

Compost and Mulch Market Study

County of San Diego, California



HIDDEN RESOURCES
COMPOSTING • SUSTAINABILITY • CONSULTING

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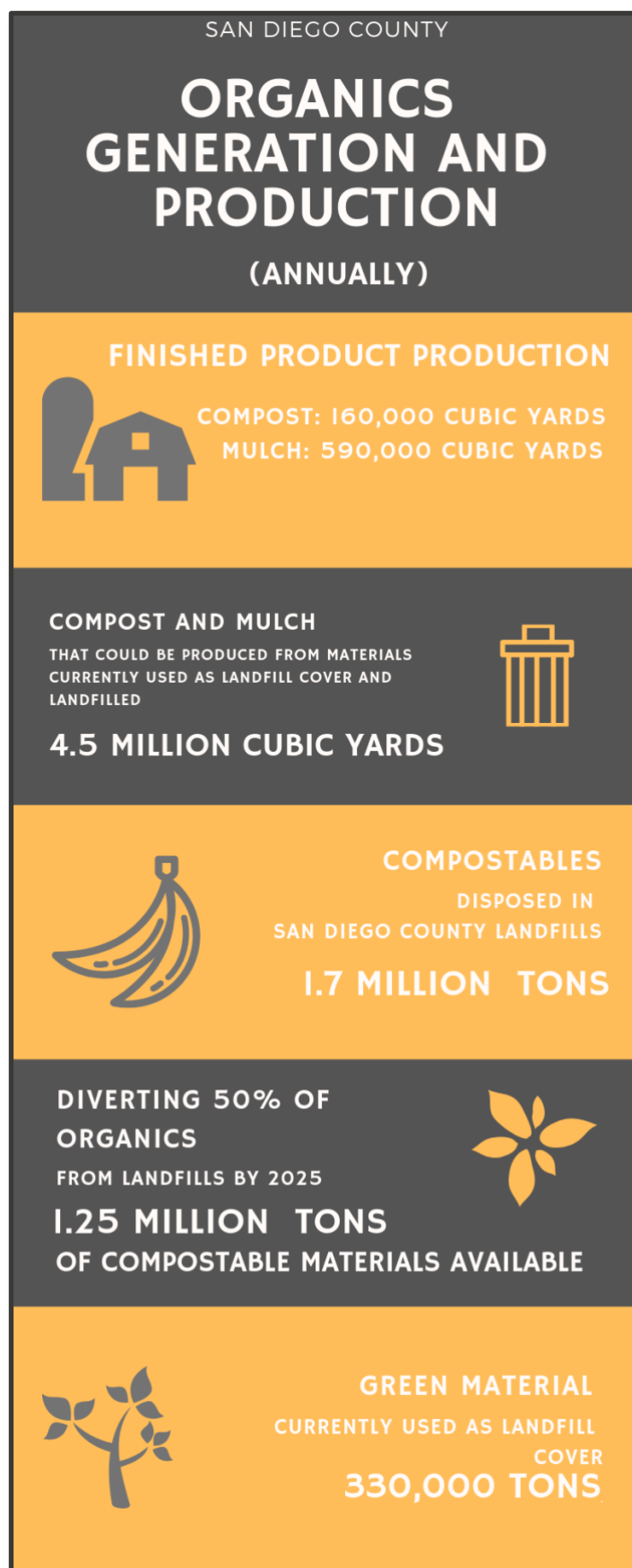
1. Executive Summary

There is tremendous potential for improvement and growth in the compost and mulch sales market in San Diego County. To fulfill this potential, public and private stakeholders representing multiple sectors must work together to advance investment in improved policy and industry-wide marketing programs. Without these efforts, the myriad benefits of greater compost and mulch use – including increased economic viability and job creation, reduced irrigation requirements and water conservation, healthier soils, farms and landscapes, and reduced greenhouse gas emissions and carbon sequestration, among others – cannot be realized.

While surveyors found a substantial and almost unified frustration from stakeholders interviewed, there was consensus that the issues at the root of this dissatisfaction could be mitigated through increased strategic investment, policy changes, and a well-planned, cooperative, public/private sector push. One of the most critical elements for the success of this effort is a focus on a market-based approach to management of these organic resources.

As true with all successful resource management efforts, the practicable end use and integration into the full cycle value of these materials is imperative. While diversion of these compostable commodities from the landfill is a positive endeavor, diversion does not equate to sustainability. Though laudable, it is not a means to the end, and a market-based focus must move to the forefront of compostable materials management to ensure the true value and enormous benefits of these efforts are realized.

There are plenty of untapped bright spots looming and ripe for utilization given adequate funding and a managed, regionally coordinated approach, and include carbon farming and watershed protection, stormwater management and post-fire remediation markets. Local and state funding for programs to better manage stormwater and protect watersheds currently exceed \$1.1 billion. Green material-based composts and mulches are poised to play a substantial, and increasingly more prevalent and beneficial role in these efforts.



Stakeholders who participated in this survey spent considerable effort and time to answer questions and present their thoughts on the barriers and opportunities in this industry, for which the researchers are extremely grateful. This report is essentially written by these stakeholders, and in turn, by design, for their own benefit and the welfare of the region's environment, economy and populace. While researchers added details and insights where necessary, this document is largely a compilation of stakeholder views, in an attempt to qualify and quantify both existing and potential markets based on all available data as vetted by survey respondents.

Table 1 presents estimated existing sales volumes market potential for compost.* Analysis demonstrates compost sales could increase more than four times over current sales if resources are invested to help fortify compost markets and reduce barriers to production and utilization.

Table 1: Current and Potential Compost Market

Market	Current Estimated Annual Sales Volume (cubic yards)	Potential Estimated Annual Sales Volume (cubic yards)
Agriculture	38,000	57,000
Rangeland	0	127,000
Landscaping	112,500	487,000
Stormwater/Erosion Control	7,500	15,000
Total	158,000	686,000

Table 2 presents estimated existing mulch sales and potential future markets. Mulch currently outpaces sales of compost, and that demand will likely continue. Mulch sales have the potential to double and exceed one million cubic yards annually. As with compost, attention is needed to facilitate increased sales and reduce barriers for the mulch market to reach its full potential. Section 1.1 below summarizes major recommendations to strengthen markets.

Table 2: Current and Potential Mulch Market

Market	Current Estimated Annual Sales Volume (cubic yards)	Potential Estimated Annual Sales Volume (cubic yards)
Agriculture	9,000	90,000
Rangeland	0	0
Landscaping	448,000	913,000
Stormwater/Erosion Control	53,000	106,000
Total	510,000	1,109,000

* Calculation methods and assumptions for both Table 1 and Table 2 provided in sections 7 and 8.

1.1 Summary of Recommendations to Strengthen Compost and Mulch Markets

Investment in Market Development

There are many emerging markets such as green infrastructure development, community gardens, urban farms and rooftop gardens that have yet to be fully developed, and are just beginning to be explored. Other existing, but substantially underutilized markets include golf courses, open space, parks and farms. These sectors represent vast acreage and budding opportunity in the region. With a creative, collaborative, strategic, and adequately funded investment in education, market research and development, the potential for market growth for compost and mulch is tremendous.

One way investment can be strengthened is through private and public sector partnerships with farmers, business and landowners and property managers to establish pilot programs that demonstrate best practices and the benefits of utilizing these products.

Business Case Analysis for Compost and Mulch Utilization

The business case for compost and mulch utilization has not been fully developed nor widely established, particularly one that considers the full spectrum of savings in water usage, pesticides, and petroleum-based fertilizers when compost and mulch is utilized.

The analysis should include an examination of the full costs of using these products, which is the sum of price per cubic yard of compost or mulch, delivery charges, and handling and spreading expenses. Benefits studied should look at potential cost savings from reduced irrigation requirements, a reduction in fertilizer and pesticide use, the possibility of increased revenue from higher crop yields and improved soil health for long term productivity, as well as public health and quality of life enhancements.¹

Increased Education across all Market Segments

Producers and end users expressed similar sentiments that both consumer and industry education is vitally important for the compost and mulch market to reach its full potential. Education and outreach strategies should be developed and tailored to the unique requirements of the end users targeted.

Procurement/Incentives for Locally-Produced Products from Permitted Facilities

Local jurisdictions and government agencies, including Caltrans, should qualify in job specifications the requirement that projects use locally manufactured recycled organics products, and that use of such products will result in the project meeting prescribed performance measures. Strengthening specifications and performance standards will ensure that high-quality materials are prioritized over cheap or inferior materials, especially those coming from out of the region.

Efforts are already underway for farmers to receive carbon offset credits in California's cap-and-trade system. The American Carbon Registry, an organization that certifies carbon offsets, approved compost additions to rangeland as an offset² in October 2014.

2. Background/Methodology

Hidden Resources was contracted by the County of San Diego to produce a quantitative study of existing compost and mulch markets in San Diego County, in part to support development of a collaborative, industry and countywide marketing plan, if the potential, interest and cooperation exist to implement such a plan in the future.

Due to time and budgetary restraints, this is by no means an exhaustive study, and while a large percentage of stakeholders contacted freely shared information, many did not.

Some sectors' compost and mulch use were difficult to quantify without this cooperation nor comprehensive, compiled data available from the industry. Hence, assumptions and extrapolations based on accessible data were necessary for quantification.

This initial study intends to begin an in-depth understanding of the market as a basis to create the aforementioned regional, collaborative marketing plan that benefits *all* compost and mulch producers in the county, as well as existing and potential end users of these products.

Researchers developed an online survey to be distributed to key stakeholders in the region. While the number of actual online survey responses fell below expectations, phone calls and direct communication were reasonably successful. Four industry trade associations sent the online surveys out to members, including:

- CLCA (California Landscape Contractors Association)
- ASLA (American Society of Landscape Architects)
- CCOF (California Certified Organic Farmers)
- San Diego County Farm Bureau

Other trade organizations contacted include:

- Association of Compost Producers
- CANGC (California Association of Nursery and Garden Centers)
- SDGCSA (California Golf Course Superintendents Association)
- San Diego County Flower and Plant Association
- San Diego County Vintners Association

More than 200 phone calls were made and more than 100 emails were sent to stakeholders, and the largest compost and mulch producers in the county were interviewed, as well representatives from the following end product user groups:

- Trade and professional organizations
- Landscapers
- Landscape architects
- Farmers/ranchers
- Municipal parks managers
- Stormwater and erosion control companies
- Golf course superintendents/agronomists
- Facility and large venue managers
- Resellers
- Topsoil manufacturers

Data from end users was compared to that of generators, but it is important to note a significant volume of compost and mulch sold or given away in the county was produced in other counties and regions, including Orange County, Riverside County, Los Angeles County, and the Pacific Northwest as well as throughout the United States (as sold in bagged products). The focus of this study was to determine market potential for *local* generators of compost and mulch produced from county sources of landscape trimmings, crop residuals, manures and food scraps, and does not include a detailed examination of out-of-county materials sold here.

While several local generators sell bagged products, the bag market is dominated by material processed out of the region, and is not included in this analysis.

Biosolids dried cake and compost were not included in this study either, but do overlap with other compost markets, and are the subject of the analysis, "Biosolids Management Plan: Technical Memorandum - 8: Biosolids Beneficial Use - City of Oceanside, Fall 2018," which was in draft form at the time of this writing.

→ Opportunity for Change

"A significant volume of compost and mulch sold or given away in the county was produced in other counties and regions, including... in bagged products."

Data from interviews with compost and mulch buyers was utilized as a factor to extrapolate totals based on industry size (number of businesses, gross sales revenue, or square footage or acreage managed, depending on the sector), to estimate both existing and potential markets. When end user data was not available, researchers extrapolated from generator production and sales volumes. Primary market sectors evaluated include:

- Agriculture
- Landscaping
- Stormwater Management and Erosion Control

All submarkets fall under one of these three categories, and include:

Agriculture

- Field Crops
- Organic
- Vine crops and viticulture
- Carbon farming/rangeland
- Ornamental
- Nurseries (wholesale, retail)
- Fruit and nut crops

Landscaping

- Architects
- Contractors
- Nurseries (wholesale, retail)
- Parks
- Large venues
- Schools
- Facility maintenance
- Golf courses
- Resellers
- Topsoil manufacturers

Stormwater Management and Erosion Control

- Green infrastructure (i.e. Climate Friendly Landscaping)
- Municipalities
- Parks
- Watershed protection agencies
- Freeway and transportation management agencies

Representatives from all of these subsectors were either not reachable or willing to share data, therefore estimations do not include all submarkets.

