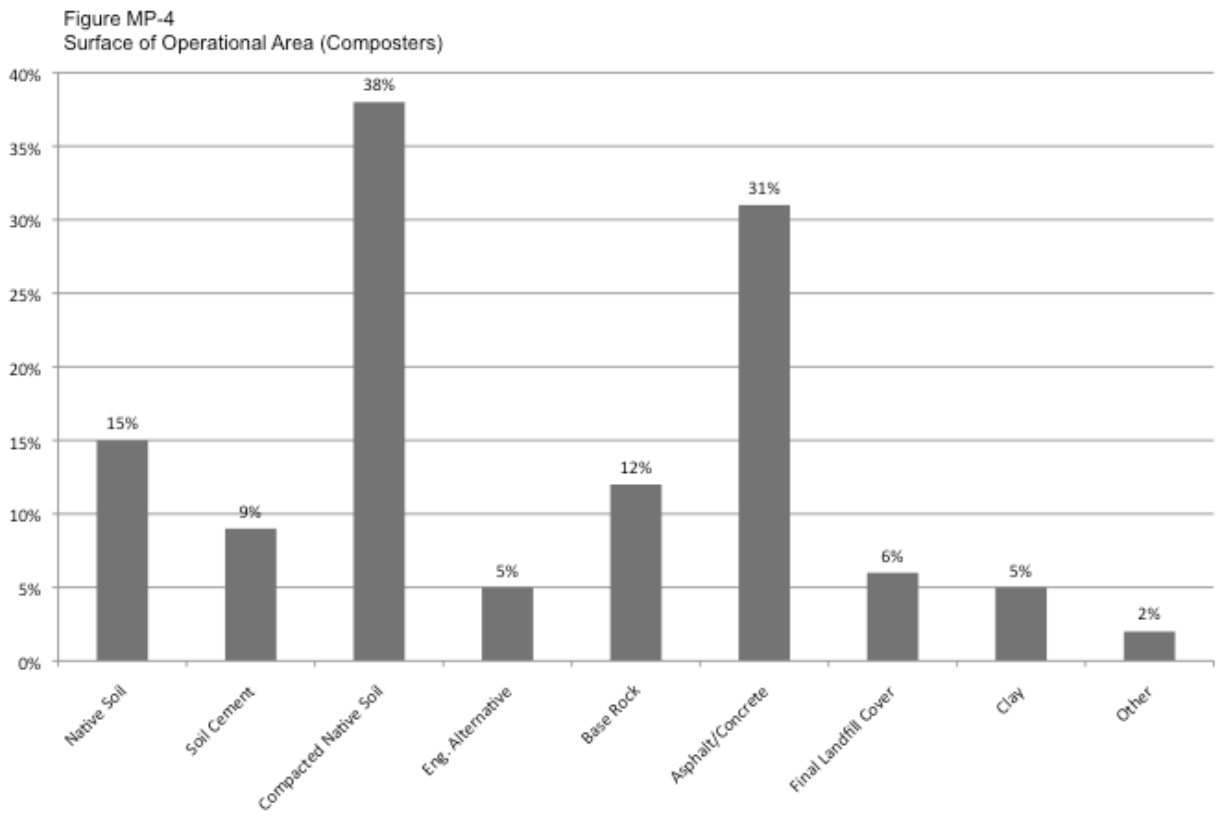

Figure MP-4 Surface of Operational Area (Composters)	
Native Soil	15%
Soil Cement	9%
Compacted Native Soil	38%
Eng. Alternative	5%
Base Rock	12%
Asphalt/Concrete	31%
Final Landfill Cover	6%
Clay	5%
Other	2%

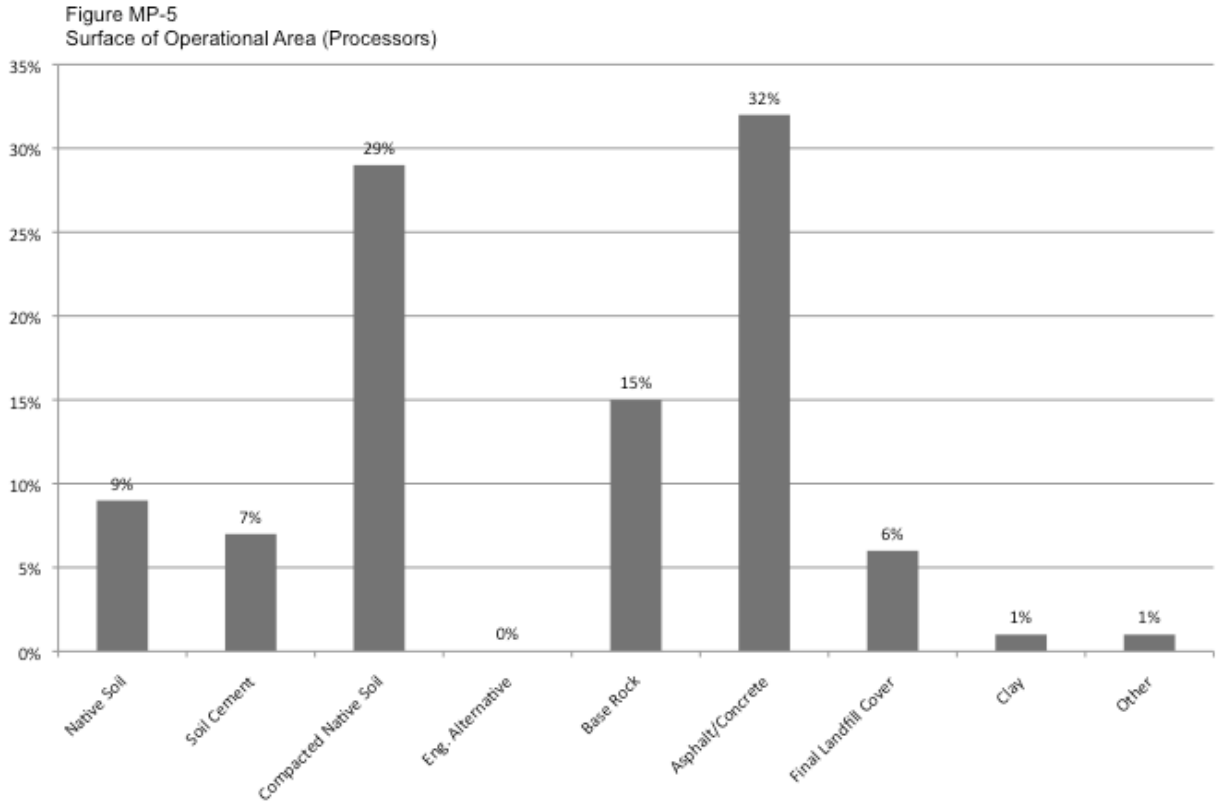

Figure MP-5
Surface of Operational Area (Processors)

Native Soil	9%
Soil Cement	7%
Compacted Native Soil	29%
Eng. Alternative	0%
Base Rock	15%
Asphalt/Concrete	32%
Final Landfill Cover	6%
Clay	1%
Other	1%

