

# Biosolids Composting in the U.S. in 2010

*Ned Beecher*

*Executive Director, North East Biosolids & Residuals Association*

January 26, 2011

New England Water Environment Association

Annual Conference • Marriott Copley Hotel • Boston



**BIOCYCLE**



# Acknowledgments

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*BioCycle* Survey: Nora Goldstein, Nathan Clark

The survey results were published in the December, 2010 and January 2011 editions of *BioCycle*. Free download of the main survey results available at [http://www.jgpress.com/archives/2010\\_12.html](http://www.jgpress.com/archives/2010_12.html).

Sally Brown, Univ. of Washington

Nathan Widell, Waste Options, Nantucket, MA

Other facilities: organization websites & NEBRA

*! And thanks to NEWEA for this opportunity. !*



**BioCYCLE**



# compost...

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why?

# Many benefits of *composting*:

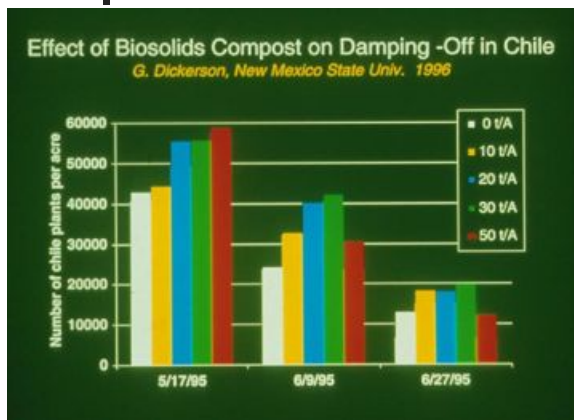
- More stable product with diverse uses
- Using nutrients & organic matter
- Reduces disposal; saves landfill space
- Creates local jobs



Floor  
aerated  
windrow

Images this & next 4 slides  
courtesy WSU: [http://  
organic.tfrec.wsu.edu/compost/  
ImagesWeb/CompImages.html](http://organic.tfrec.wsu.edu/compost/ImagesWeb/CompImages.html)

# Benefits of *using compost*:



- Suppress plant diseases and pests.
- Reduce the need for chemical fertilizers.
- Promote higher yields of agricultural crops.
- Facilitate reforestation, wetlands restoration, and habitat revitalization efforts by amending contaminated, compacted, and marginal soils.



# More benefits of *using* compost...

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- Cost-effectively remediate soils contaminated by hazardous waste.
- Remove solids, oil, grease, and heavy metals from stormwater runoff.
- Capture and destroy 99.6 percent of industrial volatile organic chemicals (VOCs) in contaminated air.
- Provide cost savings of at least 50 percent over conventional soil, water, and air pollution remediation technologies, where applicable.

Text on this and prior slide from: <http://www.epa.gov/waste/consERVE/rrr/composting/basic.htm>



Billerica, MA biosolids compost applied on a golf green.



Merrimack, NH biosolids compost helps keep this central MA golf course green.



Biosolids compost for wildflowers along a NH interstate highway.

Boston Harbor Islands, Massachusetts 2004





## And more benefits of *using* compost...

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- Improved crop nutritional value (micronutrients)
- Slow release of nutrients = less nutrient pollution of ground & surface waters
- Reduced use of pesticides / fungicides (due to improved biological richness in soil & healthier plants)
- Improved water holding capacity of soil, reducing irrigation needs (30% compost in soil = an additional 1.9 gallons/cubic foot)



Maine's Colby College uses biosolids compost on sports turf, improving safety for players.



The Great Lawn in New York's Central Park is growing on Merrimack, NH biosolids compost.



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# More & more & more benefits...

- “In general, N-rich, well-matured composts were good media for sod growth” (Barker, Univ. of MA, 2001).
- “The severity of leaf rust caused by Puccinia sp. was significantly less on perennial ryegrass seeded on compost-amended soils” (Loschinkol & Boehm, Ohio State, 2001)
- Re greenhouse gas emissions: “intensive management systems that result in increased soil organic matter are a significant part of the solution” (Wright et al., OK State, 2001).