End user data was weighed against compost and mulch producer figures, with a factor assigned to out-of-region materials sold in San Diego County.

3. Benefits of Using Compost and Organic Mulches

Soils in San Diego County are typically poor, heavy in clay or sand, and require amending with organic matter to improve physical structure and microbial diversity, especially for most food crops and ornamental or decorative non-native landscape plants. The benefits of amending local soils with organic material – whether composted, mulched, or directly land applied – are numerous, and include improvement in plant vigor and crop yields, and decreased use of irrigation water, fertilizer and pesticides. In food production, the more thorough uptake of nutrients by hardy crops results in healthier food.³ Environmental benefits range from decreased erosion and less contamination of local water sources,⁴ to minimized health risks to farm workers.

“Compost has the unique ability to improve the properties of soils and growing media physically (structurally), chemically (nutritionally), and biologically. Although many equate the benefit of compost use to lush green growth, caused by the plant available nitrogen, the real benefits of using compost are long-term and related to its content of living-organic matter.”

– The Field Guide to Compost Use, E&A Environmental Consultants, Inc., US Composting Council, 1996

Reductions in landfill methane emissions by diverting compostable organics as well as carbon sequestration through use of compost and carbon-beneficial agricultural practices have been well-researched and documented, and are supported by numerous California bills and initiatives

(see Appendix 1). As discussed below, California grasslands and rangelands hold enormous promise to sequester atmospheric carbon through modest applications of compost (½ inch of compost applied per acre in a single application can lock in 4.4 metric tons of carbon over three years, with additional sequestration benefits lasting for decades).⁵

The Marin Carbon Project⁶ has successfully demonstrated this idea of “carbon farming” by applying these relatively small amounts of compost to grazing rangelands. Their rangeland compost protocol calls for applying compost to just five percent of California’s rangelands at a depth of ½ inch. This practice holds the potential to reduce carbon dioxide emissions by 28 million metric tons per year; the equivalent of removing six million cars from the road. Results from carbon studies, such as the Marin Carbon Project, helped prompt California’s Healthy Soils Initiative, which is now expanding these strategies statewide through grants, trainings and incentives.

→ Opportunity for Change

“...applying compost to just five percent of California’s rangelands at a depth of ½ inch... holds the potential to reduce carbon dioxide emissions by 28 million metric tons per year; the equivalent of removing six million cars from the road.”

Applications of compost and mulch are considered best management practices (BMPs) because of their low maintenance requirements, relatively low cost, and high effectiveness. Compost and mulch products are used effectively for erosion control, weed suppression, slope stabilization, storm water treatment, pollution prevention, and water conservation as the water-holding capacity of native, irrigated, and agricultural soils is improved.

High water and land prices, increasing demand for organic and more sustainably grown produce, and more stringent storm water and runoff monitoring and mitigation requirements have prompted increased interest from county farmers in mulches and other value-added soil amendments, particularly compost. Growing most certified organic crops in such poor soils is nearly impossible without amending with compost, and its moisture holding capacity makes composting a BMP for compliance with storm water and runoff rules. One of the fastest growing markets for

agricultural outputs is localized produced crops, and while no exact definition exists for “local,” the San Diego County Farm Bureau considers its farms “a local source for more than 17 million Southern California consumers.”

At the local level, farming groups in San Diego County were awarded nearly \$350,000 from the California Department of Food and Agriculture (CDFA) in 2017 to conduct Healthy Soils Program Demonstration Projects. Carbon friendly farming practices including utilization of compost and mulch products are key components of these projects. A small-scale carbon farming project at Montado Farms in Santa Ysabel, a community in unincorporated San Diego County area just northwest of Julian, is discussed later in this study.

4. Regulatory Drivers

California has passed legislation to mandate the recycling of compostable materials and divert them from landfills. Governor Brown's **Healthy Soils Initiative** aims to restore soils and ecology in California by implementing strategies that effectively sequester carbon from the atmosphere and store it in the ground and in plant matter. In turn, it is anticipated that new supplies of value-added compost and mulch products will increase significantly and new markets will be developed as public and industry awareness of these materials' benefits increases.

Included in Appendix 1 are synopses of key legislation recently passed that will dramatically increase organics recycling in California. Of note, **SB 1383** specifically targets the reduction of short lived climate pollutants from various sectors across the state. Methane emissions resulting from the decomposition of organics in landfills are a significant source of greenhouse gas (GHG) emissions contributing to global climate change. SB 1383 establishes mandatory source separation of organic materials from the solid waste stream starting in 2022. It also targets a 50% reduction in organics disposed in landfills from 2014 levels by 2020, and a 75% reduction by 2025.

AB 1594 will eliminate an existing loophole that currently allows jurisdictions to claim diversion for organics applied as Alternative Daily Cover (ADC) in landfills. This material represents approximately 300,000 tons per year, and will require a market-based approach for success.

AB 1826⁷ requires each city and county to assess the infrastructure necessary for implementing their respective jurisdiction's commercial organics recycling programs, and include in the following in annual reports:

- The names of existing organic material recycling facilities within a reasonable distance from the major population centers, and the available capacity at each facility to accept the jurisdiction's organics, including food scraps.
- Identification of existing organic material recycling facilities within the jurisdiction that may be suitable for potential expansion, and/or existing solid waste facilities within the jurisdiction that may be suitable for colocation with organic material processing facilities.
- A description of any efforts underway to develop new private or public regional organic material recycling facilities, the anticipated timeline for completion, the types of feedstocks these facilities may accept, and the potential available organic material capacity at those facilities for the county or regional agency's organic discards, including food.

AB 876⁸ addresses longer-term planning for organics infrastructure by requiring counties and regional agencies to include, in annual reports to CalRecycle, an estimate of the amount of organic discards in cubic yards that will be generated in the county or region over a 15-year period, an estimate of the additional organic material recycling facility capacity needed to process that estimated volume, and areas identified as locations for new or expanded organic materials recycling facilities capable of safely meeting that additional need, thereby imposing a state-mandated local program.

Other jurisdictional requirements under AB 1826 and AB 876 can be found in links in the References section at the end of this report. Detailed requirements per AB 1826 are provided in Appendix 2. Final rulemaking for SB 1383 was underway at the time of this report writing. The latest regulatory text and information is available on CalRecycle's website.*

* <https://www.calrecycle.ca.gov/climate/slcp>

5. Compost and Mulch Generation in San Diego County

As of this writing, there are currently 16 permitted composting and chipping and grinding facilities in the County of San Diego and one research operation. Most facilities are permitted as composting facilities and conduct a combination of composting and chipping and grinding activities. Three of the 16 facilities are permitted solely for chipping and grinding. Some facilities produce material for ADC, internal use, or for their own landscaping divisions. As mentioned, the largest producers were contacted and provided sales volume data, and estimates were assigned to smaller operations. While most of these permitted facilities have excess permitted capacity, end product markets play a role in this full processing capacity remaining unrealized. Other factors include operational limitations, sensitivity to neighbors, and quality of feedstock available, among others.

Mulch produced far outweighs compost production, as demand for this material is substantially greater. Of the total materials sold, approximately 20% is sold as compost, and 80% sold as mulch. With the ongoing water supply and cost challenges in San Diego County, one producer emphasized some new housing developments are eliminating turf, reducing market demand for compost and shifting it towards mulch. Existing single family homeowners are trending towards reducing lawn area as well.

The City of San Diego Grass Replacement Rebate program⁹ offers up to \$1.50 per square foot (up to 2,400 square feet and \$3,600 per site for lawn removal from single-family homes), as well as the same per square foot rate on commercial and multi-family properties (with a larger footprint allowance of up to 10,000 square feet and \$15,000 per site). The Metropolitan Water District of Southern California's Turf Replacement program offers a rebate of \$2.00 per square foot up to a total of 5,000 square feet of converted yard per year.¹⁰

The following tables summarize key compost and mulch data. It is important to note that raw materials transported, disposed or processed, as well as processing facility capacities, are typically referenced by weight, in tons. Compost and mulch end products generated and sold, are typically expressed by volume, in cubic yards (cy).

Based on information provided by local processors, an estimate of the total amount of compost and mulch sold in San Diego County annually is presented in Table 3. An estimate of material arriving from outside of the County was assumed based on feedback from stakeholders. Table 4 provides an estimate of the total *permitted* capacity of compost and mulch facilities in San Diego County. As mentioned, this typically exceeds operational capacity and production.*

* Permitted capacity estimates were extrapolated from CalRecycle SWIS Data. Permit data is not standardized across facilities, and assumptions were applied where applicable.

Table 3: Annual Compost and Mulch Generated based on Sales (CY)

	Compost	Mulch	Total
Permitted Facilities	140,000	461,000	601,000
Non-permitted Facilities	5,000	33,000	38,000
Out of County (estimated inbound material only)	5,000	33,000	38,000
Total	150,000	527,000	677,000

Table 4: Annual Compost and Mulch Permitted Capacity (Tons)

	Yard Trimmings	Lumber	Manure	Food Scraps	Total
Composting	265,000	11,000	19,000	100,000	395,000
Chipping and Grinding (Mulch)	460,000	220,000	N/A	N/A	680,000
Total	725,000	231,000	19,000	100,000	1,075,000

Table 5 presents the estimated material throughputs at processing facilities in San Diego County. Permitting data, along with feedback received from processors, indicates that approximately 40% of the raw material is processed into compost and the remaining 60% is processed into mulch. As mentioned, several factors dictate why actual throughput is significantly less than permitted capacity.

It is important to note that the sales and throughput figures listed in Tables 3 and 5 are not direct conversions. A facility that received and processed a reported tonnage of material did not necessary sell all of that material. Unfinished or unsold material often remains onsite.

Table 5: Estimated Annual Actual Throughput (Tons)

	Yard Trimmings	Lumber	Manure	Food Scraps	Total
Composting	87,000	3,000	10,000	10,000	110,000
Chipping and Grinding (Mulch)	169,000	12,000	N/A	N/A	181,000
Total	256,000	15,000	10,000	10,000	291,000

Table 6 reflects the total tonnage of materials disposed by generators in San Diego County, per solid waste disposal data submitted by local jurisdictions and haulers to CalRecycle. Characterization studies confirm that the compostable fraction of materials disposed in landfills is about 40%. The total tonnage of compostable materials disposed as ADC is also provided in order to yield a total tonnage of compostable materials deposited in landfills. 2014 data is provided as the base year for mandated reduction targets, as defined in SB 1383, and 2016 data is provided for comparison.

Table 6: Total Disposal by Jurisdictions of San Diego County¹¹

	2016 tons	2014 tons
Total Disposal	3,320,000	3,133,000
Compostable Fraction (40%)	1,328,000	1,253,000
Total ADC	332,000	306,000
Total Compostables	1,660,000	1,559,000

Table 7 provides the reduction target of compostable materials in years 2020 and 2025, as defined in SB 1383. The totals represent the tonnage of compostable materials that may be available to processing should the reduction targets be met, along with compostable material that was previously designated as ADC.

Table 7: Potential Availability of Compostable Materials from Landfill

Timeline	Tonnage
2020	
50% reduction of 2014 disposal ⁽¹⁾	627,000
Total from ADC (from Table 6) ⁽²⁾	306,000
Subtotal	933,000
2025	
75% reduction of 2014 disposal	941,000
Total from ADC (from Table 6)	306,000
Subtotal	1,247,000
<i>Notes: (1): CA SB 1383; (2) CA AB 1594</i>	

Table 8 provides the total potential future production of compost and mulch combined in San Diego County, expressed as the sum of total existing production and potential materials availability in 2020 and 2025 if diversion targets are met. In order to actually meet diversion targets, the region's existing and future processors will need to handle four to five times more material than is being processed today.

Table 8: Potential Future Compost and Mulch Production in San Diego County

Production	Annual Tonnage*
Existing Production (from Table 5)	291,000
Potential New Production 2020 (from Table 7)	933,000
Total Production 2020	1,224,000
Potential New Production 2025 (from Table 7)	1,247,000
Total Production 2025	1,538,000

**Based on disposed tonnage, not finished product tonnage.*

6. Compost and Mulch Market Sectors

6.1 Methodology

A wide diversity of markets for compost and mulch exist in San Diego County, and include subcategories under the agriculture, landscaping and stormwater/erosion control sectors.