Figure MP-6
Windrow Turning Frequency

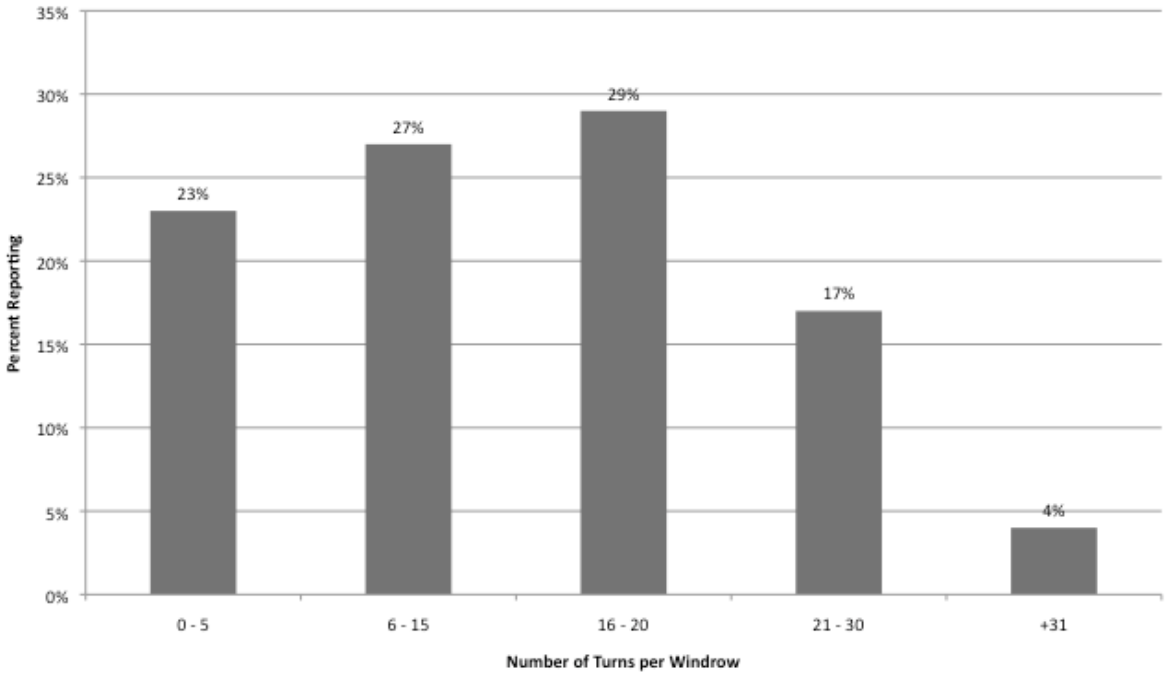

Figure MP-6 Windrow Turning Frequency	
0 - 5	23%
6 - 15	27%
16 - 20	29%
21 - 30	17%
+31	4%

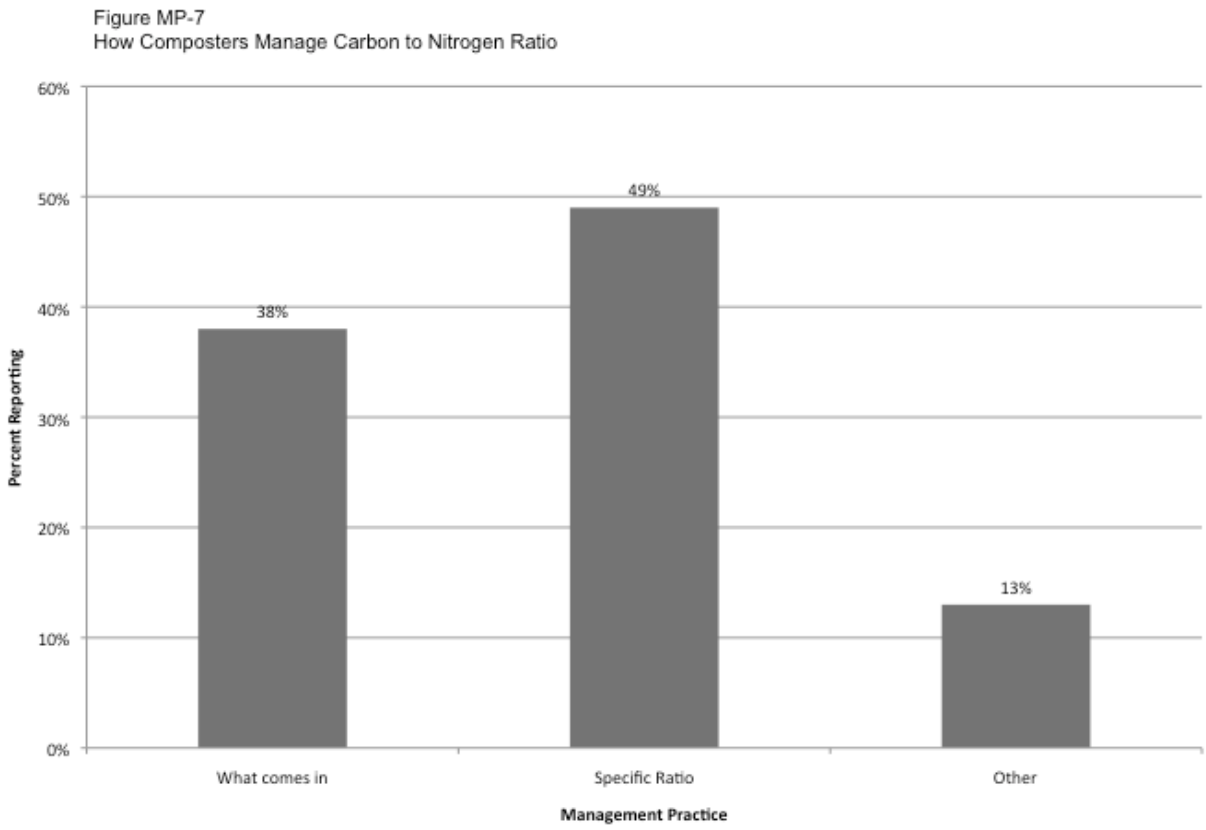

Figure MP-7
How Composters Manage Carbon to Nitrogen Ratio

What comes in	38%
Specific Ratio	49%
Other	13%

Figure MP-8
Management of Key Compost Process Variables

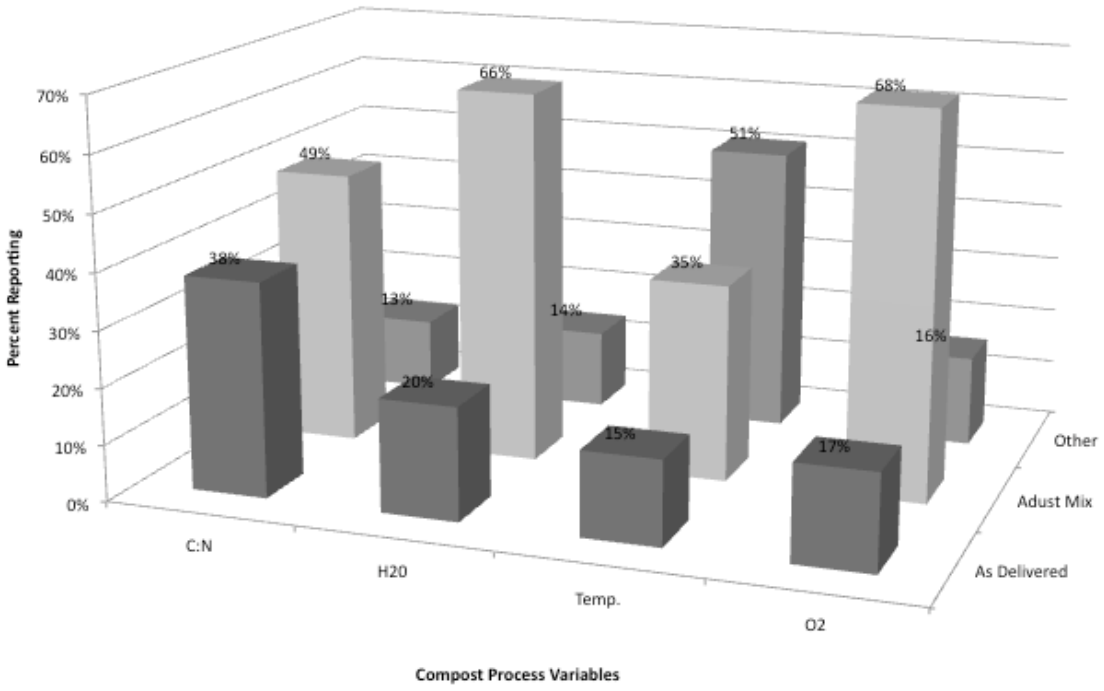

Figure MP-8
Management of Key Process Variables

	C:N	H20	Temp.	O2
As Delivered	38%	20%	15%	17%
Adjust Mix	49%	66%	35%	68%
Other	13%	14%	51%	16%

