

Organics Roadmap IV - 2011

This is the fourth in a series of annual Organics Roadmaps developed primarily to address organic materials, the largest category of materials disposed in California landfills and the focus of CalRecycle's Strategic Directive 6.1, which calls for a reduction of 50% in the amount of organics disposed by 2020. Previous Roadmaps were presented at California Integrated Waste Management Board meetings and outlined the many challenges and opportunities for increasing organics diversion along with the program activities underway. While many of these challenges and opportunities remain the same, this Roadmap focuses on several high-level policy drivers that provide the opportunity to significantly impact the organics waste stream. It also describes associated CalRecycle program activities (Attachment 1) that continue to shape California's pursuit of increased organics diversion.

Organics in the Waste Stream

Californians disposed approximately 32 million tons of material in 2009. Based upon CalRecycle's most recent Statewide Waste Characterization Study, carbon-based organic materials comprise approximately 2/3 (or 21 million tons) of what is disposed in landfills. Of this statewide disposal total, compostable materials, including food and vegetative materials, account for more than 20 percent (or 6.4 million tons). Food is the largest subcomponent of these compostable materials, comprising nearly 16 percent (or 5.1 million tons) of the total statewide disposal, which equates to 330 pounds per person per year of compostable organic waste disposal of which 265 pounds is food waste. Of the remaining carbon based materials in the disposed waste stream, much of it is non-compostable and/or difficult-to-recycle organic material, such as wood waste (15% or 4.8 million tons), which may be suitable in some cases for mulch and in others for biofuels and bioenergy applications.

Current Status of Organics Diversion

CalRecycle's "Third Assessment of California's Compost and Mulch-Producing Infrastructure-- Management Practices and Market Conditions" report (published in 2010, available at www.calrecycle.ca.gov/Publications/default.asp?pubid=1358) indicated that approximately 9.3 million tons of organic materials were processed in 2008. This organics diversion was accomplished by over 200 facilities, including traditional "composters," facilities that actively compost organic material, and "processors" and "chippers and grinders," facilities that process material but do not compost the materials they produce. This infrastructure has grown significantly since the early 1990s, when only a handful of permitted facilities existed in the state, and this growth has been aided in part by CalRecycle demonstration projects, research studies, and regulations that protect public health and safety while allowing for market development.

However, to meet the goals of Strategic Directive 6.1, California will need to divert more than 10 million tons MORE organics per year, which is more than double the current processing capacity in the state. Unfortunately, the annual amount of processed organics has remained fairly stagnant over the past several years and, in fact, decreased by approximately 500,000 tons since CalRecycle's previous 2003 infrastructure study. This stagnation in processing capacity is a reflection of the many barriers faced by composters and processors, including several key barriers associated with new and emerging regulations

for air quality, water quality, and food residual management. For example, new and emerging regulations could increase the capital and operating costs of composters and processors who would be challenged to identify new revenue streams to offset increases in their production costs. These are briefly listed below:

- Pending local air district rules to reduce volatile organic compound emissions from piles of composting greenwaste feedstocks (e.g., San Joaquin Valley Unified Air Pollution Control District Rule 4566 and South Coast Air Quality Management District Rule 1133.3);
- Imposition of federal New Source Review and Title 1 permitting for new compost facilities within the San Joaquin Valley Unified Air Pollution Control District, which will require Best Available Control Technology and costly offsets for new or expanded facility permits. The South Coast Air Quality Management District will likely impose similar restrictions;
- State Water Resources Control Board and Regional Water Quality Control Boards' Waste Discharge Requirements and Stormwater Permits; and National Pollutant Discharge Elimination System (NPDES) permit requirements;
- CalRecycle regulatory provisions that some suggest impede the development of food waste processing;
- New requirements from the California Department of Food and Agriculture for the registration and labeling of bulk compost intended for organic production; increased scrutiny of compost facilities providing inputs for organic agriculture;
- Reports of pathogens (e.g., e-coli O157:H7 and salmonella) found in finished compost and food products;
- Presence of pesticides that persist through the composting process (e.g., bifenthrin) that may impair the acceptability of products being used for organic food production or a composters' organic certification;
- Presence of regulated pests (Light Brown Apple Moth, European Grapevine Moth, Asian Citrus Psyllid, Sudden Oak Death, etc.) that affect the movement of organic material from county to county;
- Difficulties in siting new composting facilities in proximity to urban areas where large amounts of organics are generated.

For a detailed discussion of these barriers, please refer to Organics Roadmaps I, II, and III at www.calrecycle.ca.gov/Organics/RoadMap08/default.htm.