Researchers explored markets in the following classifications:

Agriculture

- Field Crops
- Organic
- Vine crops and viticulture
- Carbon farming/rangeland
- Ornamental
- Nurseries (wholesale, retail)
- Fruit and nut crops

Landscaping

- Architects
- Contractors
- Nurseries (wholesale, retail)
- Parks
- Large venues
- Schools
- Facility maintenance
- Golf courses
- Resellers
- Topsoil manufacturers

Stormwater Management and Erosion Control

- Green infrastructure (i.e. Climate Friendly Landscaping)
- Municipalities
- Parks
- Watershed protection agencies
- Freeway and transportation management agencies

Representatives from all of these subsectors were not available or willing to share data, or specific data was unavailable from trade associations and research, therefore estimations do not include all submarkets.

End user data was weighed against compost and mulch producer figures, with a factor given to out-of-region products sold in San Diego County, as well as estimated non-permitted facilities within the county.

Researchers attempted to interview all key stakeholders in the county, and many were willing to discuss the issue of compost and mulch markets and share some of their numbers and views. Some of those contacted were unavailable or reluctant to share detailed information, but for the most part, the most active and knowledgeable stakeholders were willing to relate their perspectives on local markets, including challenges, opportunities for improvement, as well as the amount of material they specify, sell, buy, and/or produce themselves for internal use.

Stakeholders interviewed include:

- Compost and Mulch Producers
- Landscape Architects
- Landscapers
- Farmers and Ranchers
- Stormwater and Erosion Control Experts
- Resellers
- Facility Maintenance Supervisors (including golf courses, schools, parks and large venues)
- Trade Association Representatives

Note: Some stakeholders fall into more than one category, such as compost and mulch producers who also buy and resell products from other generators, and farmers who also produce and sell compost.

6.2 Market Challenges

Most stakeholder feedback fell into several common themes, as discussed below.

End users requested more information on the benefits of compost and mulch, while in turn, producers expressed concern that both existing and potential finished product market sectors do not have a clear understanding of the value of these products. This lack of knowledge about compost and mulch results in potential buyers either not using them at all, or being unwilling to pay what they perceive is too a high price for both purchase and application of these products. For example, many farms, landscapers and residents are still using black cloth or plastic and gravel for weed suppression, rather than mulches produced from carbon-based organic materials such as wood, lumber and landscape trimmings.

→ Opportunity for Change

When consumers better understand the value of compost and mulch, producers experience higher demand and fetch better prices.

The Bay Area was cited multiple times by stakeholders interviewed as a good example of the value of these products being better understood, resulting in higher demand and better prices and return for producers.

Plastic contamination, weed seeds, pathogens and immature compost were common concerns expressed by end users. Pathogens and weed seed infestation were cited as concerns across multiple market segments, including farmers, vintners and landscapers. Nearly all interviewed had a personal anecdote related to weed infestation or plastic contaminants resulting in extra handling, higher costs, and dissatisfied customers, leading some reducing or completely stopping the use of these products. Farmers questioned about the prospect of improved quality assurance from compost and mulches certified under the US Composting Council's Seal of Testing Assurance (STA), or OMRI listed (Organic Materials Review Institute), generally felt these certification processes would not be enough to allay their concerns.

Plastic contamination was cited as major nuisance requiring extra work, but was not necessarily enough reason to stop using compost and mulch. Both farmers and landscape contractors complained about the need to pick out plastic from a field or site that had been mulched in the past.

Landscape contractors in particular were concerned about immature material and have received complaints from their customers that the compost or mulch applied had a very strong odor. In some cases, residents living close to large commercial properties filed complaints due to the strong odor being generated. Immature compost is also perceived to be the source of weed seeds and pathogens.

Both producers and end users voiced concerns about high costs impeding sales and usage. Several producers mentioned that farmers in particular found the total cost of the product (price per cubic yard[cy], delivery, and spreading) to be too high. Quality concerns and minimally-processed material coming in from out of the county was cited to impact costs as well. Many farmers receive material for free or just pay for trucking, at the expense of getting an inferior product that skews their perception of paying market rates for it in the future, or as mentioned, ceasing to use it at all after issues related to its poor-quality result. Further, the lack of understanding of the benefits of compost and mulch adds to diminish the perceived value of these products.

Sourcing compost and mulch locally is critical to complying with active quarantine regulations¹² and reducing the potential introduction of invasive pests and disease. The probability of introducing invasive pests increases when material is imported from outside the county where the source and quality of the material is unknown. Per Gary Bender, Ph.D., Farm Advisor-Emeritus at the University of California, Agriculture and Natural Resources, “Growers should insist that only correctly composted mulch be brought into their groves,”¹³ as using material that has not been put through a thermophilic, pathogen reduction cycle can harbor problematic organisms.

Dr. Bender cites an invasive pest, the polyphagous shothole borer, that has spread fungal disease in Los Angeles, Orange and San Bernardino Counties, as an example of what can go wrong. Trees that are diseased and dying are cut down and minimally processed into mulch and compost. This material is then offered to growers in San Diego County for the cost of trucking or no charge at all. Unfortunately, the imported mulch, which is perceived as a good value, may be produced from quarantined materials and creates far more problems and expense than using properly processed, locally sourced material.

Recent quarantines in San Diego County include the Mediterranean fruit fly, Asian citrus psyllid, and light brown apple moth. Links to more information on local quarantines and pest prevention is included in the reference section of this report.¹⁴

While some farmers expressed concerns about cost and quality, several producers believe this remains a largely untapped market with tremendous potential. One producer thought this market could be expanded if fully-weighted compost prices fell into the \$20-25/cy range, including product, transportation and spreading costs. Currently, this can be the cost of purchasing the product alone, with a range of transportation costs at \$3-\$10/cy, certification costs \$4/cy, and range of \$1-\$5/cy for spreading, bringing the fully weighted cost range from \$28-\$44/cy. Another producer estimated the fully weighted cost to a farmer purchasing compost in the \$20-\$25 range would be closer to \$60/cy.

These costs are highly variable however, and are contingent on the producer’s operational methods, trucking resources, permit status and regulatory compliance requirements, among other factors. Spreading costs vary based on the volume of material purchased, application method, crop type and equipment accessibility at the farm. Some producers can sell compost that is not OMRI-listed or registered under CDFA’s Organic Input Material program (OIM) at higher volumes for \$8/cy or below at a profit (supplemented by tipping fees), which would put fully weighted costs to the farmer in the \$12-\$23/cy range. An OMRI/OIM compost at this \$8 price (factoring in a \$4/cy certification cost) would fall into a \$16-\$27 range delivered and spread.

Per stakeholder comments, a thriving market place would ensure:

- The value of these products is understood and appreciated by consumers
- Strong product marketing programs are in place
- New buyers are continuously being identified and attracted
- New markets are created for untapped product uses
- New products and blends are continuously being market tested

Unfortunately, none of the above appear to apply to the current compost and mulch market. There is a limited number of who understand and use either compost or mulch buyers in certain market segments, and the majority of potential buyers likely remain unaware of these products or their benefits. There is little industry supported product marketing in place, and a widespread quality perception issue which no one is actively working to fix.

There are a variety of untapped benefits that compost offers over existing products, particularly in green infrastructure, erosion control and storm water management. The permitting process is cumbersome and the regulations are onerous, preventing new producers from entering the marketplace. And as discussed, many end users feel the cost of these products is too high as they don’t fully understand the benefits. All of this has created a

challenged marketplace and led to some of the largest producers in the county to give the product away for free or at highly discounted prices, and out-of-county material is transported to this region for minimal costs as well. These tenets of the current market dynamic all serve to undermine the value of the product.

6.3 Markets for Compost and Mulch in San Diego County by Sector

Farmers and Ranchers

San Diego County is home to more than 5,700 farms and nearly 400 registered organic growers. The County's agriculture industry represents a \$1.8 billion industry and nursery and cut flowers account for \$1.2 Billion of that market.¹⁵ Total agricultural land spans more than 250,000 acres, and is composed of range and pastureland at approximately 200,000 acres, and actively farmed land at 50,000 acres.¹⁶ Nurseries primarily use bagged soil mixes. If pasture lands and nurseries are removed, prospective farmland that could use compost and mulch is reduced to 36,000 acres. Table 9 breaks down the region's agricultural lands by acreage.

Table 9: San Diego County Agriculture Land Acreage

Category	Acres
Field Crops	
<i>Rangeland</i>	<i>195,070</i>
<i>Pasture, Irrigated</i>	<i>902</i>
<i>Hay and Oat</i>	<i>2,100</i>
<i>Miscellaneous Field Crops</i>	<i>3,574</i>
<i>Subtotal Field Crops</i>	<i>201,646</i>
Vegetable and Vine Crops	3,545
Nursery & Cut Flower Products	12,356
Fruit and Nut Crops	33,174
Total	250,721

Based on stakeholder interviews, limitations in compost usage by ornamental growers may be attributed to the cost of available products and concerns with pathogens. Some farms are producing their own compost onsite to ensure better quality of the end-product. Mulch usage is extremely low in this sector. Survey input suggests many of the smaller farms would like more information about the benefits of compost and mulch, and combined with the large number of smaller farms and acreage utilized, there is likely a strong potential for significant growth in this market segment.

While a common barrier cited by stakeholders was the total cost of using compost, including transportation and spreading, the range and pastureland market holds tremendous promise. Incentives may need to be provided to make it viable for this sector to fully realize its potential.

The Montado Farms carbon farming project in Santa Ysabel (highlighted in Section 10: Case Studies) was designed to demonstrate the feasibility and viability of applying compost to rangelands and may help the region understand how the numbers could work.

Many of the farmers and wineries directly interviewed were aware of the benefits of compost. However, in most cases, quality and cost concerns overrode the decision to buy from a producer, and they choose to produce compost onsite instead. In the survey responses, nearly every farmer and winery requested more information on the benefits of compost and mulch. Some farmers asked for advice on how to use the products, and where to purchase them.

→ Opportunity for Change

“While a common barrier cited by stakeholders was the total cost of using compost, including transportation and spreading, the range and pastureland market holds tremendous promise. Incentives may need to be provided to make it viable for this sector to fully realize its potential.”

Producers are aware of product quality concerns and expressed a willingness to work with individual farmers, provided they do regular soil testing to gauge benefits.

Landscape Architects

The ASLA informed researchers that education has been conducted to their members on the importance of soil health, and the majority of their landscape architects do specify both compost and mulch. They noted that there are still some government, municipal and large education sector clients that include nitrolized wood shavings and weed cloth with gravel or wood bark in their standard specifications.

Landscaping

The largest landscaping firms are purchasing a substantial volume of locally-produced mulch, but very little compost. Some ongoing quality concerns were raised with respect to weed infestation and odor. Price was also cited as an issue, and options were being explored to keep the costs down. Specifically, transportation costs were viewed as a barrier, as they can become “more expensive than the product.” Stakeholders relayed that cost reduction options include identifying suppliers close to job sites, and arranging schedules for periodic bulk delivery to their yards or strategic locations to avoid transportation costs for smaller jobs. Some stakeholders conveyed a general distrust of compost and mulch offered for free, questioning the quality of these products, yet they indicated a willingness to pay more for a higher quality product.

Large landscape management firms appeared to understand the benefits of compost in improving soil health, and readily concede that San Diego has poor soil. However, use of compost is ultimately dependent on what the client is willing to pay, soil conditions and the type of plants being installed. Mulch is commonly used in maintenance and new installations. Compost is used initially to prepare the soil before landscapes are planted.

Nurseries/Landscape Supply Stores

Stakeholders felt that potential exists for expanding the residential customer market through increased public education. Concern was expressed about the market being undervalued from products being given away for free. Very few stakeholders from this sector responded to surveys or were willing to discuss their industry.

Parks and Recreation Departments

The City and County of San Diego span nearly 100,000 acres of parklands and open space, including about 20,000 acres of actively managed parklands. Compost and mulch are an integral part of current park and open space management in most parks and open space areas included in this survey, but there is room for expansion. San Dieguito County Park is featured in the Case Studies section of this report.

Chula Vista has approximately 550 acres designated as parks, with about 200 acres of those maintained. They do not currently use or produce compost, but discussed the possibility of starting a pilot program with the Conservation Department to use mulch and compost. Mulch is used in city planter boxes, some of which produced by the parks department, but most from tree trimmers dropping it off for free.

Chula Vista also has about 2,000 acres of open space. They do not compost, citing it is too cumbersome. They do have a chipper and make mulch from pruned tree limbs and dead trees, and spread the mulch they produce back into the landscape. Mulch produced by chipping does not fulfill their needs, so more is purchased than produced internally. It is used for moisture conservation, erosion control, and weed suppression on the medians, right-of-ways, green belts, and irrigated landscaped areas and slopes along parkways.