Figure MP-9
Importance of Key Compost Process Variables

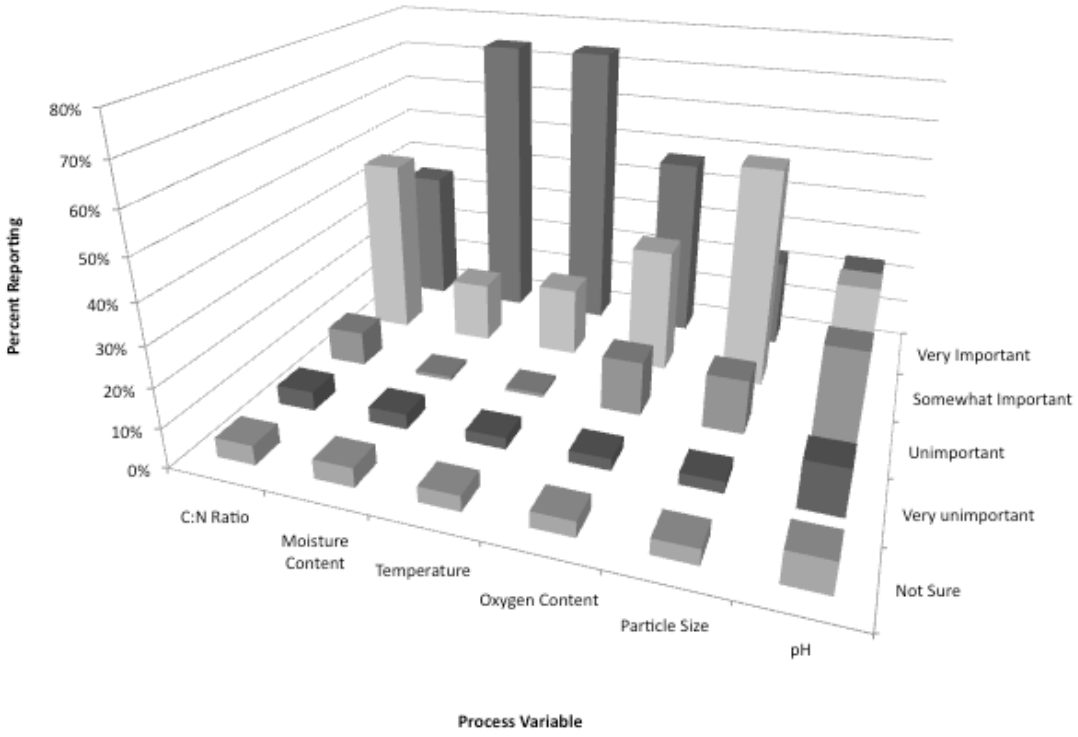

Figure MP-9
Importance of Key Process Variables

	Very Important	Somewhat Important	Unimportant	Very Unimportant	Not Sure
C:N Ratio	35%	46%	9%	5%	5%
Moisture Content	74%	16%	1%	4%	5%
Temperature	74%	18%	1%	3%	4%
Oxygen Content	47%	32%	14%	3%	4%
Particle Size	23%	56%	14%	3%	4%
pH	24%	30%	26%	12%	8%

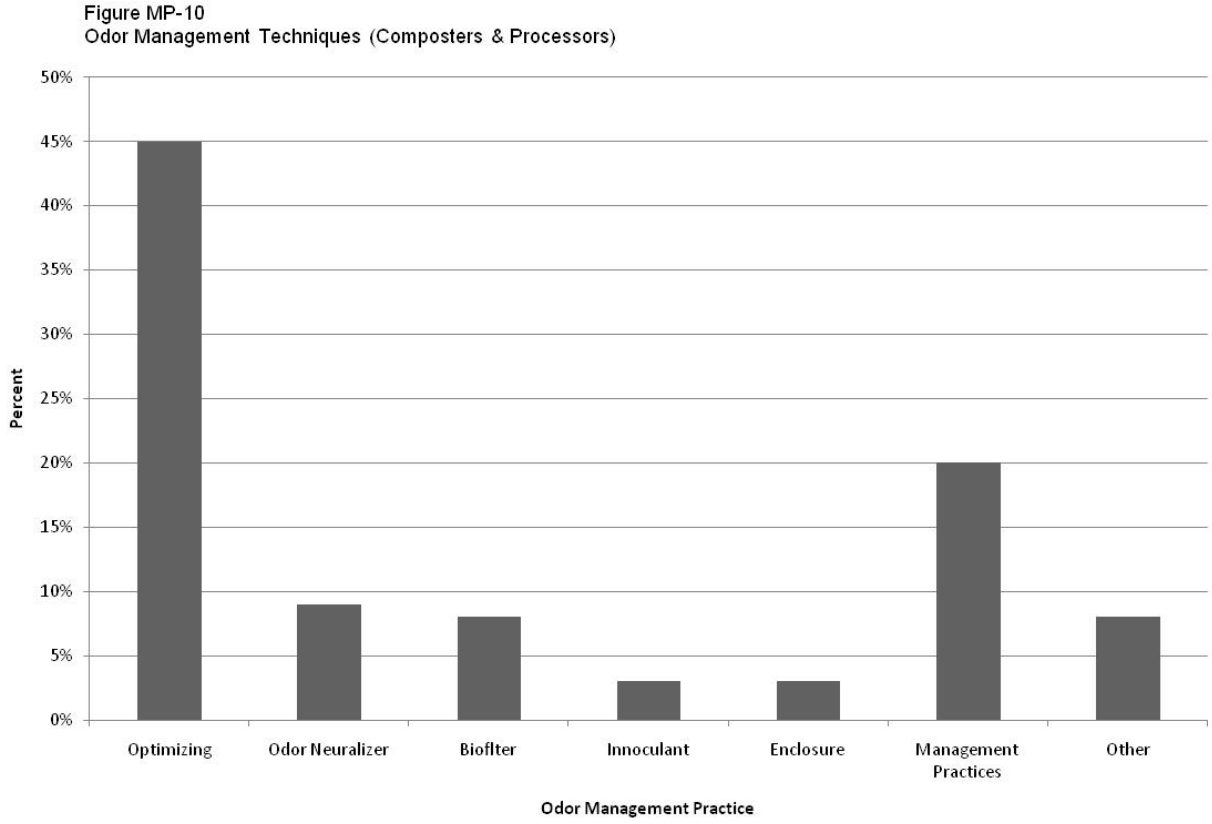

Figure MP-10
Odor Management Techniques used by Composters and Processors

Optimizing Compost Parameters	45%
Odor Neutralizer	9%
Biofilter	8%
Innoculant	3%
Enclosure	3%
Management Practices	20%
Other	8%