These issues are difficult to resolve, particularly in the case of regulatory efforts that are driven by important environmental policy goals. CalRecycle has worked diligently, and continues to do so, to foster rulemakings that achieve these environmental goals while providing flexibility and reasonable provisions for composters and others to attain compliance in a cost effective manner. These regulatory barriers can translate into economic barriers that prohibit organics diversion infrastructure development. The industry tends to be marginally profitable, in part because it has to compete with lower cost landfill disposal options for sourcing feedstock and lower-priced synthetic fertilizers which do not provide the additional environmental benefits of compost.

The Future

Traditional organics processing would need to expand by nearly 70% to handle just the compostable materials currently disposed, and it would need to more than double to handle this and the non-compostable portion. If traditional organics processing is unable to expand, other ways to handle organic materials will need to be developed. One technology that appears particularly promising is anaerobic digestion (AD), which has the potential to handle odorous and putrescible wastes such as food waste, meet strict environmental performance standards, and capture new revenue streams through the production of renewable energy and low carbon fuel. In addition, neither traditional composting or AD operations can handle all of the organics wastestream, particularly non-cellulosic and hence non-compostable components. Other thermochemical "Conversion" technologies (CT) such as combustion, gasification, and pyrolysis, may also be needed to turn organic materials into revenue generating commodities such as bio-char, electricity, and fuel. However, thermochemical CT facilities have been the subject of much debate related to their statutory definitions, potential impact on feedstock availability for other processes, environmental performance, and economic viability. Nevertheless, several jurisdictions are evaluating the potential of thermochemical conversion technologies to produce bioenergy and biofuels from residual organic materials that otherwise would be landfilled after recyclable and compostable materials are removed.

Policy Drivers that Provide New Opportunity

Several State policy drivers have the potential to significantly impact organic diversion, and CalRecycle is working with relevant agencies to capitalize on these opportunities. These include:

- Global Warming Solutions Act (AB 32), which requires a 30% reduction in greenhouse gas emissions by 2020, and the call to deal with climate change adaptation, both dependent on organic materials.
- Water Use Efficiency, another key component of the AB 32 Scoping Plan, which details water-efficient landscape requirements that include the use of compost for reducing evaporation, suppressing weeds, moderating soil temperature, and preventing soil erosion;
- Low Carbon Fuel Standard (LCFS), which requires a 20% reduction in the carbon intensity of fuels by 2020 and 30% by 2030.
- Renewables Portfolio Standard (RPS), which requires 33% renewable energy by 2020.
- Bioenergy Action Plan, which identifies challenges to the development of facilities that generate electricity or produce fuel from biomass and actions that the Bioenergy Interagency Working Group will take to address those challenges.
- AB 118 Alternative and Renewable Fuels and Vehicles Program, which provides over \$100 million to incentivize renewable transportation fuels.

These policies incorporate a combination of mandates, regulations, incentives, and market-based mechanisms in all of which organics can play an important role. With the abundance of organic wastes being disposed in California, these policy drivers provide opportunities to further redefine organic materials as resources, making them into usable products that help solve multiple environmental issues.

However, funding to support research and the development of financial incentives is needed to capitalize on the opportunities presented by this set of policy drivers.

CalRecycle Activities

Many activities are needed to increase traditional and new organics processing capacity throughout California. CalRecycle's efforts are documented in the Organics Roadmap IV (Attachment 1) and summarized briefly below:

1. Education and Promotion: CalRecycle continues to promote the benefits of compost and mulch, such as their positive impacts on climate change, water conservation, water quality, and soil health, and their short and long-term benefits to agriculture.
2. Research, Product Standards, and Technical Evaluations: CalRecycle's research on compost in agriculture, water retention and erosion control, and VOC and other emissions has been key in helping establish a more sound foundation for market development and appropriate regulations. However, CalRecycle funding is currently not available for further efforts. As a result, CalRecycle will continue to promote its existing research on organics regarding best management practices, work with agencies on consistent specifications and standards to ensure the highest quality materials, proactively investigate pathogen claims in finished compost and objectively determine if the investigation results agree with those claims, and where possible, conduct technical analyses that quantify environmental benefits (e.g., erosion control, water holding capacity, greenhouse gas reductions, etc.).
3. Siting and Capacity: CalRecycle will continue its activities to streamline permitting (for example, through completion of its Program Environmental Impact Review on Anaerobic Digestion and its ongoing review of CalRecycle composting regulations), and to collaborate with regulatory agencies and organics stakeholders on the development of other agencies' environmental regulations that may impact the organics infrastructure.
4. Economic Incentives: CalRecycle continues to pursue additional incentives, such as
 - Working with the ARB to develop an AD fuel pathway for the Low Carbon Fuel Standard that incorporates food and other organic wastes, including the organic fraction of municipal solid waste, as feedstock for the production of low carbon fuel;
 - Working with the CEC's AB118 Alternative and Renewable Fuels and Vehicles Program to fund projects that use biomass and MSW feedstock or are co-located at solid waste facilities. In the 2011 draft AB 118 Investment Plan, \$8 million is allocated for pre-landfill biomethane projects;
 - Collaborating with the Climate Action Reserve and the ARB to develop greenhouse gas emission reduction protocols which in the long-run will be critical to secure new sources of revenue to support the collection and processing of organic material that is currently being landfilled;
 - Continuing to provide low interest loans through the Recycling Market Development Zone Loan Program to projects such as Environ, Inc. and the Inland Empire Utilities Agency in Chino to be used to purchase pre-processing equipment for an anaerobic digestion project that will process food waste derived from commercial and industrial sources to produce biomethane gas.