Mulch is commonly produced onsite at other jurisdiction's parks for use onsite during regular tree and shrub maintenance. Many parks and open space areas also use purchased mulch or receive it at no cost from local tree trimmers. Mulch was cited for use for moisture conservation and weed suppression in landscaped areas, around trees, in planters and for small habitat restoration. In addition, mulch is favored for use in erosion control on slopes and trails throughout parks and preserves.

The San Diego State University Soil Erosion Laboratory conducted tests in 2002, and results indicated that when it was applied to a depth of four inches, it protected a 2:1 slope from erosion during a 10-year rain event and reduced runoff by 50%.

Current compost use in parks and open space appears very limited. Most of the surveyed respondents were not composting nor using compost, citing lack of resources to purchase it or manage onsite composting. Parks actively using compost utilize it for small community, butterfly and herb gardens. It is also occasionally used for dressing small beds and planters, as well as demonstration purposes.

Otay Lakes County Park, Sweetwater Regional Park, and Dos Picos County Park have demonstration composting operations designed to educate and encourage the public to compost.

Schools

Most stakeholders interviewed use mulch chipped onsite or receive it for free from arborists. Limited budgets were cited as a barrier and use of compost is limited, with the exception of sports field construction or renovation.

Large Venues

Using mulch generated onsite or purchased is also common for this sector. Some stakeholders understand the benefits of compost and mulch and have used it to reduce their irrigation and herbicide use. Compost use is less common, but used for planter beds or new construction projects when included in job specifications. LEGOLAND is featured in the Case Studies section of this report.

Golf Courses/Turf Managers

This sector uses both compost and mulch in their maintenance programs, although mulch is often produced onsite from chipped brush. Compost is blended with sand and used for divot mixes, and valued for building soil structure, micronutrient content and water retention, which is important to areas of rough and fairway but not on greens, where drainage is critical. Compost is used in new turf establishment to facilitate rapid germination. Some golf course superintendents raised concerns about compost/mulch quality and the fear of weed infestation. Stakeholders in this sector felt that most golf course superintendents and agronomists were familiar with the benefits of compost and mulch, but actual utilization and volumes purchased suggest it is generally not a highly-valued soil amendment.

Resellers

This sector includes companies that don't have a processing facility and buy and resell compost and mulch from those that do, as well as producers who either don't manufacture enough volume to meet their market demands, or don't actually produce particular products some of their customers want or are specified in contracts. Many producers in San Diego County purchase and resell mulches from the Pacific Northwest, and some buy and resell those produced in the county. In turn, some local facilities depend on these resellers to reduce their overstock and comply with capacity limitations. This is an interesting dynamic, and an example of the potential for interindustry cooperation (although in this case, somewhat ad hoc) should a collaborative, industrywide marketing effort be developed.

Topsoil Manufacturers

This is a relatively small market, but includes sand and gravel type facilities that may purchase compost to enhance their blends. Some compost producers purchase or receive mined or stripped soils to create blends using the compost they produce, and fall into this category as well.

Stormwater Management and Erosion Control Companies

This sector includes erosion control and stormwater management, subsets of green infrastructure development, and is a market that remains virtually untapped. Erosion control contracts were cited to be 70% private sector accounts and 30% from the public sector. Knowledge about the sustainable solutions composts and mulches offered in stormwater management and erosion control is deficient, per the contractors interviewed who provide these options. Education on low impact, sustainable development is needed. Contracts are typically awarded solely based on price, but cost analyses rarely include the full life cycle costs of the project, including product replacement and maintenance, environmental impacts and quality of the mitigation methods.

→ Opportunity for Change

"This market will benefit if both the producers and stormwater protection agencies work together to develop specifications that consider product quality and cost."

Compost and mulch are beneficially used to some degree to improve or protect stormwater quality, and their application is cited as an industry accepted practice (see inset on the following page, Local Programs and Collaboratives, Stormwater and Green Infrastructure).

The stormwater protection industry is promoting development of mulch products that do not float away during large storm events, which could otherwise adversely affect drainage structures and receiving waters. Their negative experiences with mulch floating away (i.e., low product quality, usage of wood barks) could be in part due to selecting

lowest cost bids without knowledge of the difference in quality of mulch products or consideration for long term maintenance costs. Erosion control contractors interviewed cited these issues as negatively affecting this market. This market will benefit if both the producers and stormwater protection agencies work together to develop specifications that consider product quality and cost. The regional collaborative, Project Clean Water (see inset), consists of all 19 jurisdictions in the San Diego region. This collaborative provides a major opportunity for erosion control contractors as well as product manufacturers to work efficiently with stormwater protection groups and effect positive change.

Local Programs and Collaboratives, Stormwater and Green Infrastructure

San Diego Sustainable Landscapes Program

The San Diego Sustainable Landscapes Program, hosted by the San Diego County Water Authority (SDCWA) and its funding partners, provides guidelines for a watershed approach to landscaping and serves as a the “go-to resource to assist San Diego County residents in adopting sustainable landscaping best practices through education and training, technical assistance, landscaping materials and financial incentives.”¹⁷ The program features healthy, living soils as one of four key principles of sustainable landscapes, as well as includes resources on compost and mulch applications. More details about the SDCWA’s efforts are included in the Case Studies section below.

County of San Diego's Landscape Ordinance and Water Efficient Landscape Design Manual

The California Department of Water Resources updated its Model Water Efficient Landscape Ordinance (MWEL) in 2015 to increase efficiency standards for new and existing landscapes and to limit the use of turf. In response, The County of San Diego updated its own water efficient landscape ordinance to be as effective as the MWEL. The County’s amended Ordinance No. 10427 became effective in May 2016.

The County of San Diego’s Water Efficient Landscape Design Manual incorporates the requirements of MWEL and includes specifications for mulch and soil amendments. It includes preference for organic mulch materials derived from recycled or postconsumer products, unless prohibited by County Fire Code. The County’s Landscape Documentation Package Checklist verifies the project incorporates the mulch and compost specifications.¹⁸

Project Clean Water

Project Clean Water is a regional collaborative consisting of co-permittees of the San Diego Regional Water Quality Control Board’s (SDRWQCB) MS4 stormwater NPDES permit. Co-permittees include all 18 cities, the County of San Diego, the Port of San Diego, and Regional Airport Authority. The San Diego County co-permittees jointly developed the 2018 Model Best Management Practices (BMP) Design Manual for the San Diego Region.¹⁹ Each co-permittee must update its own BMP design manual in accordance with the content of the regional model.

The BMP Design Manual has specifications on the amount of compost and material content in the bioretention soil media (BSM). These specifications are intended to support plant growth - without excessive nutrient enrichment - that can result in nutrient leaching and resulting eutrophication in downstream waterways. The guidelines also recognize the use of mulch for promoting plant growth and requires a minimum of 3” of mulch for bioretention and biofiltration BMPs, and is also a component of the amended soils that are used for other BMPs like impervious area dispersion.

Due to concerns of leaching nutrients to receiving waters, compost designated for use in stormwater facilities must be properly manufactured and meet certain product specifications, such as production at a permitted facility, and not being biosolids-based.

San Diego Regional Climate Collaborative is another regional entity promoting green infrastructure as a means to achieve climate resilience and address stormwater issues.²⁰

7. Compost Markets: Present Day and Future Potential

Current and potential future markets for annual compost sales in San Diego County are presented in Table 10. While all market sectors described in Section 6 were analyzed, the results shown below represent key sectors that were found to significantly influence or yield potential to influence the compost market via sales.

Table 10: Current Annual Sales Volume of Compost

Market	Current Sales Volume (cy)*	Potential Sales Volume (cy)*
Agriculture	38,000	57,000
Rangelands	0	127,000
Stormwater/Erosion Control	7,500	15,000
Landscaping		
<i>Landscape Contractors</i>	<i>included in total</i>	<i>141,000</i>
<i>Existing Residential</i>	<i>included in total</i>	<i>15,000</i>
<i>New Residential Development</i>	<i>included in total</i>	<i>1,000</i>
<i>Golf Courses</i>	<i>included in total</i>	<i>33,000</i>
<i>Parklands</i>	<i>included in total</i>	<i>297,000</i>
Total Landscaping	112,500	487,000
Total	158,000	686,000

**Values rounded.*

Figure 1 below presents the current and potential markets for compost by market sectors’ sales volume.

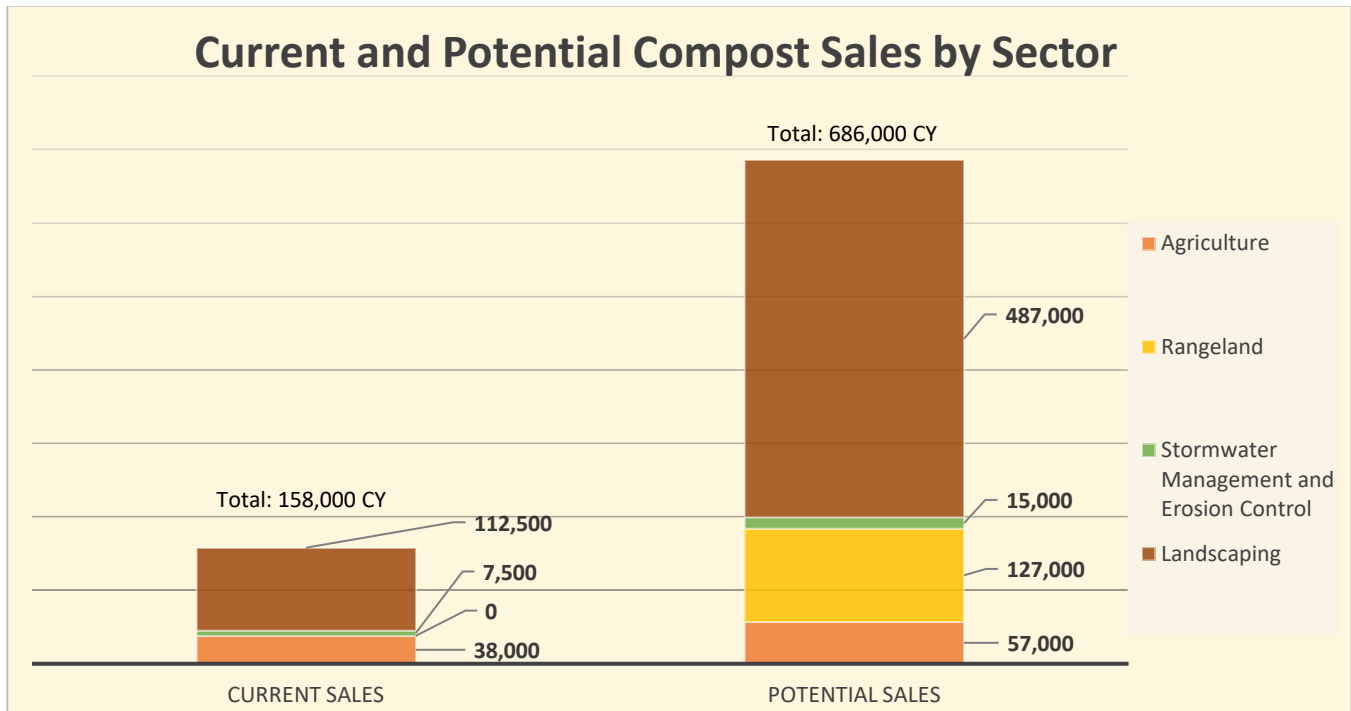


Figure 1: Comparison of Present vs. Potential Annual Compost Sales Volumes by Sector

Erosion Control and Stormwater Management

Current Sales - 7,500 cy • Potential Sales - 15,000 cy

Local governments and state agencies can influence the erosion control and stormwater management sector by requiring incorporation of locally produced and certified compost in standard specifications for stormwater management, low impact development, erosion and sediment control, water conservation, as well as habitat restoration. Targeted outreach to local governments and agencies on the benefits of incorporating compost in contract requirements is needed to spur investment in this market sector. While the volume of current and potential compost sales is minor compare to other sectors, regulations and funding are targeted directly to the erosion control and stormwater management sector. Successful outreach to this sector will also influence education of stakeholders and result in compost sales in other sectors including Landscaping, Parks, and Golf Courses.

→ Opportunity for Change

“Local governments and state agencies can influence the erosion control and stormwater management sector by requiring incorporation of locally produced and certified compost in standard specifications for stormwater management, low impact development, erosion and sediment control, water conservation, as well as habitat restoration.”