Figure MP-10A
Odor Management Techniques used by Composters

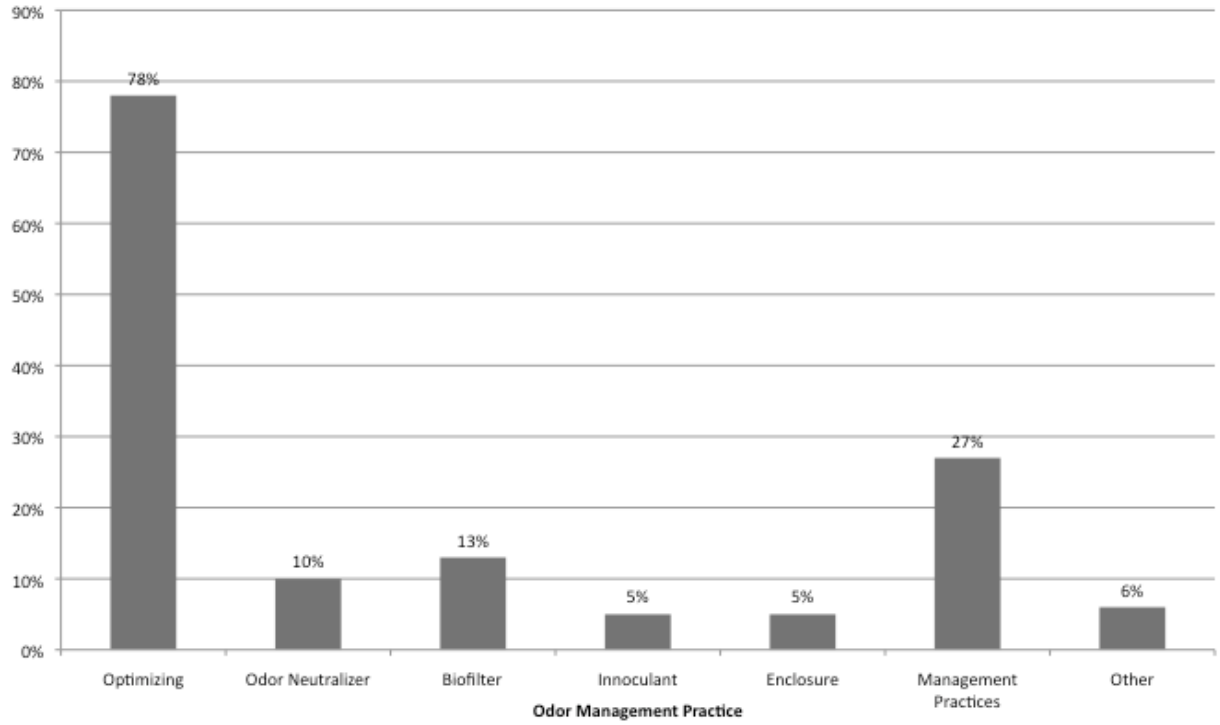

Figure MP-10A Odor Management Techniques used by Composters	
Optimizing	78%
Odor Neutralizer	10%
Biofilter	13%
Innoculant	5%
Enclosure	5%
Management Practices	27%
Other	6%

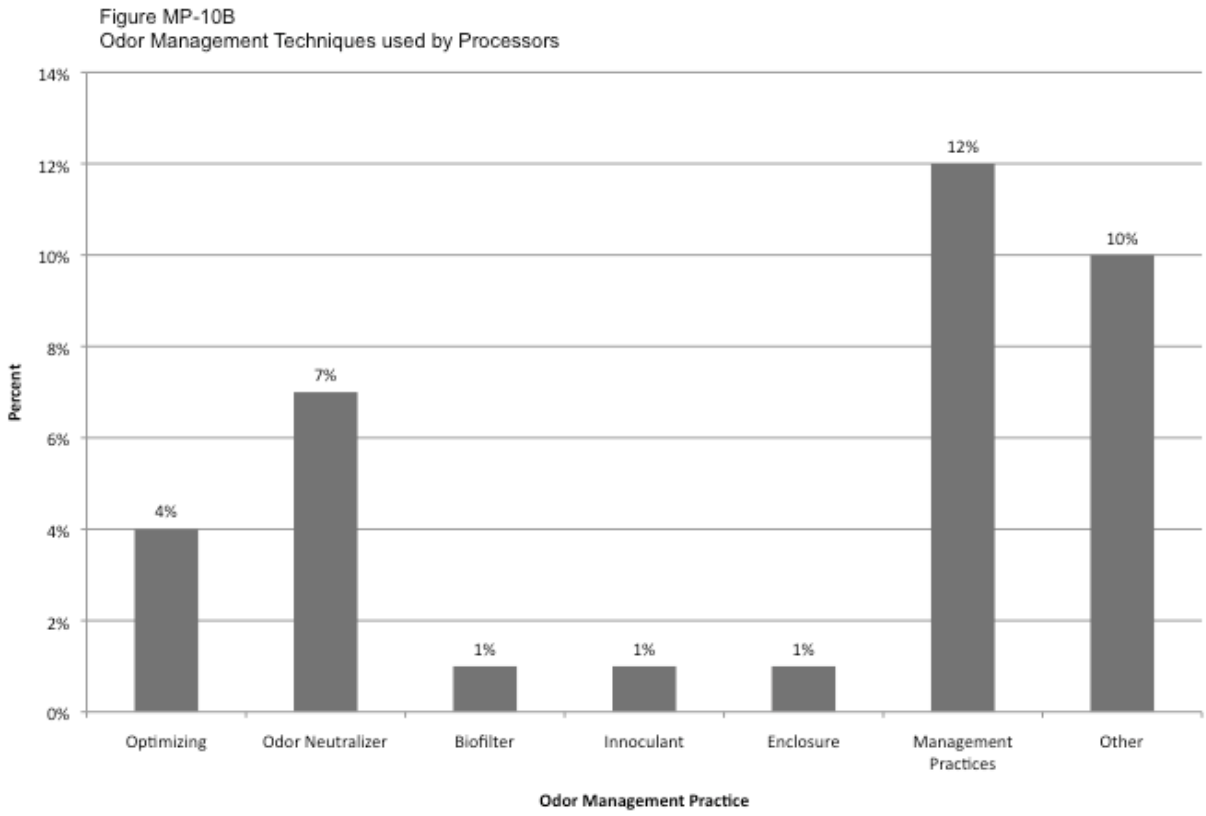

Figure MP-10B Odor Management Techniques used by Processors	
Optimizing	4%
Odor Neutralizer	7%
Biofilter	1%
Innoculant	1%
Enclosure	1%
Management Practices	12%
Other	10%