Other ideas that may incentivize diversion include increasing the Integrated Waste Management Fee, which has not been increased in almost ten years, and allowing a portion of that fee to be used to increase organics diversion via grants, loans, and research; or pursuing market-based incentives that may become available, such as payments for GHG emission offsets to help bridge the cost differential between low cost landfill disposal and higher cost processes that produce value added organic products.

Roadmap IV Activities (2010/2011)			
	Update	Future Activities	
Core Issue*	Activity (* Conducted in 2010, but not included in Roadmap III)	2010	2011
Economic Incentives and Disincentives (Non-ADC)	Renewables Workplan	See renewables activities under AB 118, AD Program EIR, Low Carbon Fuel Standard, California Biomass Collaborative Forum, Sustainable Biofuels Roundtable, Emerging Technologies Guidance Document, Bioenergy and Biofuels Contract, and Integration of Rotary Drum Reactor and AD Technologies for Treatment of MSW.	
	Assist California Energy Commission in Review of AB 118 Applications	Participate on Investment Plan Advisory Committee, review CEC's annual investment plan, consult with CEC on technical aspects of proposals to develop waste-derived transportation fuels, review applications, consult with ARB on related issues; in 2010, over \$30 million was awarded for biomethane production activities and about \$3 million for biodiesel production.	http://www.energy.ca.gov/2009publications/CEC-600-2009-008/CEC-600-2009-008-CMF.PDF
	CEC Bioenergy Action Plan	Review and comment on CEC's 2011 Bioenergy Action Plan	CEC's 2011 Draft Bioenergy Action Plan includes \$8 million for pre-landfill biomethane projects.
	Economic Incentives Webpage	Created economic incentives webpage; coordinated with CalRecycle's General Business Assistance effort	Update economic incentives webpage as required.
	* RMDZ Loans	Funded a \$1,350,000 loan to Ortigalita Power, www.PhoenixEnergy.net, to build a biomass conversion plant in Merced County to process wood chips and other organics into electricity for sale to PG&E	Approved loan of \$1,637,500 to Environ Strategy, www.EnvironStrategy.com, to build an anaerobic digestion plant in San Bernardino County to process food waste into biomass gas and generate electricity for sale to the Inland Empire Utilities Authority, www.IEUA.org
			http://www.calrecycle.ca.gov/RMDZ/ZoneAdmin/

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	Third Assessment of California's Compost- and Mulch-Producing Infrastructure	Published August 2010	None Planned
	Clearinghouse and Guidance Tools for Developing Regional Infrastructure Studies of Organic Processing and Organic Material Supply	See Organics Toolbox	
Economic Incentives and Disincentives (Non-ADC) (cont.)	Baseline Infrastructure Inventory and Information Management Framework Contract	Completed initial inventory of disposal, diversion processing, and manufacturing facilities; built database and populated it with 3rd-party data	Projected to be completed by mid-2011; verify data with facilities; build model on facility capacity to 2025; identify capacity shortfalls; outreach through articles and conference presentations
	* Anaerobic Digestion Scoping Plan Measure (See AD Program EIR)	See AD Program EIR	See AD Program EIR
			http://www.calrecycle.ca.gov/swfacilities/Compostables/AnaerobicDig/default.htm
			http://www.calrecycle.ca.gov/Contracts/details.asp?ID=700
			http://www.calrecycle.ca.gov/Organics/RoadMap08/ToolBox.htm
			http://www.calrecycle.ca.gov/Publications/Organics/2010007.pdf
			Link