To demonstrate the potential for this market, a substantial amount of funding has been allocated for watershed protection and stormwater management through Conservancy Proposition 1, including over \$100 million from the

California State Coastal Conservancy, \$17 million from the San Diego River Conservancy, \$285 million from the Department of Fish and Wildlife, \$200 million from the State Water Resources Control Board, \$30 million from the Ocean Protection Council, and \$510 million from the Department of Water Resources, Integrated Regional Water Management.

Rangelands

Current Sales – None • Potential Sales - 127,000

By far the largest market potential for compost use in San Diego County by acreage is field crops, (including grazing rangeland) that spans some 200,000 acres. The Marin Carbon Project and local carbon farming project at Montado Farms are demonstrating the benefits of depositing a one-time application of a ¼ to ½ inch layer of compost on grazed rangelands. Upfront costs associated with purchasing and spreading compost in remote areas may pose feasibility challenges with ranchers. The state is developing grants and incentives as part of its Healthy Soils Program to spur development of local carbon farming projects. Local governments can help propel this market by committing resources through implementation of their Climate Action Plans. Easing of local zoning regulations could also help compost facilities open closer to this target market while enabling processing of material generated in rural areas.

The non-profit, Regeneration International, estimates that if compost was applied to just over five percent of the CA's grazing lands, a year's worth of greenhouse gas emissions from California's farm and forestry industries would be captured in the soil.

Agriculture

Current Sales - 38,000 cy • Potential Sales - 57,000 cy

Based on the 2016 Crop County report, there are approximately 37,000 acres of irrigated farmland (not including nurseries) in San Diego County. Most farms that could benefit from compost use are not currently purchasing it. Farmers interviewed either produce their own compost onsite, or simply do not use it either due to lack of knowledge, costs, or concerns about safety and effectiveness. Pathogen and weed seed infestation concerns will need to be addressed and incentives will need to be developed to compensate for high product, transportation and spreading costs.

The California Compost Coalition (CCC) estimates that on average seven tons per acre of compost is used on agricultural land. If farms in San Diego utilized compost at this rate, they would consume roughly 500,000 cy of compost annually. At best, a more realistic, and perhaps achievable market target of 120,000 cy appears reasonable with aggressive marketing.

Landscaping

Current Sales - 112,500 cy • Potential Sales - 487,000 cy

Landscapers represent the largest market for compost and mulch products. Although the proportion of compost purchased is small compared to the mulch they purchase, this sector remains a major buyer of compost. There are several ways this market can be expanded, including collaborative industry and public sector planning and education and procurement rules requiring more compost usage. Note that the sales estimates are inclusive of Golf Courses, Parks and Recreation, and Residential listed below.

Golf Courses

Current Sales- Minimal • Potential Sales - 33,000 cy

Interviews with golf course superintendents and agronomists revealed that they are familiar with the benefits of compost and are utilizing it, yet input from producers indicates the market is largely untapped. While many

courses readily make their own mulch, there is reluctance to produce their own compost onsite due to operational constraints and odor concerns. Targeted outreach and specialized product development could help this market expand.

Parks and Recreation

Current Sales- Minimal • Potential Sales - 297,000 cy

Actively managed park lands, including community and regional parks, represent an underutilized compost market with great potential. Feedback from interviewees indicates compost use is very limited. Landscaped and turf areas represent an untapped market for compost.

New and Existing Residential

Current Sales- Minimal (sourced in-County) • Potential Sales - 16,000 cy

Both existing and planned residential homes may be a logical market to target, but homeowners are more likely to purchase bagged compost from retail outlets and these stores stock compost produced from out of the county. Local facilities could develop retail lines of bagged compost if they wanted to enter this market, and some already do, but the shelf space is dominated by out-of-region material. The value of outreach and education to residents cannot be understated, especially as new state compostable organics initiatives come online in the near future. Consumer education could also influence the landscaping industry as residents select watershed appropriate approaches to their landscape makeovers, increasing demand for compost products.

8. Mulch Markets: Present Day and Future Potential

Current and potential future markets for annual mulch sales in San Diego County are presented in Table 11. While all market sectors described in Section 6 were analyzed, the results shown below represent key sectors that were found to significantly influence or yield potential to influence the mulch market via sales. Refer to Appendix 6 for further details on calculation methods and assumptions.

Table 11: Current and Potential Annual Sales Volume of Mulch

Market	Current Sales Volume (cy)	Potential Sales Volume (cy)
Agriculture	9,000	90,000
Stormwater/Erosion Control	53,000	106,000
Landscaping		
<i>Landscape Contractors</i>	<i>Included in total</i>	<i>560,000</i>
<i>Existing Residential</i>	<i>Included in total</i>	<i>61,000</i>
<i>New Residential Development</i>	<i>Included in total</i>	<i>292,000</i>
Total Landscaping	448,000	913,000
Total	510,000	1,109,000

**Values rounded.*

Figure 2 presents a comparison of the current and potential markets for mulch by each market sector’s sales volume.

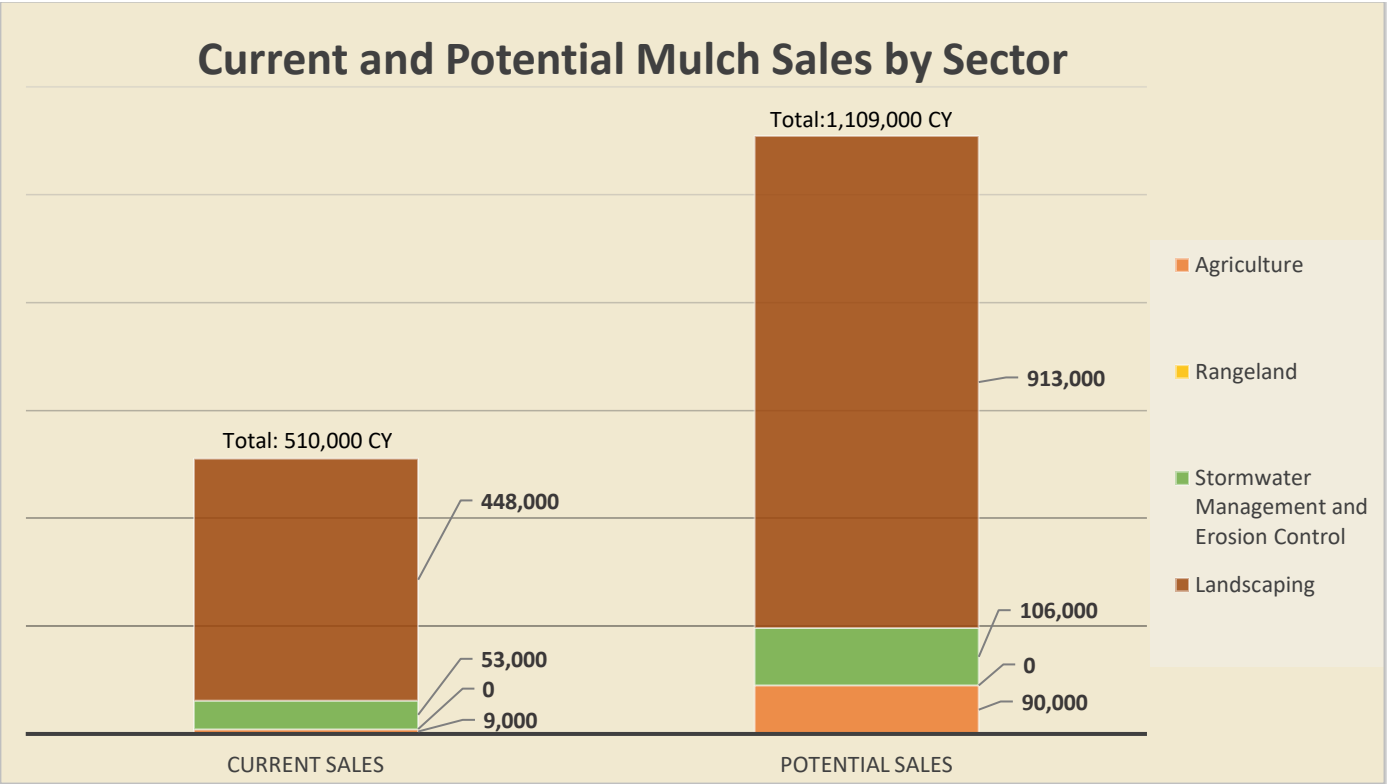


Figure 2: Comparison of Present vs. Potential Annual Mulch Sales Volumes by Sector

Potential Markets

Agriculture

Current Sales - 9,000 cy • Potential Sales - 90,000 cy

There are approximately 33,174 acres of farmland planted with fruit and nut crops that could benefit from the use of mulch to keep the soil moist, reduce water consumption and reduce soil erosion. According to the 2016 crop report, avocado is the crop with the greatest amount of planted acreage. It is also one of the most water hungry fruit trees, having shallow roots that thrive when frequently “showered” or kept moist. Typically grown on slopes, these soils are subject to soil erosion, and application of mulch to these slopes is a challenge.

Given that San Diego County has the highest water prices in the country, there is strong incentive for growers to use all measures to keep irrigation costs down. Avocado crops are also highly sensitive to salts in the water, and efforts to treat and deliver even recycled water to these farms has been slow due to high cost and difficult logistics. Based on the collected survey results and in-person interviews, mulch usage is very limited and in one case, an avocado farmer asked for help in the proper way to use mulch.

The next largest agricultural market with potential to increase mulch usage are vine crops and nurseries. Survey results indicate that farmers are either concerned about contaminants, have access to free mulch, or use other materials to mulch their crops such as black plastic and gravel. If they could find cost effective, reliable, and sources of mulch they deem safe, and were adequately educated on usage and benefits, this market could be encouraged to increase its use of mulches produced from recycled organics.

Though nurseries typically do not use significant quantities of mulch in their growing operations, they could serve as an advocate and promote mulch use to their customers. Some nurseries not already doing so, have the potential to become resellers of mulch products.

Stormwater Management and Erosion Control

Current Sales - 53,000 cy • Potential Sales - 106,000 cy

As mentioned for compost, the stormwater management and erosion control sector considers itself largely untapped. Mulch, even when used as specified, is said to be sourced from out of County and is being used for decorative purposes rather than for its erosion and stormwater management benefits. Targeted outreach to local governments and agencies on the benefits of incorporating locally produced mulch in contract requirements is needed to spur investment in this sector.

Landscaping, including Landscape Architects

Current Sales - 448,000 cy • Potential Sales - 913,000 cy

Interview and survey results from product producers, trade associations and users themselves confirm that the landscaping industry is the most substantial consumer of mulch. One product producer opined that the urban market is largely saturated and growth potential is limited.

Interviews with the major landscape management firms and CLCA producers/resellers was that the largest commercial landscapers are already using mulch in most of their new construction and maintenance work. In new jobs, there is some variation based on the landscape architect's specifications, and that is often determined by standard specifications from local governments and agencies. Stakeholders expressed that there are still some government, municipal and large institutional sector clients that include nitrolized wood shavings and weed cloth with gravel or wood bark in their standard specifications.

Growth in this market sector appears possible if smaller landscape companies and their customers are educated about the benefits of using organic material-based mulches. Many are still using weed cloth with gravel in their landscaping strategies. Training and education on watershed appropriate landscaping, rather than impermeable hardscaping would yield improvements to this market.

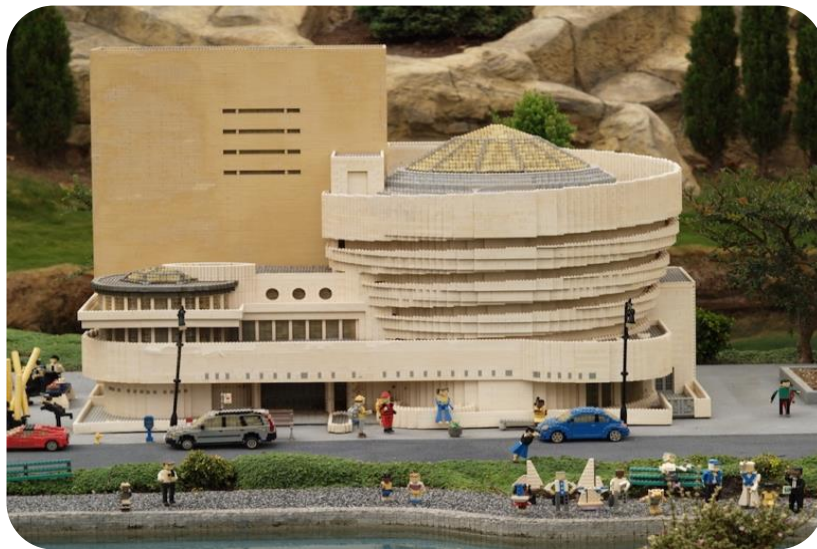
9. Case Studies

9.1 LEGOLAND California

*Compost and Mulch Usage Reduces
Fertilization Requirements*

Market Sector
Landscaping, Large Venues

LEGOLAND maintains 50-60 acres of landscaped area on the park's 130-acre footprint. Approximately 100-200cy of compost and 1,500cy of mulch is applied annually. Additionally, compost and mulch are used in all new landscape construction projects, and these volumes are not included in LEGOLAND's annual numbers.