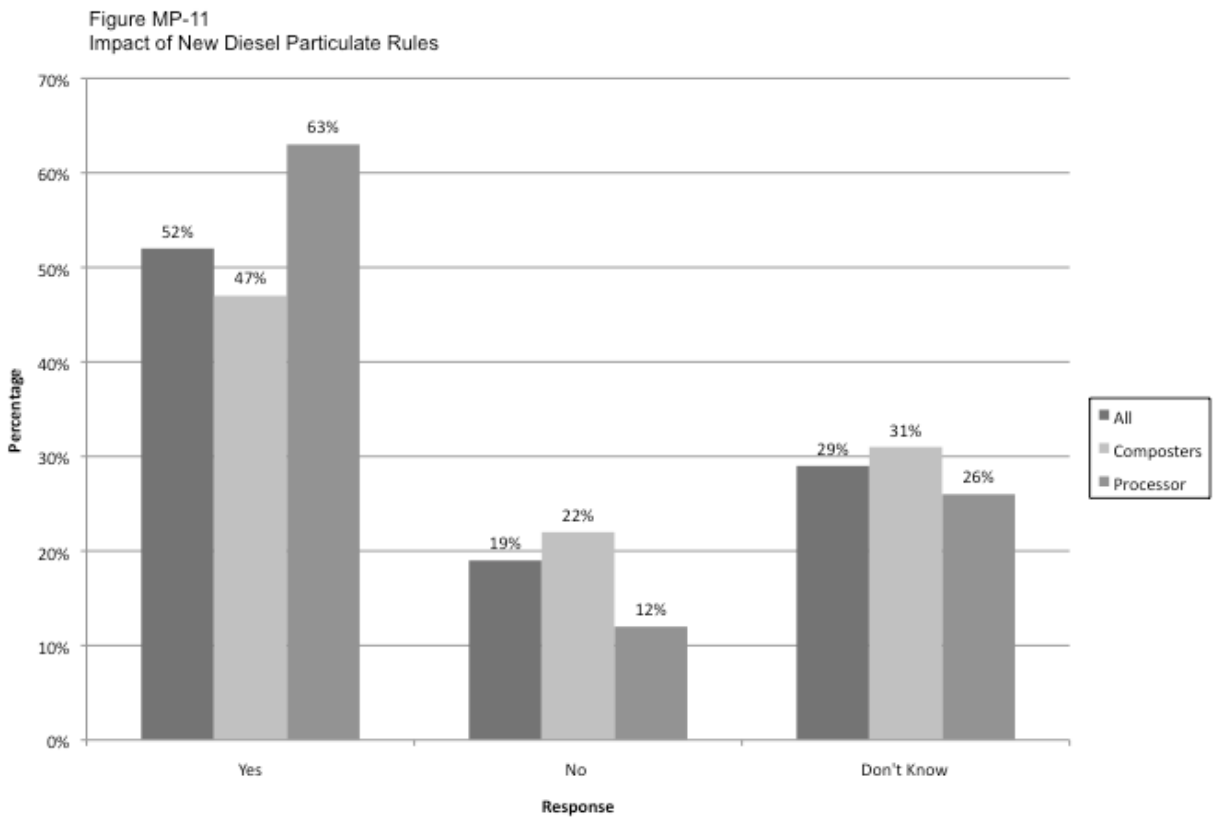

Figure MP-11
Impact of New Diesel Particulate Rules

	All	Composters	Processors
Yes	52%	47%	63%
No	19%	22%	12%
Don't Know	29%	31%	26%

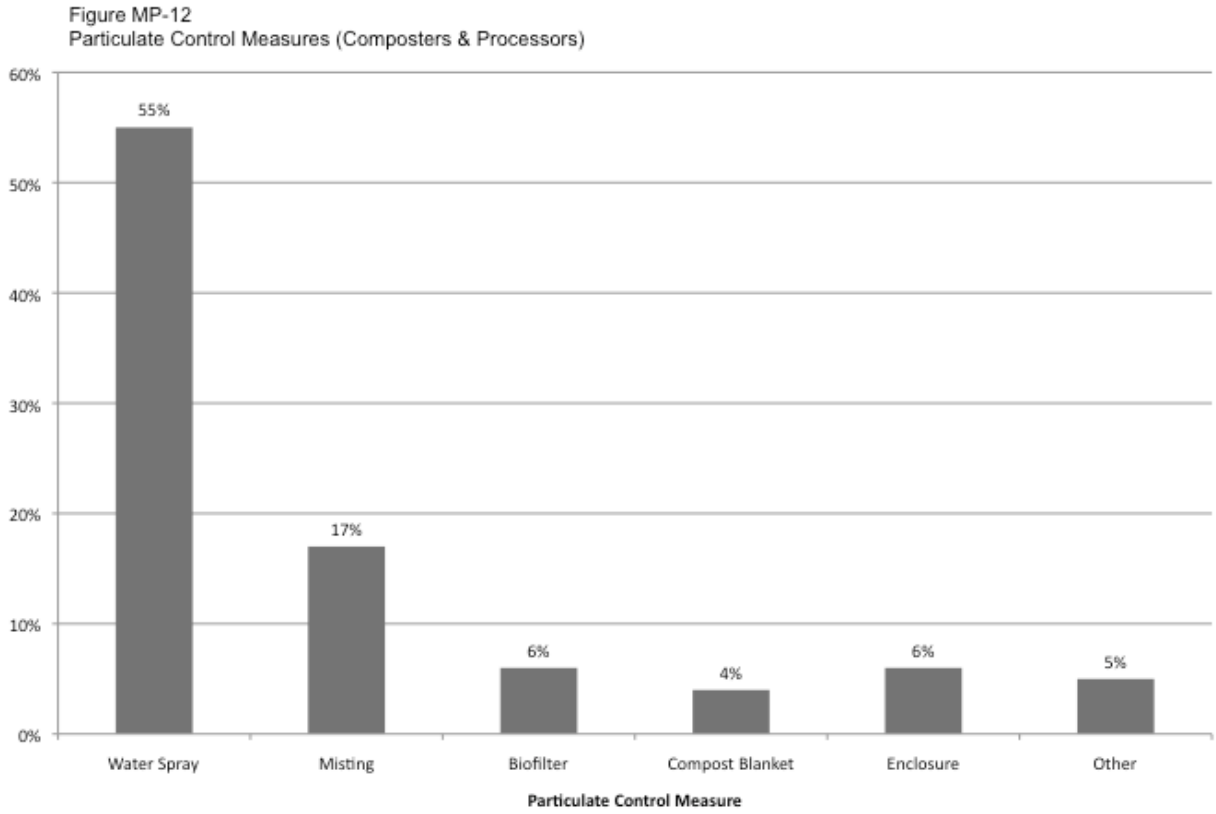

Figure MP-12 Particulate Control Measures (Composters and Processors)	
Water Spray	55%
Misting	17%
Biofilter	6%
Compost Blanket	4%
Enclosure	6%
Other	5%

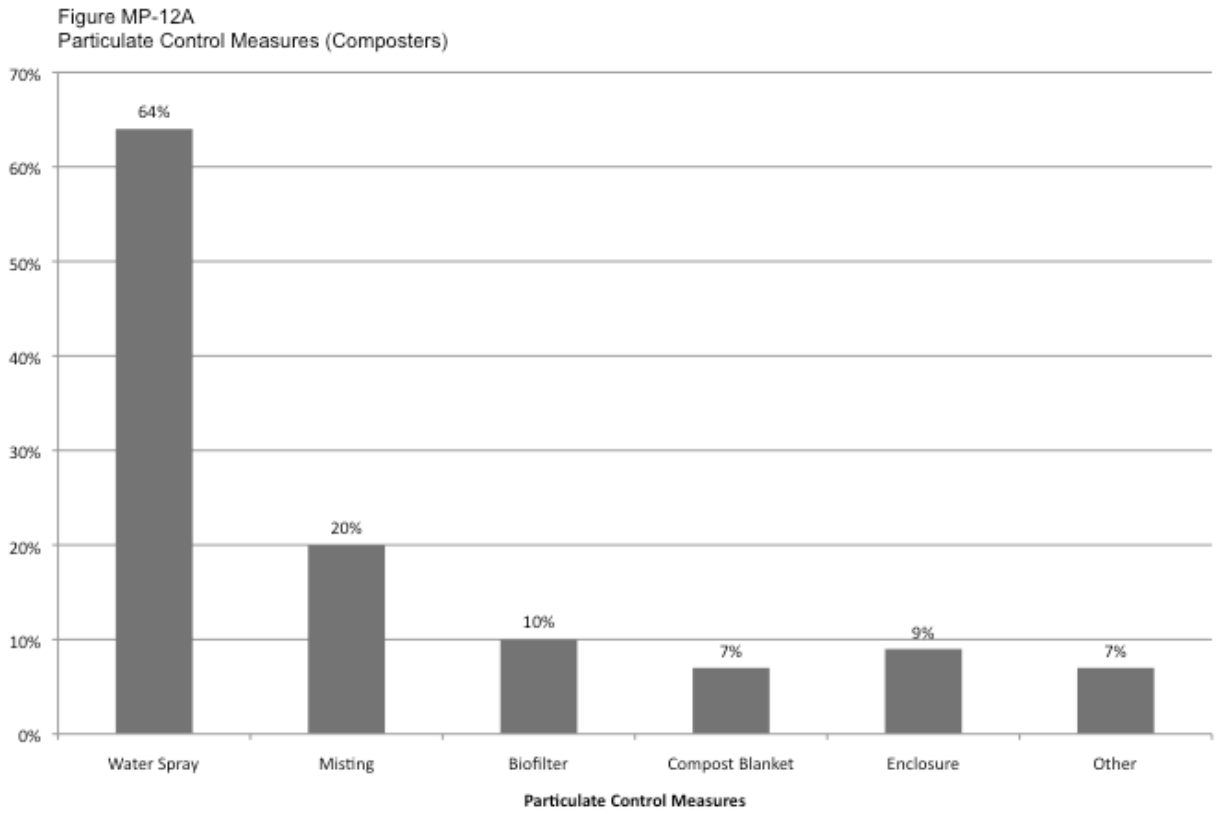

Figure MP-12A Particulate Control Measures (Composters)	
Water Spray	64%
Misting	20%
Biofilter	10%
Compost Blanket	7%
Enclosure	9%
Other	7%