		Update	Future Activities	
Core Issue* Activity (* Conducted in 2010, but not included in Roadmap III)	Low Carbon Fuel Standard Scoping Plan Measure	Assisted ARB in development of AD pathway; working with CRRC, industry, and academia to gather processing data.	AD pathway projected to be completed late-2011	http://www.arb.ca.gov/fuels/lcfs/lcfs.htm
	CDFPA Issue: Safe Management of Waste Meat, Poultry, and Fish Waste	CDFPA and CalRecycle developed a FAQ document on safe management of waste meat, poultry, and fish waste. This FAQ targets generators, haulers, and solid waste facilities.	Review, revise, and finalize FAQs to align with new CDFPA rendering rules (rulemaking filing scheduled for Fall 2011). Participate with CDFPA in development of rendering rules.	http://www.calrecycle.ca.gov/swfacilities/compostables/wastemeat.pdf
	Siting and Capacity Development *Bifenthrin in Compost	Stakeholder meeting held in Monterey in January 2010. Bifenthrin was ruled by National Organics Program to be permissible in compost used for organic production if the concentration value was below the unavoidable residual environmental contamination (UREC) level defined as the lowest USEPA tolerance level and did not contaminate crops, soil, or water.	DPR will continue its reevaluation of all pyrethroids, including bifenthrin.	http://www.calrecycle.ca.gov/organics/threats/clopyralid/
California Statewide Waste Characterization Study	Published 2008 Study in August 2009	Next study planned for 2014. In mean-time, existing waste characterization data will be used to support commercial recycling regulation development, jurisdiction program implementation.	http://www.calrecycle.ca.gov/Publications/General/2009023.pdf	

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		Update	Future Activities	
	Update Organics Toolbox	Staff collected and updated information from local jurisdictions implementation policies related to compost and mulch use.	Staff will continue to update toolbox with local jurisdiction implementation policies related to compost and mulch use.	http://www.calrecycle.ca.gov/Organics/RoadMap08/ToolBox.htm
Core Issue*	Activity (* Conducted in 2010, but not included in Roadmap III)	2010	2011	Link
	Air Districts Composting Rules	Collaborate with San Joaquin Valley Unified Air Pollution Control District Rule 4566 and South Coast Air Quality Management District on revised Rule 1133.1 and 1133.3.		http://www.calrecycle.ca.gov/Organics/Air/default.htm#Rules
Regulatory & Permitting Constraints	* Collaborate with Air Districts and USEPA on Federal New Source Review application to composting	San Joaquin Air District is applying Title I Clean Air Act rules (New Source Review) to new and expanded composting facilities. This may preclude development of new facilities within the district by making new or expanded facilities economically infeasible.	Collaborate with districts, with USEPA, and potentially with legislators to look for solutions.	http://www.epa.gov/nsr/actions.html
	Coordinate with SWRCB staff on Conditional Waiver of Title 27 Waste Discharge Requirements for Composting Facilities	Submitted comments on Draft (Internal Working Document) "Current Concepts for the Conditional Waiver of Title 27 Waste Discharge Requirements for Composting Facilities (May 2010).	Conditional Waiver to be considered for approval at SWRCB November 2011 Board meeting.	http://www.calrecycle.ca.gov/Organics/Water/default.htm

	<p>Core Issue*</p> <p>Food and Green Waste Anaerobic Digestion (AD) Program EIR</p>	<p>Activity (* Conducted in 2010, but not included in Roadmap III)</p> <p>Contractor developed AD draft Program EIR in November 2010.</p>	<p>2010</p> <p>Draft Program EIR released for public comment in February 2011. Final Program EIR scheduled for completion by summer 2011.</p>	<p>2011</p> <p>http://www.calrecycle.ca.gov/swfacilities/Compostables/AnaerobicDig/default.htm</p>
	<p>Provide input to Central Valley Regional Water Quality Control Board on Dairy Co-Digestion AD EIR</p>	<p>CalRecycle staff participated in Technical Advisory Group meetings & provided comments on Notice of Preparation and draft Program EIR. Dairy Co-Digestion AD Program EIR was approved by CVRWQCB in November 2010.</p>	<p>Completed</p>	<p>http://www.waterboards.ca.gov/centralvalley/board_decisions/tentative_orders/1012/dairy_digester_eir/dairy_digestr_fpeir.pdf</p>
<p>Regulatory & Permitting Constraints (cont.)</p>	<p>* SCAQMD Rule 1110.2 Technical Review Group</p>	<p>Rule concerns NOX control for internal combustion engines burning LFG. Provided comments on rulemaking during August 2010.</p>	<p>Monitor and comment on revised draft rule.</p>	<p>http://www.aqmd.gov/rules/support.html#Rule_1110.2</p>
	<p>CallRecycle SD 8.3 Regulations Reviews: ADC</p>	<p>CalRecycle, in consultation with LEA's and other stakeholders, developed a draft ADC demonstration guidance document. This document will assist landfill operators in developing, implementing, and documenting ADC demonstration projects.</p>	<p>Completion delayed due to resource constraints</p>	<p>http://www.calrecycle.ca.gov/LEA/regs/review/default.htm</p>