According to Kyle Silrum, LEGOLAND Landscape Manager, the park prefers using a locally-produced mulch which is a combination of chipped tree trimmings and green waste because it breaks down quicker and benefits the soil. It is a natural sponge and creates a uniform ground cover that is easier to clean and remove leaf litter than traditional chipped bark mulches. Mulch is applied at a depth of 3-4 inches, and utilized for erosion control, soil temperature moderation and reduction of irrigation demands by minimizing evaporation. Mulch is reapplied at least annually and as needed as it reduces to a 1-2" depth. A portion of the organic matter remains and continues to benefit the soil.

Compost is used as a soil amendment in areas of new planting and turf installation to enhance the soil. It is also used as a top-dressing on turf in a 50-50 ratio with sand. In new plant establishment, compost is mixed into the soil and a layer of mulch is added on top.

LEGOLAND generates approximately 2,500cy of landscape trimmings annually, collected in a 40cy roll-off and delivered to a local compost facility for processing.

Benefits noted by park staff after consistent mulch use include healthier plants, a reduction in irrigation requirements and decreased need for herbicides. Herbicide use has been entirely eliminated in planters, but is still used on turf and hardscaped areas where mulch cannot be applied. Mulch has proven to be a great option for erosion control. In the winter of 2017, 3 ½ inches of rainfall fell in a 24-hour period, and no erosion occurred anywhere mulch was in place. Compost and mulch use also serve as a critical component LEGOLAND's IPM efforts.

9.2 Montado Farms

Carbon Farming comes to San Diego County

Market Sector *Rangelands*

Kevin Muno was the leaseholder of the 80-acre Montado horse farm located in Santa Ysabel. On October 13, 2016, Kevin started a carbon farming demonstration site²¹ in San Diego County and became the southernmost of 17 locations being trialed as part of the Marin County Carbon Project.²²



Kevin was drawn to this effort for the potential ecological and productivity benefits associated with a one-time application of $\frac{1}{4}$ " of compost. The Marin County Carbon Project used $\frac{1}{2}$ " of compost but a smaller application rate is being trialed to see if the benefits of reduced irrigation requirements, increased productivity, minimized stormwater runoff, and carbon sequestration are comparable.

One acre was set aside for the project with half used for the study and the other half as a control plot. Compost for the project was provided by Marin County to eliminate product variables. All 17 sites use the same compost. Soil samples will be collected and analyzed over the next 10 years. The initial results looked promising and Kevin is planning to implement carbon farming on a larger scale in early 2019, provided financial resources are available. Financial incentives from the local or State government to stimulate the use of compost on farms would result in ecological services with multiple benefits. These incentives are required to encourage greater participation and help make this type of compost utilization accessible to farmers. Without this support, costs may be too prohibitive for the farming and rangeland communities to embark on these methods.

Findings of Marin Carbon Project are included as Appendix 3.

9.3 UCSD Keeling Apartments

Infrastructure Tinted Green by Compost

Market Sector *Stormwater/Erosion Control*

The UCSD Charles David Keeling Apartments is a LEED Platinum building. Facility features manage 100% of onsite precipitation on 158,000 square feet with a combination of bioswales, basins, weirs and conveyance channels. These controls filter runoff throughout the complex, which is at the downslope end of the campus stormwater system, heightening the need for runoff management.



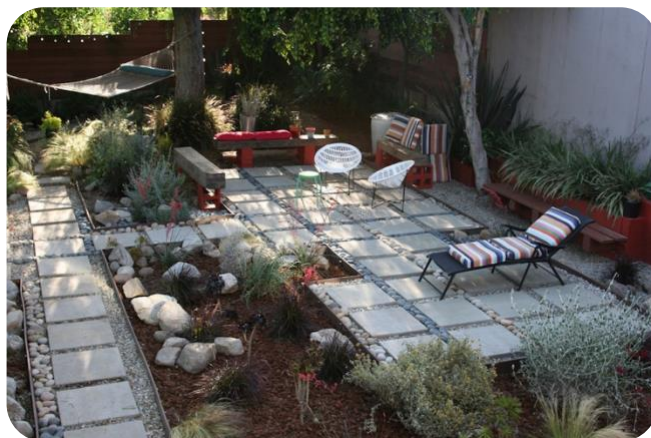
The stormwater system was designed to control potential flooding, and can capture and slow-release water levels up to a 100-year storm event. During heavy rains, overflow from the buildings green roof is directed to the courtyard retention basins, allowing sediment and pollutants to settle and filter out before water leaves the site. The stormwater is ultimately diverted to the arroyo bioswale, which filters pollutants and captures suspended sediments through plants, rocks, and compost-amended soil.

9.4 San Diego County Water Authority

Channeling Funds into Compost and Mulch for Sustainable Landscaping

Market Sectors
Landscaping &
Stormwater/Erosion Control

The SDCWA received Proposition 50 drought assistance funds from the California Department of Water Resources (DWR), and created a grant program to facilitate lawn removal and water conservation, aided by compost and mulch. Under this funding, the City of San Diego challenged 100 single family residences or duplexes to remove turf and install sustainable landscaping. Incentives offered included credits of \$1.50/square foot of lawn removed with an additional 20 cents/square foot for compost use. All turf removal areas had to be amended with compost and covered with mulch, with a minimum of 3" of mulch applied and 1.3" of compost.



A second grant cycle is ongoing (Oct 2016- present) and includes 207 participants. To date, nearly eight acres have been converted. The same 3" of mulch and 1.3" of compost are required.

The Turf Replacement Program's goal is to educate, train, and provide assistance to San Diego County residents in adopting sustainable landscape best practices. Resources, program guidelines, and financial incentives can be found online²³. This site provides a lot of information and options to assist homeowners in identifying their climate zone, sensitive habitat information, water management best practices, plant options for each microclimate, integrated pest management and tips for a successful landscape installation.

A significant investment by the SDCWA has been made to educate consumers on the benefits of compost and mulch, with all education provided for free. More information on the incentives, tools and free classes is available online²⁴. The Turf Replacement Program is administered by the Metropolitan Water District of Southern California²⁵.

9.5 Filtrex (Manufactured by Summit Erosion Control)

Compost and Mulch Rein for Stormwater Management

Market Sector
Stormwater/Erosion Control

Filtrex offers solutions for erosion, sediment and industrial pollutant control, utilizing compost and mulch for both public and private sector projects.



As a manufacturer of Filtrex compost filter socks, Summit Erosion Control utilizes locally produced compost and mulch for sediment and industrial pollutant removal. This practice supports local facilities and represents a much more sustainable system of stormwater management than other options.

By using compost, Filtrex's socks and berms provide soil structure, increased germination rates, and vegetation growth, as well as organic matter and micronutrients to filtration plants and soil, critical to erosion and sediment control. The compost socks and berms utilized capture sediment and pollutants, as well as supporting vegetation for additional erosion control.

In 2018, Caltrans updated compost specifications for both storm water blankets and compost filter socks. These revised specs have increased the range of particle size for each of the various compost options, i.e. fine, medium and coarse compost. Fine compost is used for compost blankets, medium is typically a blend of fine and coarse material for compost blankets that are blown on steeper slopes, and coarse material is for use in both compost filter socks and as a landscape mulch around trees, plants and vegetation.

Caltrans' changes were made to make it easier for erosion and stormwater contractors to source and obtain compost that meet these specs. Prior to the changes, the particle size range was too narrow and did not match what most composters had available for sale. Caltrans revised specs for compost and compost socks are included as Appendix 4.

Erosion control and stormwater and watershed protection are heavily funded in the State of California. Examples of such allocated funding are included as Appendix 5.

9.6 San Dieguito County Park

Forging Trails to Sustainability

Market Sector
Parks &
Stormwater/Erosion Control

Some 17,735 visitors enjoy San Dieguito County Park's 125 picturesque acres of chaparral covered hills and Canyonlands. Located in Del Mar and Solana Beach, the park is comprised of three sections; an upper park, lower park, and 1.25 miles of hiking and equestrian trails. The lower park has a tranquil pond, wedding gazebo, butterfly garden, tall trees, and lush greenbelts with picnic areas.



Sixty-eight acres are designated as parkland, 55 acres as open space, and a two-acre border serves as a buffer to neighboring properties. A park superintendent, four rangers, two maintenance workers, and four park attendants maintain hillside trails in open space, the upper and lower parks, and buffer zone. Entry and parking areas at both levels have trees, shrubs, flowers, and medians that are mulched as needed. The lower park has expansive lawns which are trimmed with mulching mowers.

San Dieguito is one of the few parks in San Diego County that uses compost and does composting onsite. They have been composting for about three years and are currently producing a truckload of compost and purchasing 30 cubic yards of material produced offsite each year. They utilize a covered static pile and 100-gallon dual bin tumbler for composting. Employee food scraps, non-invasive weeds, green materials from garden beds, and chipped shrub trimmings and small branches are composted. The maintenance team manages the system. Some of the regular park attendees have taken such an interest in the program, they have asked to participate by composting picnic food scraps and using the opportunity to teach sustainable practices to their children.

Finished material is used throughout the park's landscaped areas, in the herb and butterfly garden, and for new plantings. "Compost is preferred as an amendment because it improves the soil and the plants and shrubs grow so much better," said Park Ranger Nicole Ornelas.

San Dieguito is also producing 30 cubic yards of woodchips annually from shrub and tree trimmings put through two portable, commercial chippers. The park purchases an additional 20 cubic yards of mulch per year. Mulch is applied in landscaped areas around trees and shrubs, and on the trails and slopes to control invasive weed species and reduce soil erosion. The park has some problem areas where mulch was cited as particularly helpful to reduce maintenance time, stabilize slopes and improve aesthetics.

Trails and common areas that do not have grass get a lot of foot traffic, with surfaces becoming dusty in dry months and soil eroding during the rainy season. Exposed dirt slopes can also be hard to walk up and down without slipping. Mulch is applied three to four inches thick and provides a functional, aesthetically-pleasing pathway that keeps the dust down, provides traction and reduces run-off during heavy winter rains. Park staff is particularly diligent in keeping these areas adequately mulched during times with peak visitor flows and prior to major rainstorms. Straw wattles are also used on very steep slopes for stormwater management. At the end of the season, wattles are opened and the straw is composted.



When staff noticed that mowing and using weed trimmers on the park's large turf area would frequently scar the lower trunk and the exposed roots of the trees, they decided to remove three feet of grass around the base of them, amend the soil with compost, and apply about three inches of mulch. Tree roots were also damaging the blades of the lawn mower, requiring additional equipment servicing. This practice has been successful in protecting the trees, saving maintenance time and staff hours, and lowering equipment maintenance costs.

Mulch is important to San Dieguito's increasingly sustainable invasive weed management program. In the past, herbicides, insecticides and pesticides were used, but were costly, and harmful to local habitat. Park staff now minimize use of these products whenever possible, and have been able to cut back as they continue to expand use of mulch. Once weeds are removed from an area, they immediately apply three to four inches of mulch. Herbicides are no longer utilized for this task. Ranger Ornelas noted, "When the park was using pesticides, oftentimes untargeted species would also be killed." With utilization of mulch, habitat and native pollinators are restored and in better health.

Since the park has expanded its production and use of compost and mulch, they estimate, on an annual basis, \$1,000 savings on the water bill, \$325 less spent on herbicides, and \$1,370 in avoided disposal costs. San Dieguito plans to expand organics management in the near future to capture more landscape trimmings. It a win-win, and a model for others to follow. Parks that don't have the resources to produce their own compost and mulch onsite would realize a wide array of benefits to purchase and use these products. "At the end of the day," Ranger Ornelas offered, "we are trying to be more sustainable and self-sufficient. Compost and mulch benefit our landscape while maintaining the integrity of the park."