Figure MP-12B
Particulate Control Measures (Processors)

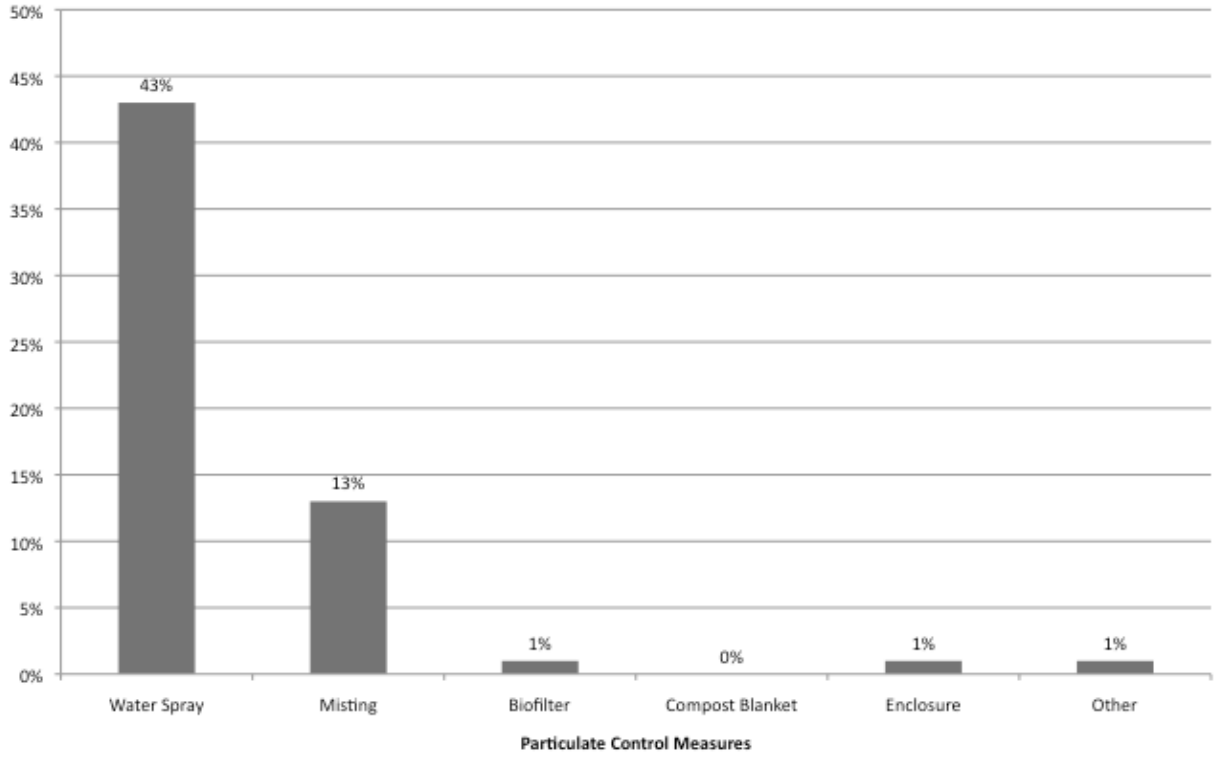

Figure MP-12B Particulate Control Measures (Processors)	
Water Spray	43%
Misting	13%
Biofilter	1%
Compost Blanket	0%
Enclosure	1%
Other	1%

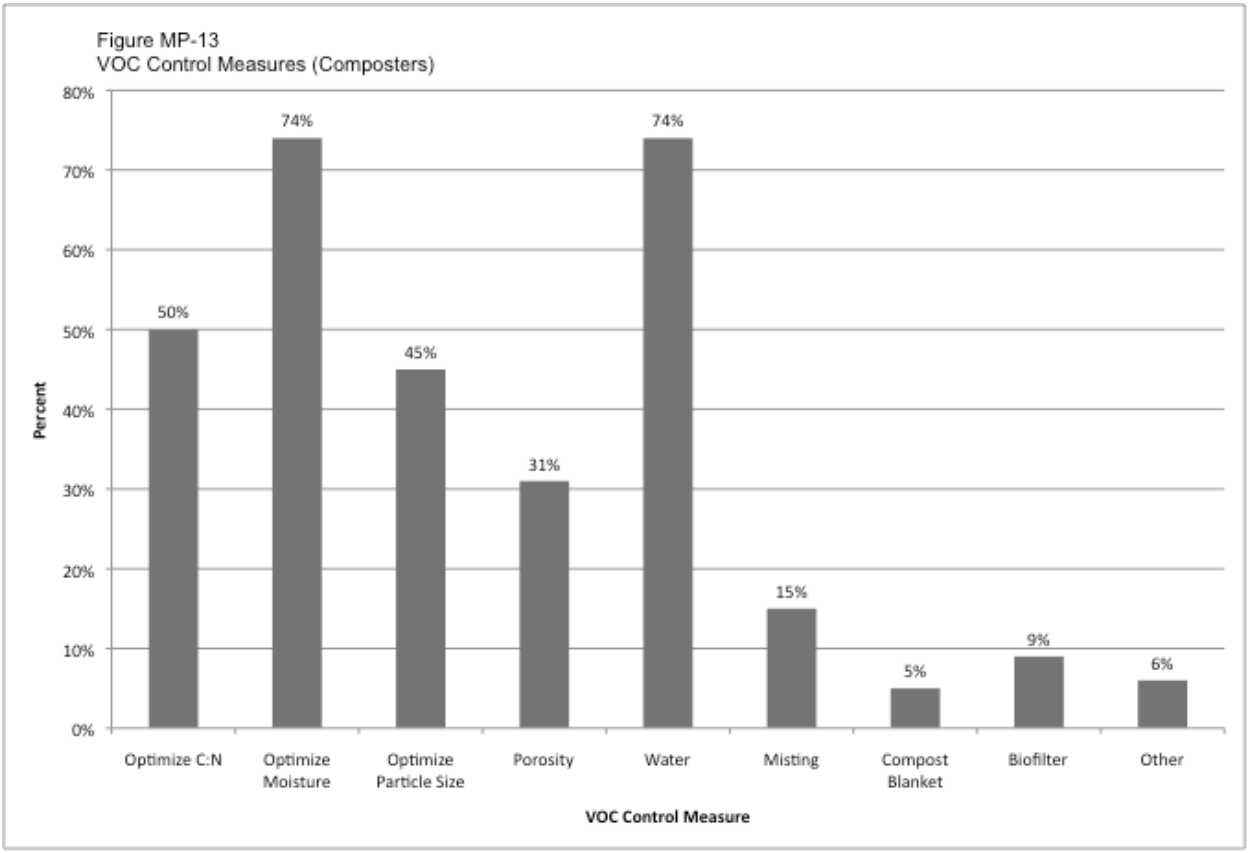

Figure MP-13 VOC Control Measures (Composters)	
Optimize C:N	50%
Optimize Moisture	74%
Optimize Particle Size	45%
Porosity	31%
Water	74%
Misting	15%
Compost Blanket	5%
Biofilter	9%
Other	6%