Core Issue*	Activity (* Conducted in 2010, but not included in Roadmap III)	2010	2011
S.D. 8.3 Regulations Review: Food Waste Composting	Staff visited several compost facilities to observe & document food waste composting best management practices.	CalRecycle may revise composting regulations to change the definition of food waste and allow food waste composting in EA Notification tier if certain best management practices are implemented by operators.	http://www.calrecycle.ca.gov/LEA/egs/review/default.htm
S.D. 8.3 Regulations Review: Study on Other States' Regulatory Oversight	S.D. 8.3: Study on Other States' Regulatory Oversight of Waste and Material Handling Activities Relative to Recycling Centers, Transfer Stations, and Green Material Contamination published February 2010	Completed	http://www.calrecycle.ca.gov/Publications/Facilities/2010003.pdf
S.D. 8.3 Regulations Review: Beneficial Reuse - Landspreading	Staff completed draft white paper in 2010.	CalRecycle may address issues if composting regulations are revised.	http://www.calrecycle.ca.gov/LEA/egs/review/default.htm
Regulatory & Permitting Constraints (cont.) S.D. 8.3 Regulations Review: Farm & Ranch Organic Diversion (storage of green-derived processed material)	Staff completed draft white paper in 2010.	CalRecycle may address issues if composting regulations are revised.	http://www.calrecycle.ca.gov/LEA/egs/review/default.htm
CA Biomass Collaborative Forum	Forum Held May 10-11, 2010	Forum to be held April 5-6, 2011; participate in agenda development	http://biomass.ucdavis.edu/f2010.html
* Sustainable Biofuels Roundtable	Not Active	Participate in Sustainable Biofuels Roundtable; work with California Biomass Collaborative on multi-agency conversion technology facility tour	http://biomass.ucdavis.edu/

	Core Issue*	Activity (* Conducted in 2010, but not included in Roadmap III)	2010	2011
<p>Regulatory & Permitting Constraints (cont.)</p>	<p>Outreach on Department of Water Resources (DWR) Model Water Efficient Landscape Ordinance (effective September 10, 2009)</p>	<p>Provided DWR with flyer templates for its workshops, updated CalRecycle web page to promote the ordinance.</p>	<p>Completed</p>	<p>http://www.water.ca.gov/wateruse/efficiency/landscapeordinance/</p>
	<p>Emerging Technologies Guidance Document</p>	<p>Completed first draft</p>	<p>Completion delayed due to resource constraints</p>	<p>N.A.</p>
	<p>Mandatory Commercial Recycling Rulemaking</p>	<p>Workshops held June 16 and September 21, 2010.</p>	<p>Workshop held January 19, 2011. Formal rulemaking anticipated to start late spring 2011.</p>	<p>https://share.epanet.ca.gov/Waste/MCR/default.aspx</p>
<p>SWRCB Workgroup for Compost Use on Food Crops</p>	<p>Participated in Workgroup; Attended Meetings</p>	<p>No further meetings scheduled</p>	<p>N.A.</p>	
<p>* CDFA Issue: AB 856 - Organic Fertilizer</p>	<p>CalRecycle was represented on CDFA's AB 856 Implementation Committee, which met a half dozen times and includes members from all major stakeholder groups associated with organic production.</p>	<p>Workshops for composters held in February in Modesto and in April in San Diego at BioCycle. CDFA submitted regulations to OAL in February. Composters should begin to license their facilities and register their organic inputs. AB 856 Committee "on call" for 2011 if needed.</p>	<p>http://www.leginfo.ca.gov/pub/09-10/bill/asm/ab_0851-0900/ab_856_bill_20091011_chaptered.pdf</p>	

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<p>Core Issue*</p> <p>Activity (* Conducted in 2010, but not included in Roadmap III)</p>	<p>2010</p> <p>A workshop was held in March 2010 to present research results from two compost demonstration projects conducted at UC Riverside's agricultural field station. The workshop consisted of a tour of the research plots and a presentation on data collected on the constituents in plot runoff. Workshop attendees included local and state water agencies, local jurisdictions, compost professionals and other interested parties.</p>	<p>2011</p> <p>The Compost BMP Final Report is in the final stages of review.</p>	<p>Link</p> <p>Anticipated to be published May 2011.</p>
<p>Research, Product Standards, and Technology Evaluation</p>	<p>Compost BMPs and Benefits Contract (IWM-07052)</p>	<p>5-TPD Biomass-to-Power and Mixed Alcohol Facility Operational 1st Quarter 2010. Overall project funded primarily by UC Discovery Grant and CEC.</p>	<p>http://www.calrecycle.ca.gov/Archive/IWM/MBMtgDocs/Agenda.asp?ReclD=1434&Year=2008&Comm=BRD&Month=1</p>
	<p>Bioenergy and Biofuels Contract</p>	<p>Contractor's report published April 2010; proved feasibility of concept</p>	<p>Completed</p>
	<p>Final Report on Landfill-Based Anaerobic Digestion Pilot Project</p>	<p>Coordinated with LEAs to obtain lab analysis reports on salmonella, E coli</p>	<p>Reviewed lab reports to determine number of compost samples that exceeded regulatory requirement</p>
<p>Compost Pathogen Testing Analysis</p>			