10. Recommendations to Strengthen Compost and Mulch Markets

10.1 Investment in Market Development

This recommendation came from most stakeholders interviewed. While some sectors, such as landscape architects and landscapers, are generally aware of these products and using them in varying degrees, nearly every survey participant requested more information about compost and mulch, their benefits, and product safety (i.e., pathogens, weed seeds and contaminants). Further, most stakeholders expressed the need to educate the market on the value of these products. One particular stakeholder, a major producer in the region, felt that the urban compost and mulch markets were fully saturated.

→ Opportunity for Change

“With a creative, collaborative, strategic, and adequately funded investment in education, market research and development, the potential for market growth for compost and mulch is tremendous.”

While this may be true, there are many new markets such as green infrastructure development, community gardens, urban farms and roof gardens that have yet to be fully developed and are just beginning to be explored. Other untapped markets include increased product use by golf courses, parks and farms, which are existing but highly underutilized sectors that represent a vast acreage of opportunity in the region. With a creative, collaborative, strategic, and adequately funded investment in education, market research and development, the potential for market growth for compost and mulch is tremendous.

Developing pilot programs with farmers can re-establish trust in the product and alleviate quality concerns. Introducing measures such as soil health monitoring at farms can determine the root cause of pathogen infestation and help dispel fears about compost quality.

10.2 Business Case Analysis for Compost and Mulch Utilization

In conducting interviews with stakeholders in various sectors, researchers learned that business case analysis has not been conducted for most market segments. The farming sectors are especially concerned about the cost of the product, transportation and spreading costs and in general lack knowledge about the tremendous benefits of these products over both the short and long-term. San Diego County has some of the highest water prices in the US, yet compost and mulch are not being used sufficiently to retain moisture in the soil to help keep irrigation costs down. Soil health and erosion control experts interviewed recommended doing a full business case analysis of using compost and mulch versus using conventional methods.

The analysis should include an examination of full costs of using these products, which is the sum of price per cubic yard of compost or mulch, delivery charges, and handling and spreading expenses. Benefits studied should look at potential cost savings from reduced irrigation requirements, and a reduction in fertilizer and pesticide use as well as the possibility of increased revenue from higher crop yields and improved soil health for long term productivity.

10.3 Increased Education across all Market Segments

Producers and end users expressed similar sentiments that both consumer and industry education is vitally important for the compost and mulch market to reach its full potential.

Education and outreach strategies suggested include:

- Consolidating efforts of the private and public sectors and NGOs to develop a cohesive message to educate both the public and commercial markets.
- Encourage collaborations with municipal watershed and recycling programs to implement demonstration sites in a diverse variety of locations such as community gardens, schools, farms, municipal parks, business parks, and shopping centers to showcase model landscaping and benefits of mulch and compost while providing guidance on choosing products and application rates. Provide signage at these pilot projects to educate the public on the project and its benefits.
- Develop education programs and demonstration areas at producer and reseller sites as well for more technical guidance on how products should be used, including the potential for custom blends to provide the greatest benefit for specific applications.
- Work with waste and recycling haulers as partners in the effort to increase education as well as inform consumers on the importance of clean, source separated products.
- Tailor education for each market segment to highlight benefits most relevant to their respective applications.
- “Know your product, know your source...” Educate consumers on the value and safety of products manufactured on permitted, regulated facilities, with the goal to dispel pathogen, weed and contamination concerns if products are obtained from a legally-operating producer.

10.4 Procurement/Incentives for Locally-Produced Products from Permitted Facilities

Local jurisdictions and government agencies, including Caltrans, need to qualify in job specifications the requirement that erosion control, stormwater quality, green infrastructure, low impact development, and waterwise landscaping projects use locally manufactured recycled organics products that meet prescribed performance measures. Specifications should include long term performance standards to ensure water quality and erosion control standards are verified and met after project completion. Long term performance liability will help ensure that contractors utilize high quality and durable materials. Local jurisdictions should require that new or redeveloped commercial or residential projects include sustainable landscaping specification requirements and use locally produced compost and mulch.

In addition, jurisdictions and CalRecycle should request that government users such as Caltrans track and record volumes of compost and mulch procured and used by their districts or regions. Record keeping would help ensure local procurement occurs.

Incentives should be developed to help offset total product cost and increase product usage. Application of compost and mulch is a relatively low cost and simple BMP that provides proven benefits to stormwater quality, runoff and erosion control. Widespread use would reduce the overall cost and burden of compliance with stormwater regulations. Efforts are already underway for farmers to receive carbon offset credits in California’s cap-and-trade system. The American Carbon Registry, an organization that certifies carbon offsets, approved compost additions to rangeland as an offset²⁶ in October 2014

Appendices

Appendix 1 – California Composting and Recycling Legislation

Assembly Bill (AB) 341¹ -Mandatory Commercial Recycling, California’s ambitious drive toward a 75 percent reduction in the amount of waste going to landfills by the year 2020, will be achieved through source reduction, recycling, and composting. Attaining this goal will require diverting up to 22 million tons of waste from California landfills annually. Infrastructure required to achieve this translates into a multitude of new businesses, jobs and entrepreneurial opportunities.

AB 1826² -Mandatory Commercial Organics Recycling requires the state’s commercial sector, including restaurants, supermarkets, large venues and food processors, to separate their food scraps and yard trimmings and arrange for organics recycling service. Multifamily dwellings are also required to separate their yard trimmings and arrange for organics recycling service but are not required to separate food waste. Compliance will be phased in, starting in 2016 with the largest generators of food waste. AB 1826 builds on the success of the mandatory commercial recycling program established by AB 341.

- Commencing April 1, 2016, commercial entities that generate 8cy or more a week must source separate food scraps and yard trimmings and arrange for recycling services for that organic waste in a specified manner.
- On January 1, 2017, commercial entities generating 4cy or more per week of organics are also subject to the diversion requirement.
- The bill also requires commercial entities that generate 4cy or more of commercial solid waste per week, on and after January 1, 2019, to arrange for organic waste recycling services and, if CalRecycle makes a specified determination, would decrease that amount to 2cy, on or after January 1, 2020.

AB 1594³, Compostable Organics Management - Commencing on January 1, 2020, use of green material, as defined as alternative daily cover (ADC) does not constitute diversion through recycling and would be considered disposal for purposes of compliance with California’s mandated 50 percent diversion from disposal (AB 939, California’s source reduction and recycling law).

The Governor’s 2015-2016 Healthy Soils Initiative recognizes the important nexus between composting (and waste diversion), soil health, water, and climate change. Applying compost to soil ultimately increases the soil carbon content and results in overall net sequestration of atmospheric carbon into the soil and plant substrate.

“...as the leading agricultural state in the nation, it is important for California’s soils to be sustainable and resilient to climate change. Increased carbon in soils is responsible for numerous benefits including increased water holding capacity, increased crop yields and decreased sediment erosion. In the upcoming year, the Administration will work on several new initiatives to increase carbon in soil and establish long term goals for carbon levels in all California’s agricultural soils.”⁴

CA Air Resources Board Draft Short-Lived Climate Pollutant Reduction Strategy - Identifies methane emissions associated with landfill disposal of organics as a major source of short-lived climate pollutants, or SLCs. “For landfills, ARB will work with CalRecycle to develop a regulation by 2018 to progress towards existing State targets for landfill diversion by 2020,

¹ http://www.leginfo.ca.gov/pub/11-12/bill/asm/ab_0301-0350/ab_341_bill_20111006_chaptered.html

² http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB1826

³ http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB1594

⁴ Note: California Department of Food and Agriculture charged to coordinate the initiative.

<https://www.cdffa.ca.gov/EnvironmentalStewardship/HealthySoils.html>

and effectively eliminate organics disposal in landfills by 2025.” Diverting organic materials from landfills through composting will sequester more carbon in the soil and reduce what’s released into the atmosphere.

SB 1383⁵ - Establishes methane emissions reduction targets in a statewide effort to reduce emissions of short-lived climate pollutants (SLCP). SB 1383 establishes targets to achieve a 50 percent reduction of disposed organic waste from the 2014 level by 2020 and a 75 percent reduction by 2025. The law also establishes a target that not less than 20 percent of disposed edible food is recovered for human consumption by 2025. The law grants CalRecycle the regulatory authority required to meet the organic waste disposal reduction targets.

AB 32, the California Global Warming Solutions Act of 2006⁶ creates a comprehensive, multi-year program to reduce GHG emissions to 1990 levels by the year 2020 (and recently proposed target of removing all organics from California landfills by 2025). AB 32 requires that the Air Resources Board (ARB) develop GHG reduction strategies that do not interfere with existing air pollution control measures. The AB 32 Scoping Plan contains the main strategies California will use to reduce the GHGs that cause climate change. The Scoping Plan (Measure No. RW-3) commits ARB staff to work with CalRecycle, the California Department of Food and Agriculture, the Department of Transportation, and others to provide direct incentives for the use of compost in agriculture and landscaping.

These “direct incentives” will include funding from the Greenhouse Gas Reduction Fund (GGRF), which was established in 2012 by AB 1532, SB 535, and SB 1018. The GGRF receives Cap-and-Trade auction proceeds that are appropriated by the Legislature and Governor for projects that support the goals of AB 32.

AB 876 (Organics Management Infrastructure Planning)

With the enactment of the California Integrated Waste Management Act of 1989, the Legislature required the Department of Resources Recycling and Recovery and local agencies to promote recycling and composting over land disposal and transformation. Since the enactment of the Act, local governments and private industries have worked jointly to create an extensive material collection infrastructure and have implemented effective programs to achieve a statewide diversion rate of greater than 50 percent. However, although California now leads the nation in waste reduction and recycling, the state continues to dispose of more than 12 million tons of compostable organics each year. This constitutes approximately 40 percent of the 31 million tons disposed of during 2014 in solid waste landfills.

To reduce the landfilling of organics, increase composting and anaerobic digestion, and meet the state’s organic diversion goals, cities and counties now must plan for organics processing facilities that can process organics diverted from landfills and organics waste generators. In particular, AB 1826 (Chesbro, Chapter 727, Statutes of 2014), requires each city and county to assess the infrastructure necessary for implementing their commercial organics recycling programs.

AB 2411²⁷ requires “the Department of Resources Recycling and Recovery, on or before December 31, 2019, to develop and implement a plan to maximize the use of compost for slope stabilization and for establishing vegetation in the course of providing debris removal services following a wildfire. The bill would require the Department of Resources Recycling and Recovery, in coordination with the Department of Transportation, to identify best practices for each of the Department of Transportation’s 12 districts regarding the cost-effective use of compost along roadways and to develop a plan to implement the identified best practices in each of the districts. The bill would additionally require the Department of Resources Recycling and Recovery to review the best practices at least once every 5 years and update the best practices as necessary.”

⁵ <http://www.calrecycle.ca.gov/Climate/SLCP/> and

http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383

⁶ <http://www.arb.ca.gov/cc/ab32/ab32.htm>

Appendix 2 – Jurisdictional Requirements under AB 1826

AB 1826 (Chesbro, Chapter 727, Statutes of 2014) requires each city and county to assess the infrastructure necessary for implementing their commercial organics recycling programs. The bill requires each jurisdiction to report to the CalRecycle on its progress in implementing the organic material recycling program, and CalRecycle is required to review whether a jurisdiction is in compliance with this act.

Jurisdictions are required, in the annual report (CalRecycle Electronic Annual Report (EAR)), to include the names of existing organic material recycling facilities within a reasonable distance from the major population centers, and the available capacity at each facility to accept the jurisdiction's organic materials, including food scraps.

Jurisdictions are also required to identify existing organic waste recycling facilities within the jurisdiction that may be suitable for potential expansion, and/or existing solid waste facilities within the jurisdiction that may be suitable for colocation with organic waste processing facilities.

Jurisdictions must describe any efforts underway to develop new private or public regional organic material recycling facilities, the anticipated timeline for completion, the types of feedstocks these facilities may accept, and the potential available organic material capacity at those facilities for the county or regional agency's organic discards, including food.