# More C in soil = less CO<sub>2</sub> in atmosphere

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- “Soils can contain as much as or more carbon than living vegetation. For example, 97 percent of the 335 billion tons (304 billion metric tonnes) of carbon stored in grassland ecosystems is held in the soil” (Amthor et al, Oak Ridge National Lab, 1998, as quoted at <http://www.sustainablesites.org>).
- “Some cultivated soils have lost one-half to two-thirds of the original SOC\* pool ....The soil C sequestration is a truly win–win strategy. It restores degraded soils, enhances biomass production, purifies surface and ground waters, and reduces the rate of enrichment of atmospheric CO<sub>2</sub> by offsetting emissions due to fossil fuel” (R. Lal, Ohio State, 2004).

\*soil organic carbon



greenhouse gas  
Other ^ benefits of *using* compost

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- Replacing chemical fertilizers
  - ~ 4 kg CO<sub>2</sub> / kg N (Recycled Organics Unit, 2006)
  - ~ 2 kg CO<sub>2</sub> / kg P (Recycled Organics Unit, 2006)
- Improved soil tilth / workability = less fuel for working soil
- Replacing peat

# Compost has that “C” for soils...

- Food waste
- Yard trimmings
- Manures / biosolids

Compost them! Return them to soils!





# GHG protocol: CH<sub>4</sub> avoidance for diversion to compost facilities

## Default Projected Yields of Waste Streams Diverted from Landfilling

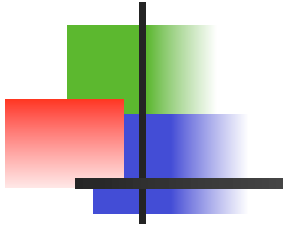
(Mg CO<sub>2</sub>e/wet ton waste diverted)

Waste type	Year 1	Year 2	Year 3	Total
Food waste	0.28	0.23	0.19	0.7
Yard waste	0.11	0.1	0.09	0.3
Biosolids	0.05	0.04	0.03	0.12