Core Issue*	Activity (* Conducted in 2010, but not included in Roadmap III)	2010	2011
Final Report on Compost Cover at Landfills Methane Reduction	Received Contractor's draft report mid-2010	Final report posted February 2011. Project verifies positive benefits of methane oxidation from biocover.	http://www.calrecycle.ca.gov/Publications/Organics/2011004.pdf
CalRecycle-Funded Compost Production N ₂ O Emissions Research	This CalRecycle contract funds research on whether compost piles emit GHG and whether application of finished compost on agricultural land can reduce N ₂ O emissions from soil. The contract with UC Davis/Prof. William Horwath signed in July. Draft study plan approved in November.	Field work has begun and will continue through 2011. Plots at Russell Ranch Farm Research Center at UCSD set up. Sampling at Northern Recycling compost site in Zamora will occur throughout year.	http://www.calrecycle.ca.gov/Archive/WM/WMtgsDocs/Agenda.asp?RecID=1595&Year=2009&Comm=BRD&Month=12
Organics Diversion Alternatives LCA Contract	Held workshop on GHG Tool on April 19, 2010.	Contract completed.	http://www.calrecycle.ca.gov/climate/organics/lifecycle/
Ag Specifications Outreach Activities	Contract completed in May 2009, all deliverables received.	In process of redefining the Compost Use Index (CUI). Staff will take contractor's summary and prepare a "Final Report" for publication and distribution. Staff will promote the updated CUI via list serves, LAMD staff and the Organics Toolbox, etc.	N.A.

Research, Product Standards, and Technology Evaluation (cont.)

Core Issue*	Activity (* Conducted in 2010, but not included in Roadmap III)	2010	2011
<p>Mobile Ozone Chamber Assay Contract</p>	<p>Field studies carried out in April, May. Lab work May-July. Draft report November-December.</p>	<p>Report published in February, 2011. Results presented at US Composting Council and at BioCycle. Study found that emissions from composting piles of green waste consists of 70-95% low-reactivity alcohols, which are not likely to form ground-level ozone when part of a diverse atmosphere. The total composting emissions mix is roughly 1/3 as reactive as the typical mix of VOCs found in urban areas (i.e., VOCs from all sources).</p>	<p>http://www.calrecycle.ca.gov/Archive/WM/MTgDocs/Agenda.asp?RecID=1579&Year=2009&Comm=BRD&Month=8</p>
<p>Research, Product Standards, and Technology Evaluation (cont.)</p> <p>*Evaluate GHG Emissions Associated With Products in Support of AB 32 Scoping Plan EPR Measure</p>	<p>Contracts with UC Berkeley and Santa Barbara for "EPR Evaluation of GHG Emissions Associated with Products" project run through May 2012. In 2010, contractors and project team finalized a set of 20 products to run through the LCA model which they are currently developing. The products were selected by project team based on 1) a preliminary ranking of products that represent a significant volume in California's waste stream and that also demonstrated environmental, waste management, and product management impacts, and 2) certain products of legislative interest.</p>	<p>Major milestones for 2011 include updating the CA-specific Economic Input Analysis Life Cycle Assessment (EIA-LCA) model with end of life (EOL) data; running model for the list of 20 products; identifying life-cycle and environmental impacts and potential improvements; developing ranked list of products on which to focus product stewardship efforts; and identifying 3 products, based on ranked list and input from a public workshop to solicit input for which to develop detailed case studies.</p>	<p>http://www.calrecycle.ca.gov/EPR/</p>

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Research, Product Standards, and Technology Evaluation (cont.)	* Integration of Rotary Drum Reactor and Anaerobic Digestion Technologies for Treatment of Municipal Solid Waste	Contractor's report published June 2010	Completed	http://www.calrecycle.ca.gov/Publications/Organics/2010004.pdf
	* California Landfill Methane Inventory Model (Bogner Study)	CEC-funded project to develop model to predict GHG emissions from landfills. Provided technical support to CEC.	Finalize in 2011	http://www.energy.ca.gov/2010publications/CAT-1000-2010-005/Research Collaboration Case Studies/Landfill Methane Inventory Model.pdf
	Outreach to Caltrans and Local Government on Caltrans Compost-Based BMPs	Last series of workshops held in 2009. See agricultural specifications project for follow-up activities.		http://www.calrecycle.ca.gov/Organics/erosion/Workshops/2008/Default.htm