Under AB 1826, jurisdictions are also required to report the following:

- Closed or abandoned sites that may be available for new organic material recycling facilities.
- Other non-disposal opportunities (on-site composting, food scraps to animal feed, etc.) available to covered entities in the jurisdiction.
- Local zoning codes that allow organic material processing facilities and local permit requirements for siting a new organic material recycling facility within the jurisdiction.
- The jurisdiction's efforts to reduce food waste at the source and increase edible food recovery (e.g. promoting source reduction, expanding food donation, incentivizing partnerships with local food recovery organizations, changes in local government and school programs to reduce and/or donate surplus edible food).
- Local incentives available for developing new organic material recycling facilities within the jurisdiction (e.g. economic incentives, workforce training, permit fee waivers etc.)
- Local efforts by the jurisdiction or its partners to promote local markets for processed organic material (e.g. jurisdiction purchase of recycled organic products, compost giveaways to residents, promotion of sustainable landscaping, or education and outreach about recycled organic products).
- Local efforts by the jurisdiction or its partners to promote local markets for processed organic material (e.g. jurisdiction purchase of recycled organic products, compost giveaways to residents, promotion of sustainable landscaping, or education and outreach about recycled organic products).
- Waste and recycling service-rate adjustments implemented or planned in the jurisdiction, how they target the diversion of organic waste, and/or fund organic recycling infrastructure development.
- Known barriers to siting or expanding organic material recycling facilities in the jurisdiction, such as lack of suitable parcels, zoning issues, economic issues, lack of local markets for finished products, environmental justice issues or the known opposition of community groups, regulatory agencies or public officials, or other impediments. And the extent to which the jurisdiction has taken steps that are under its control to remove barriers to siting and expanding organic material recycling facilities.

Appendix 3 – Findings of the Marin Carbon Project

- A one-time application of ½ inch of compost on rangeland has the ability to:
 - Sequester a ton of carbon per hectare (~2.5 acres).
 - Increase grass growth by 40-60%.
 - Reduce water use by three times.
- Healthier soils and wild grasses have proven to be even more effective than trees in sequestering carbon pollution from atmosphere.
- Effects are expected to continue to provide benefits for several decades.
- Projection: If half of the state’s range lands received this ½ inch treatment of compost application, between 21-42 million metric tons of carbon annually would be able to sequestered. At the higher end of the sequestration scale, this would be equivalent to removing all the carbon emissions from state-wide electricity generation.

Appendix 4 – Caltrans Compost and Compost Sock Specifications

Caltrans Compost Specifications 21-2.02K

Compost must be derived from one or a combination of the following types of materials:

1. Green material consisting of chipped, shredded, or ground vegetation or clean, processed, recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost must not be derived from mixed municipal solid waste and must not contain paint, petroleum products, pesticides, or other chemical residues harmful to plant or animal life. Metal concentrations in compost must not exceed the maximum listed under 14 CA Code of Regs § 17868.2.

Process compost materials under 14 CA Code of Regs § 17868.3.

The quality characteristics of compost must have the values shown in the following table:

Quality characteristic	Test method*	Requirement	
		Fine	Medium/Coarse
pH	TMECC 04.11-A	6–8.5	6-8.5
Soluble salts (dS/m)	TMECC 04.10-A	0–10	0-10
Moisture content (% wet weight)	TMECC 03.09-A	25–60	25-60
Organic matter content (% dry weight)	TMECC 05.07-A	30–70	30-100
Maturity (seed emergence) (% relative to positive control)	TMECC 05.05-A	80 or above	80 or above
Maturity (seedling vigor) (% relative to positive control)	TMECC 05.05-A	80 or above	80 or above
Stability (mg CO ₂ -C/g OM per day)	TMECC 05.08-B	5 or below	8 or below
Pathogen Salmonella (most probable number per 4 grams dry weight basis)	TMECC 07.01-B	< 3	< 3
Pathogen Fecal coliform (most probable number per gram dry weight basis)	TMECC 07.01-B	< 1,000	< 1,000
Physical contaminants (% dry weight) Plastic, glass, and metal	TMECC 02.02-C	Combined total: < 0.5	Combined total: < 1.0
Film plastic (% dry weight)	TMECC 02.02-C	Combined total: < 0.1%	Combined total: < 0.1%

*TMECC refers to Test Methods for the Examination of Composting and Compost, published by the United States Department of Agriculture and the United States Compost Council (USCC).

The particle size must comply with the requirements shown in the following table:

Quality characteristic	Test method*	Requirement	
		Fine	Medium/Coarse
Gradation Fine:(dry weight % passing) 1-inch sieve 3/8-inch sieve	TMECC 02.02-B	100 95	-- --
Gradation Medium:(dry weight % passing) 2-inch sieve 3/8-inch sieve	TMECC 02.02-B	95 40	-- 55
Gradation Course:(dry weight % passing) 3-inch sieve 3/8-inch sieve	TMECC 02.02-B	95 25	-- 35

*TMECC refers to Test Methods for the Examination of Composting and Compost, published by the United States Department of Agriculture and the United States Compost Council (USCC).

Caltrans Compost Socks Specifications 21-2.02Q

Compost sock must have a functional longevity of 1 year. Compost sock must be an 8- or 12-inch diameter mesh tube filled with compost. Mesh tubing must be clean, evenly woven, and free of encrusted concrete or other contaminating materials, cuts, tears, broken or missing yarns, and thin, open, or weak places. Compost sock may be a prefilled mesh tube or be filled at the job site.

Mesh tubing must be composed of a natural biodegradable product, such as cotton, jute, sisal, burlap, wood-based yarn, or coir.

Mesh tubing must be composed of polypropylene UV photodegradable netting.

The compost used to fill the mesh tubing must comply with the requirements shown in the following table:

Quality characteristic	Test method*	Requirement
pH	TMECC 04.11-A	5.5–8.5
Soluble salts (dS/m)	TMECC 04.10-A	0–10
Moisture content (% wet weight)	TMECC 03.09-A	30–60
Organic matter content (% dry weight)	TMECC 05.07-A	30–100
Stability (mg CO ₂ -C/g OM per day)	TMECC 05.08-B	8 or below
Pathogen Salmonella (most probable number per 4 grams dry weight basis)	TMECC 07.01-B	< 3
Pathogen Fecal coliform (most probable number per gram dry weight basis)	TMECC 07.01-B	< 1,000
Physical contaminants (% dry weight) Plastic, glass, and metal	TMECC 02.02-C	combined total: < 1.0
Film plastic (% dry weight)	TMECC 02.02-C	Combined total: < 0.1

*TMECC refers to Test Methods for the Examination of Composting and Compost, published by the United States Department of Agriculture and the United States Compost Council (USCC).

The particle size of the compost must comply with the requirements shown in the following table:

Quality characteristic	Test method*	Requirement	
		Min	Max
Gradation:(dry weight % passing)			
3-inch sieve	TMECC 02.02-B	95	--
3/8-inch sieve		10	40

*TMECC refers to Test Methods for the Examination of Composting and Compost, published by the United States Department of Agriculture and the United States Compost Council (USCC).

Appendix 5 – Examples of Allocated Funding for Environmental and Watershed Protection

STATE COASTAL CONSERVANCY | PROP 1 FUNDING

Chapter 6 of Prop 1 allocates \$100.5 million to the Conservancy for competitive grants for multi-benefit ecosystem and watershed protection and restoration projects, Water Code Section 79731(j). The Conservancy expects to grant approximately \$10 million each year for about ten years.

SAN DIEGO RIVER CONSERVANCY | PROP 1 FUNDING

Chapter 6 of Prop 1 allocated \$17 million to the Conservancy for competitive grants for multi-benefit ecosystem and watershed protection and restoration projects.

DEPARTMENT OF FISH AND WILDLIFE | PROP 1 WATERSHED RESTORATION GRANTS

The CDFW is developing two new grant programs to fund multi-benefit ecosystem and watershed protection and restoration projects, as outlined in Prop 1. Relevant to San Diego, the Watershed Restoration Grant Program will focus on water quality, river, and watershed protection and restoration projects of statewide importance outside of the Sacramento-San Joaquin Delta. This grant program will invest \$285 million in projects over a 10 year period.

STATE WATER RESOURCES CONTROL BOARD | PROP 1 STORMWATER MANAGEMENT

Prop 1 allocates \$200 million to the SWRCB for stormwater projects.

OCEAN PROTECTION COUNCIL | PROP 1 GRANT PROGRAM

Prop 1 Chapter 6, “Protecting Rivers, Lakes, Streams, Coastal Waters, and Watersheds,” allocates \$30 million to the OPC for a competitive grant program for multi-benefit ecosystem and watershed protection and restoration projects in accordance with statewide priorities.

DEPARTMENT OF WATER RESOURCES | INTEGRATED REGIONAL WATER MANAGEMENT

Prop 1 authorized the appropriation of \$510 million in Integrated Regional Water Management funding for Implementation and Planning efforts to each hydrologic region of the State.

Appendix 6 – Compost and Mulch Sector Sales Assumptions and Calculation Methods

Table 12: Current and Potential Annual Compost Sales

Market	Current Sales		Potential Sales	
	Volume (cy)	Calculation Method/Notes	Volume (cy)	Calculation Method/Notes
Agriculture	38,000	Interviews indicated an average application rate of 25cy/acre. Assumes 25cy/acre to 15% of acreage of crops excluding fruit and nuts and nursery and cut flower products.	57,000	Assumes 50% increase to current sales, with outreach, education, financial incentives and development of new product blends prompting farms to apply 1/2" of compost.
Rangelands	0	No current sales to this market were identified.	127,000	Assumes 1/2" application rate annually to 1% of rangelands in the County with a 10-year reapplication rate for each, for a total of 1,270,000cy of compost applied every 10-year cycle. Assumes only 10% of rangeland is suitable for application due to slopes, terrain, soil character, native vegetation, etc.
Stormwater/Erosion Control	7,500	Assumes 5% of total estimated compost sales to erosion control. 1/3 of product purchased is compost. The remaining 2/3 is mulch.	15,000	100% increase over present sales. Stormwater and erosion control markets are considered largely untapped, while significant funding has recently become available. Job specifications will require higher volumes of locally produced product.
Landscaping				
Landscape Contractors	N/A		141,000	25% increase over present sales, due to increased marketing efforts to promote locally produced products. Job specifications will require higher volumes of locally produced product.

Market	Current Sales		Potential Sales	
	Volume (cy)	Calculation Method/Notes	Volume (cy)	Calculation Method/Notes
<i>Existing Residential</i>	N/A		15,000	Assumes 0.25cy/home and 10% of homes implemented. Assumes majority of residents would either compost at home or subscribe to collection service, which may increase landfill diversion but not necessarily contribute to market sales.
<i>New Residential Development</i>	N/A		1,000	Assumes 0.25cy/home and 75% implementation rate. Job specifications require new developments to utilize compost in landscapes.
<i>Golf Courses</i>	N/A		33,000	Assumes 35% of total acreage would benefit from compost application in 1/8" layer, with 50% implementation rate.
<i>Parklands</i>	N/A		297,000	Assumes ¼" of compost applied to just 10% of 90,000 acres region-wide of lawn/grass and landscaped areas.
<i>Total Landscaping</i>	112,500	Assumes 75% of total estimated compost sales to landscaping, and includes residential uses, golf courses and parklands.	487,000	
Total	158,000		686,000	

Table 13: Current and Potential Annual Mulch Sales

Market	Current Sales		Potential Sales	
	Volume (cy)	Calculation Method/Notes	Volume (cy)	Calculation Method/Notes
Agriculture	9,000	Assumes 2" mulch application to only .1% of fruit and nut crop acreage. Interviews indicate mulch is primarily chipped onsite materials or purchased straw.	90,000	Assumes 2" mulch application to 1% of vine and fruit and nut crop acreage.
Stormwater/Erosion Control	53,000	Assumes 10% of total estimated mulch sales to erosion control. 2/3 of product purchased is mulch. The remaining 1/3 is compost.	106,000	Assumes 100% increase. Stormwater and erosion control markets are assumed to be largely untapped. Job specifications will require a higher volume of locally produced compost and mulch.
Landscaping				
<i>Landscape Contractors</i>	N/A		560,000	Assumes 25% increase with increased marketing effort to promote locally produced products and job specifications requiring a higher volume of locally produced compost and mulch.
<i>Existing Residential</i>	N/A		61,000	Assumes 1cy/home to 10% of residences through increased outreach and education, lawn removal and waterwise landscaping.
<i>New Residential Development</i>	N/A		292,000	Assumes 3" mulch applied to 15% of total planned development acreage.
<i>Total Landscaping</i>	448,000	Assumes 85% of total estimated mulch sales to landscaping. Interviews with end users indicate a slightly higher percentage with mulch 90% of all products purchased and compost at 10%.	913,000	
Total	510,000		1,109,000	

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