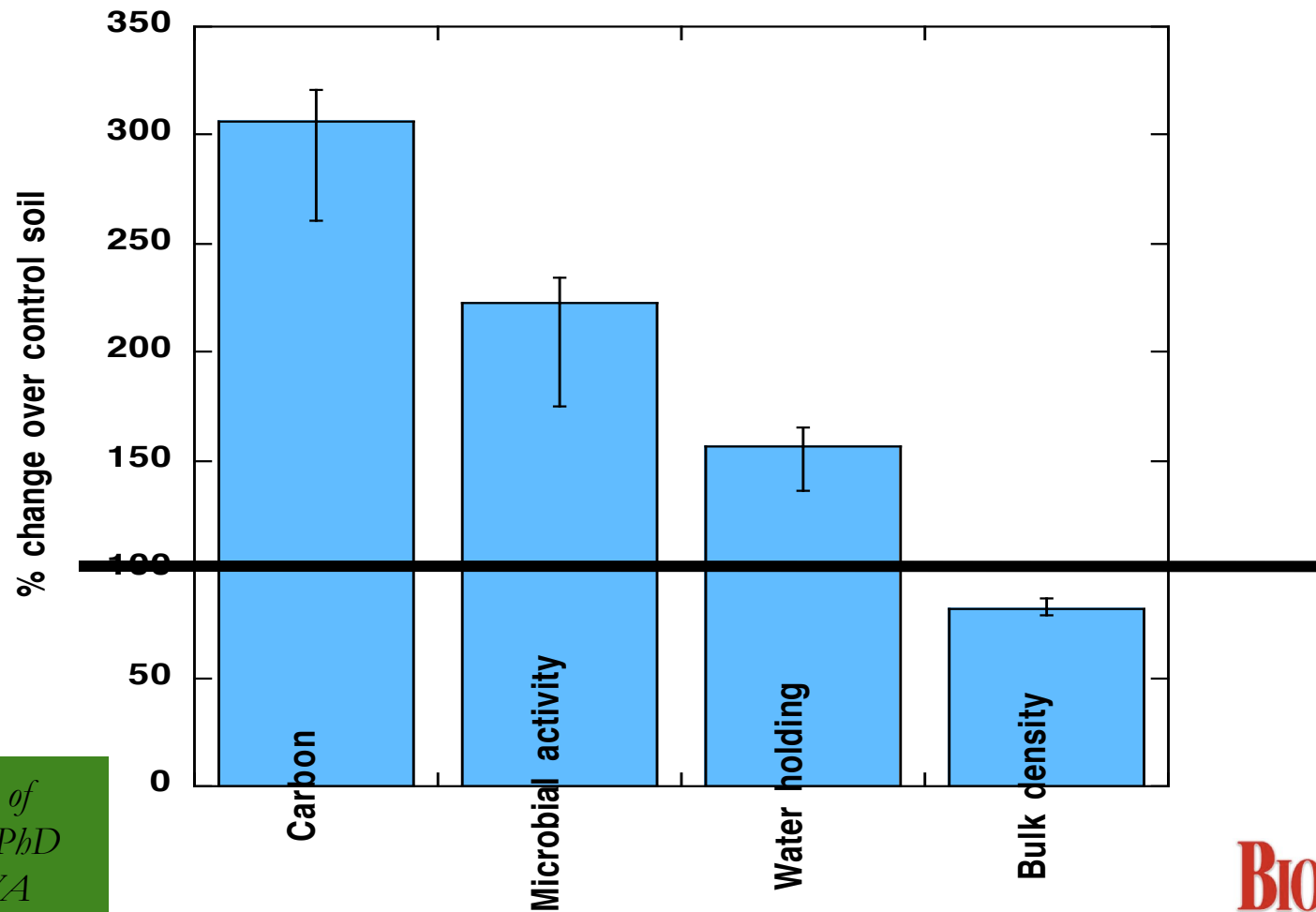
**Total = 1.12 Mg CO<sub>2</sub>**

*Slide courtesy of  
Sally Brown, PhD  
Univ. of WA*

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## Univ. of WA study: across all sites



*Slide courtesy of  
Sally Brown, PhD  
Univ. of WA*



# *Are you convinced?* Compost is an important resource...



Washington, before



Washington, after

photos courtesy of Orgro and Eliot Epstein, Ph.D.





## But what about biosolids compost quality?

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When composted in accordance with regulations and best management:

- Trace elements (metals): regulated
  - exhaustively researched
- Pathogens & VAR: Class A
  - safe for all public uses
- Microconstituents (trace chemicals):  
composting provides excellent treatment



# Scrutiny continues...

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- 2010 San Francisco fracas re biosolids compost give-aways...
- Contrast that with this independent finding:

Janet Pichette, Environmental Toxicologist with the Austin/Travis County Health and Human Services Department reviewed the test results and compared them with standards set by the Texas Commission on Environmental Quality (TCEQ) for Protective Concentration Limits (PCLs) in residential (for Dillo Dirt™).... Her evaluation accounted for possible exposure through skin, breathing, eating, and drinking for anyone in daily contact with the material.... “concentrations of compounds in these compost and digested sludge samples were below acceptable PCL values and do not pose a risk to human health.”

# Trace Elements (Metals)



## Fairbanks, AK

Table 2: Compost Product Trace Metal and Pathogen Content

Parameter		Units	GHU Compost
Arsenic	-total	mg/kg	<3.9
Cadmium	-total	mg/kg	2.6
Chromium	-total	mg/kg	25
Lead	-total	mg/kg	33
Mercury	-total	mg/kg	2.5
Selenium	-total	mg/kg	6.7
Copper	-total	mg/kg	340
Nickel	-total	mg/kg	21
Molybdenum	-total	mg/kg	6.6
Silver	-total	mg/kg	17
Zinc	-total	mg/kg	560
Fecal coliform		cfu/g	<2.0

MRL -Method Reporting Limit  
 nd -not detected  
 cfu -colony forming units  
 EQ -exceptional quality  
 < -less than

2009 Average Concentration of Metals in Com-Til and Com-Til Plus  
 (All values in mg/kg)

	COM-TIL	COM-TIL PLUS	Maximum Value Allowed
Arsenic	4	5	41
Cadmium	2	3	39
Chromium	27	48	1200
Copper	247	463	1500
Lead	39	82	300
Mercury	0.52	0.35	17
Molybdenum	15	16	35
Nickel	22	39	420
Selenium	4	4	100
Zinc	1294	2084	2800

Experience the Wonder of Plants Grown with COM-TIL

Com-Til is a composted mix of biosolids from the City of Columbus Wastewater Treatment Plants, yard waste and wood chips. Com-Til Plus also contains some incinerator ash (sand).