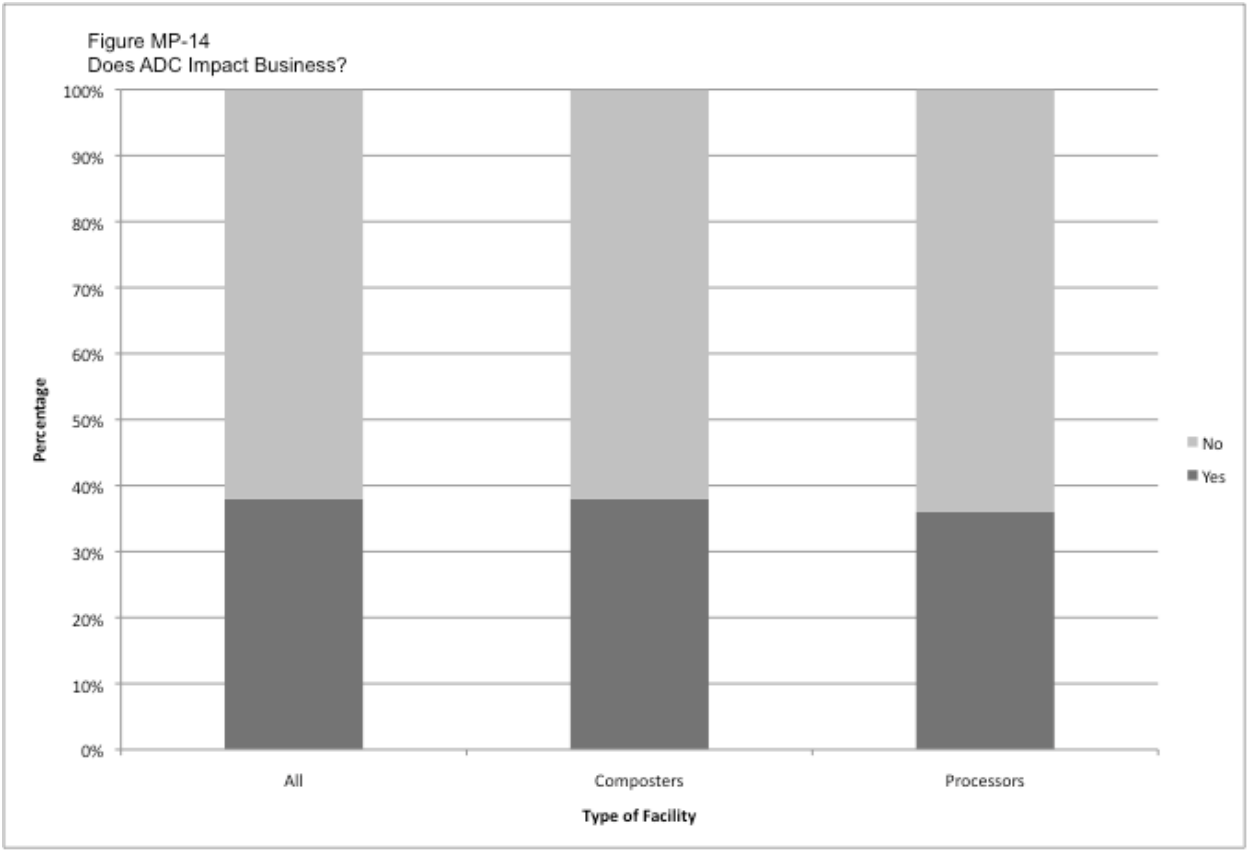

Figure MP-14
Does ADC Impact Business?

	All	Composters	Processors
Yes	38%	38%	36%
No	62%	62%	64%

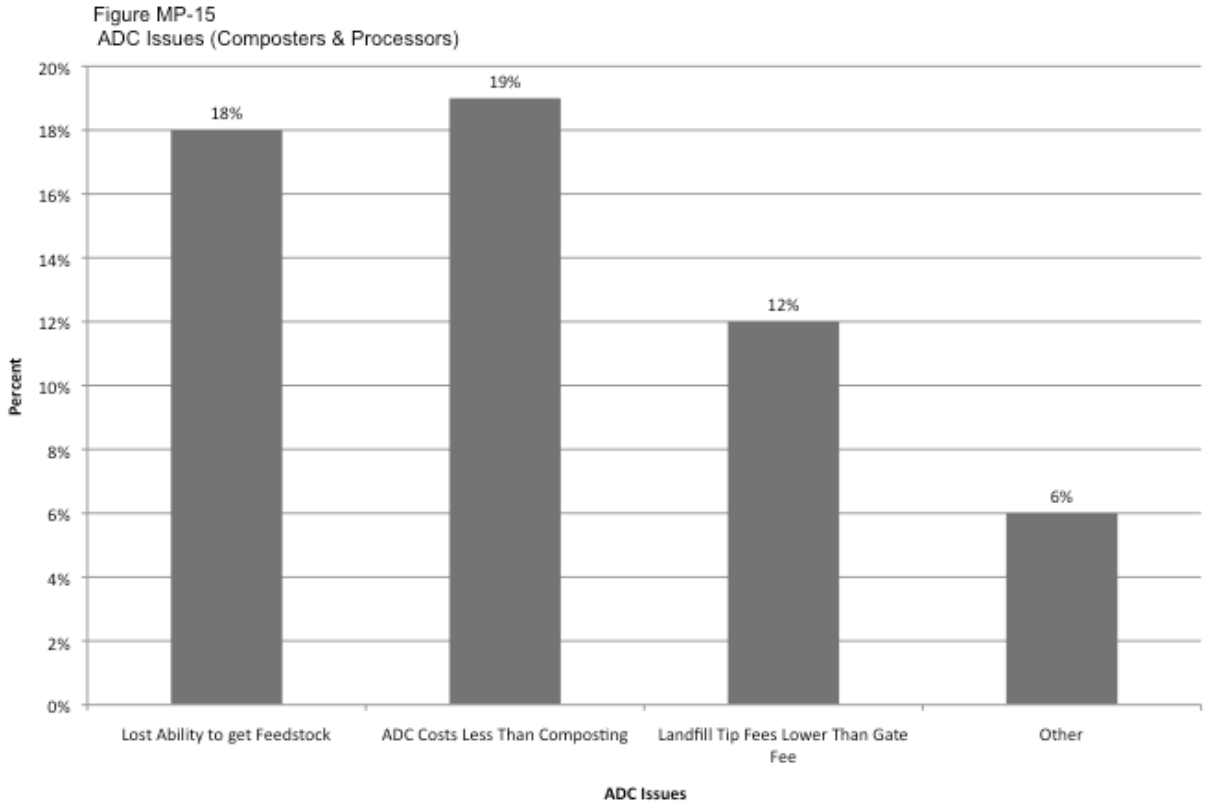

Figure MP-15	
ADC Issues (All)	
Lost Ability to get Feedstock	18%
ADC Costs Less Then Composting	19%
Landfill Tip Fees Lower Then Gate Fee	12%
Other	6%