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<p>Core Issue*</p> <p>Activity (* Conducted in 2010, but not included in Roadmap III)</p>	<p>2010</p> <p>Completed evaluation of all Web pages related to "organics" matters. Conducted analysis and editorial/navigational updates. New Organics home page was launched in spring of 2010. High-level link to the Food Scrap Management home page was added to the CalRecycle home page. Completed Web traffic analysis to further review customer needs and discover the nature of Web traffic searches and patterns.</p>	<p>2011</p> <p>Analysis and editorial/navigational updates have been ongoing over the last year and continue. A new Food Scrap Management home page, updates to "related" pages and likely new pages (due to the upgrade to the home page) are gearing for launch in the first quarter of 2011.</p>	<p>Link</p>
<p>Education & Procurement</p>	<p>Organics Research Clearinghouse</p>	<p>CT Module Design Completed. Information updated and used by staff to track CT projects.</p>	<p>http://home.calrecycle.net/MM/LAD/Teams/CT/Pages/default.aspx</p>
	<p>K12 Curriculum Development</p>	<p>State Board of Education approved Education and the Environment Initiative Curriculum and outreach to twenty school districts began. By end of 2010, fifteen school districts signed on as Early Adopters and began using the curriculum in Calif. classrooms.</p>	<p>Recruitment of additional Early Adopter School Districts continues and implementation across the State is growing. An online professional development (PD) tool and supporting materials are being developed and PD will be provided on a very large scale if funding is available.</p>
	<p>Annual IEA Training and Technical Course Series (Organics Components)</p>	<p>No conference held in 2010</p>	<p>Annual IEA/CalRecycle Conference held in Monterey February 28 - March 3, 2011</p>

Compost Best
Management Practices
and Benefits



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Executive Summary

This report presents the results of a research project that evaluated ways to conserve water and protect water quality as related to compost production and application. The project has four related objectives. The first objective considers the use of compost for remediating fire-damaged soils; the second looks at compost blankets as a means of restoring soils damaged by construction activity; the third investigates a potential Best Management Practice (BMP) for minimizing water pollution from compost operations, including a calculator developed to estimate a compost pile's potential water holding capacity; and the fourth is a literature review conducted on several topics related to the beneficial use of compost.

Background

Remediation of Fire-Damaged Soils

In California, the initial costs associated with wildfires, including suppression and structural damages, commonly exceed hundreds of millions of dollars each year. However, subsequent environmental damage, most prominently soil erosion and the associated water pollution, can substantially increase those costs. Fires eliminate vegetation, leaving soil particles exposed to the energy of falling precipitation. Under some circumstances, hydrophobic condensates from burning materials can increase stormwater runoff by decreasing the soil's infiltration capacity. Unimpeded by lack of vegetation or associated duff, dislodged soil particles will flow off of slopes as sediments, carrying with them not only nutrients but trace metals and other pollutants.

From research in other states, it is known that compost, whether incorporated or applied as a blanket, can decrease runoff and erosion as well as associated water pollution. Research in the eastern and Midwestern United States has focused on the remediation of construction sites using compost. Although the extension of compost use as a tool to protect and restore fire-damaged soil may seem straightforward, no formal studies have been reported. Because compost is rich in nutrients and organic matter, it stabilizes soils and facilitates revegetation which reduces sediment losses resulting from subsequent storms. When applying compost as a water quality BMP, composts contain nutrients, trace elements, and salts. The fate of these constituents must also be considered when evaluating compost use as a remediation alternative.

Remediation of Construction Soils

Construction activity, whether for erecting buildings or installing roadways, is a significant source of sediments. Construction commonly involves removing surface soil layers along with their accumulated humus and associated nutrients. Often the remaining soil is similar to decomposed bedrock in its characteristics. Alternatively, heavy clay or light sand may be exposed. Construction soils may also suffer from intentional or inadvertent compaction. Compost blankets have been shown to assist in controlling the erosion of soil damaged by construction activities. As with fire-damaged soil, compost blankets work by protecting the soil directly from the impact of falling rain. The compost blankets encourage infiltration into the damaged soil by slowing surface water movement and encouraging vegetative development.

Compost Production Best Management Practice

At compost production facilities, the need exists to manage operations so that their compost's macronutrients (nitrogen [N] and phosphorous [P]), trace elements, and salts are effectively conserved onsite and not exported into the environment as pollutants. Any waterborne pollutants exiting compost facility sites have the potential to eventually enter surface water and groundwater. It should be noted that many of the trace elements and salts contained in composts are also plant nutrients that will improve soil fertility. Compost production BMPs that conserve macronutrients, trace elements, and salts within the compost media enhance soil productivity while conserving water quality. Compost has a substantial water-holding capacity, and the active compost piles themselves may potentially be used to store precipitation water so that it does not move pollutants off-site. This study has afforded the opportunity to consider the use of compost's water storage capacity as a water quality BMP.

Literature Review

While the benefits of compost use are well-heralded, it is important to have scientific research which corroborates these benefits. With this study, the literature review assessed information on the benefits of compost applications with respect to specific environmental issues, and identified areas needing further scientific investigation.