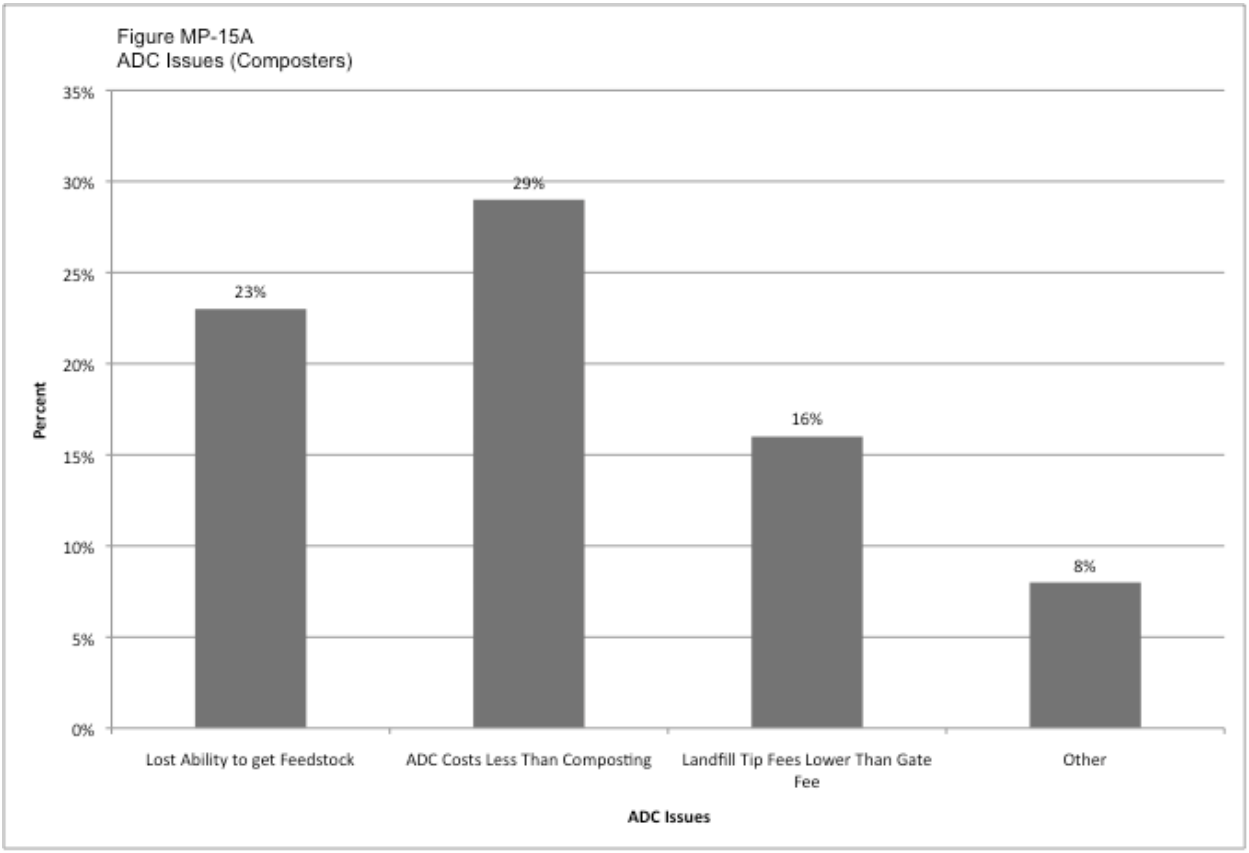

Figure MP-15A ADC Issues (Composters)	
Lost Ability to get Feedstock	23%
ADC Costs Less Than Composting	29%
Landfill Tip Fees Lower Than Gate Fee	16%
Other	8%

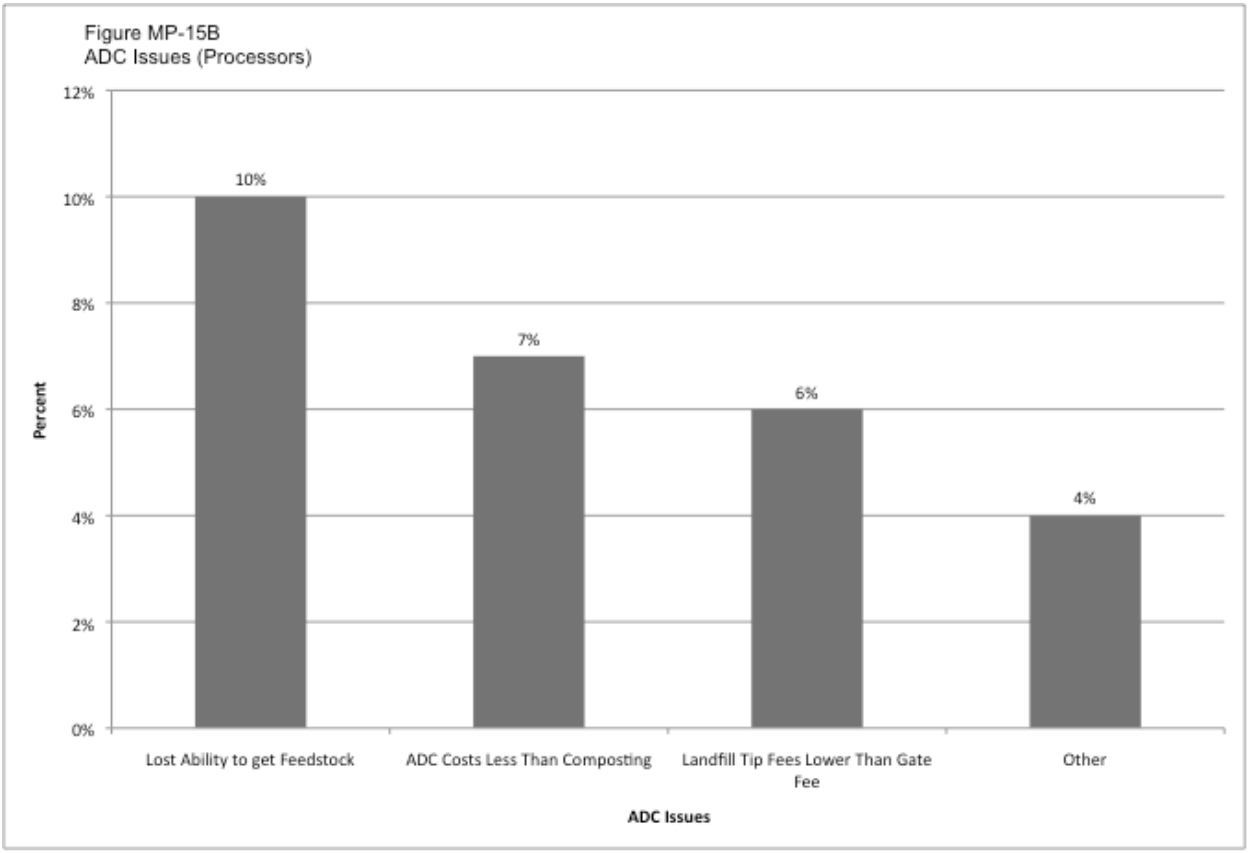

Figure MP-15B ADC Issues (Processors)	
Lost Ability to Get Feedstock	10%
ADC Costs Less Than Composting	7%
Landfill Tip Fees Lower Than Gate Fee	6%
Other	4%

Appendix C: Abbreviations and Acronyms

The following acronyms are used in this report.

ADC	Alternative Daily Cover
APCD	Air Pollution Control District
ARB	Air Resources Board
AQMD	Air Quality Management District
C&D	Construction and Demolition
C&G	Chipping and Grinding Facilities
LEA	Local Enforcement Agency
NPDES	National Pollutant Discharge Elimination System
MSW	Municipal Solid Waste
POTW	Publicly Owned Treatment Works
RWQCB	Regional Water Quality Control Board
SWIS	Solid Waste Information System
VOCs	Volatile Organic Compounds
WDR	Waste Discharge Requirements
WWTP	Wastewater Treatment Plant