Study Design

Fire-Damaged Soils

This study evaluated the use of compost blankets for mitigating soil erosion and the associated export of pollutants from burn areas. For the study, a controlled burn was conducted on an experimental area located at the University of California, Riverside. Three different compost were studied, including compost from a greenwaste feedstock (compost-greenwaste) in both a fine (less than 3/8 inch screen size) and coarse (greater than 3/8 inch screen size) grade, and co-composts from a mix of greenwaste and biosolids feedstocks (compost-biosolids) in a fine grade (less than 3/8 inch screen size). One- and two-inch blankets were included for each type of compost in the study, and an additional treatment involved the use of an incorporated two-inch blanket (i.e. two inches of compost was worked into the soil to a depth of three inches). Runoff volumes were measured following four storms that occurred during the months of December 2009 and January 2010. The study also measured the associated sediments, salts, nutrients, and trace elements in the runoff and compared the runoff results for compost treatments against the untreated controls.

Construction Soils

An adjacent experimental area to the Fire-Damaged Soils study at the University of California, Riverside location was used to evaluate the remediation of construction soils using compost. The experiment considered one inch applications of compost-greenwaste and compost-biosolids on a site simulating one that was recently damaged by construction activity, and included three seeded treatments: no reseeding; a basic native erosion control mix; and an inland sage scrub mix. Runoff volumes were measured following three storm events during January 2010. The study also measured the associated sediments, salts, nutrients, and trace elements in the runoff.

Compost Production

Water movement through active compost piles (fugitive water flows) can carry pollutants from the piles and into the environment. By controlling fugitive water flows, pollutants can be contained in the piles. Therefore, this study evaluated best management practices (BMPs) for compost production that are designed to minimize leaching and runoff losses by taking advantage of the ability of compost to absorb and hold water.

The goal of this series of experiments was to develop guidance for composters regarding BMPs for compost piles that reduce surface and groundwater pollution. In addition, part of the experiment was to develop a simple computer program that a composter could use in the field to easily determine how much precipitation a given pile could hold. Compost-greenwaste and compost-biosolids samples were collected from freshly formed piles for three different maturity dates (first, seventh, and fourteenth day of active composting). The samples were used to measure estimated water storage capacity of the composts, model movement of water through a compost pile during a precipitation event, and test management strategies to increase water infiltration into compost piles.

Literature Review

A review of the literature referenced in the bibliography was completed to identify topics related to compost use requiring additional research. The following themes were pursued: compost use and types of application; erosion control; vegetation establishment; stormwater quality; water conservation; fertilizer and pesticide reduction; and greenhouse gas (GHG) reduction.

Key Findings

Compost has the ability to absorb and store a considerable amount of water and concentrated nutrients. Therefore, the runoff volume of water during a rain event from soil treated with compost is significantly reduced. Although the concentration of nutrients in the runoff can be highly concentrated, due to the significantly lower volume of runoff, the overall mass of nutrients is comparatively low. Study results rendered the following key findings:

- Compost applications are very effective in reducing water runoff. On average, runoff volumes were reduced by 80 percent.
- Compost applications are very effective in reducing soil erosion. On average, sediments, total dissolved solids (TDS), and total suspended solids (TSS) were reduced by 95, 65, and 94 percent respectively.
- Compost applications had the following effect on water quality when compared to plots containing no compost (on average): nitrate was reduced by 80 percent, and salinity concentrations were increased by 467 percent. However, since salinity is only a measure of the concentration of salts and does not reflect the mass of salts being exported in runoff from the plots, it is more appropriate to consider the Total Dissolved Solids value which can be flow-weighted.
- Mass flux measurements are more appropriate water quality indicators than concentration values. Due to significantly reduced runoff volumes and potentially high concentration of

nutrient loadings from compost applications, mass flux measurements that take into account both concentration and flow rate are better water quality indicators for the total mass of constituents in the runoff water.

At a compost facility, BMPs for water management in compost piles can help leachate and water runoff by considering the ability of compost to absorb and hold water.

- Composters can consider using existing water storage capacity of compost piles to control the movement of leachate (water with nutrient concentrations) from their piles, reducing the potential to pollute surface water and groundwater. Composters can use the Storage Potential Calculator, an interactive Excel tool presented in this report, to evaluate the capacity of their piles to store water and subsequently take steps to minimize runoff in the event of rain.
- Compost windrows shaped with a flat top have improved water infiltration. The use of a surfactant improved infiltration into dry composts from a greenwaste feedstock.

The literature review indicates that existing research shows:

- Compost blankets are very effective at reducing sediments that pollute water;
- Compost can conserve water in landscapes, especially where soils are severely damaged by construction activity or erosion;
- Compost, whether incorporated or applied as a blanket, can speed up revegetation efforts and improve cover densities; and
- Compost improves soil fertility.

The literature review indicates research gaps for compost in the areas of: field-scale compost application studies (placement, depth, slope, support structures, wind erosion); compost berms, filters, and compost socks; revegetation and native species studies; integration of compost in fertilizer and pest management plans; and greenhouse gas emission studies.