Columbus, OH



# Soil amendment

Typical Analysis

Inland Empire, CA

(% by weight)

Nitrogen	1.5 - 2
P2O5	1-2
K2O	.5-1

Couer d'Alene  
pH

Nitrogen, % (;

Phosphorus, %

Potassium, %

C.E.C., meq/100 g

Organic Matter, %

Bulk Density, lb/ft<sup>3</sup>

**PRODUCT ANALYSIS**

pH.....7.9  
Total Nitroaen.....1.8%

**ORGRO® HIGH ORGANIC COM**

**Guaranteed Analysis**  
**1-1-0**

Total Nitrogen  
< .25% Water Soluble Nitroge  
> .75% Water Insoluble Nitroge

Phosphate (P2O5)  
Potash (K2O)

Calcium	mg/k
Magnesium	mg/k
Total Nitrogen	mg/k
Total Organic Nitrogen	mg/k

35-40



**2009 AVERAGE NUTRIENT VALUES**

	COM-TIL	COM-TIL PLUS
SOLIDS	61%	70%
TOTAL NITROGEN mg/kg	38000	32800
PHOSPHORUS mg/kg	27000	47900
POTASSIUM mg/kg	5500	6800
pH	7.6	8.2
SOLUBLE SALTS dS/m	4.65	4.42
CARBON: NITROGEN Ratio	8.4 : 1	8.9 : 1

Concentration of Metals on next page



# So modern biosolids compost is good, but how common is it?

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## *BioCycle*/NEBRA National Survey 2010

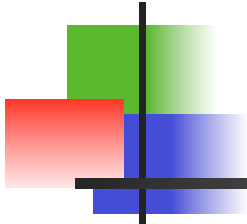
- Data from U. S. EPA regional staff, state environment agencies, and contact with many of the facilities & vendors:
  - Tons biosolids processed/year
  - Amendments / other feedstocks
  - Composting technology / method
  - Some pricing data for sales
- Results in December 2010 *BioCycle*



# Historical perspective

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Year	Operating Facilities	Facilities under construction or planned
1983	61	29
1998	274	47
2010	261	5



# Compost methods

**Table 1. Summary of composting methods utilized by U.S. projects**

System Type	
Aerated static pile	108
Windrow	83
In-vessel	46
Aerated windrow <sup>1</sup>	8
Static pile	4
Enclosed aerated static pile <sup>2</sup>	4
Vermicomposting	1
Not specified <sup>3</sup>	9
<b>Total projects</b>	<b>265</b>

<sup>1</sup>Windrow on in-slab aeration system. <sup>2</sup>Engineered tarp enclosure with aeration. <sup>3</sup>Unable to confirm composting method utilized.



# A regular but small slice of the biosolids use & disposal pie

7.8% of U. S. biosolids are composted – 562,000 dry tons

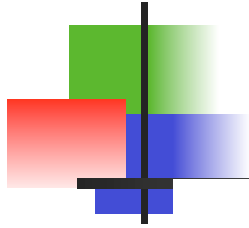
State	Total biosolids (dry U. S. tons, 2004)	Approx. % composted & estimated trend since 2004
Maine	32,200	13% increasing
Vermont	9,000	4% decreasing
Alaska	17,000	9% steady
Washington	110,600	11% increasing
California	788,700	22% decreasing
Ohio	354,000	7% steady
New York	353,300	4% decreasing





# Operating U. S. Biosolids Composting Facilities

U. S. EPA Region	States with Biosolids Composting Facilities	Number of Facilities
1	New England (CT, MA, ME, NH, RI, VT)	35
2	New York, New Jersey, Puerto Rico	30
3	Delaware, Maryland, Penn, Virginia, W. Virginia	26
4	Florida, Georgia, Kentucky, N & S Carolina, Tenn	32
5	Indiana, Michigan, Ohio, Wisconsin	10
6	Arkansas, New Mexico, Oklahoma, Texas	31
7	Iowa, Kansas, Missouri, Nebraska	14
8	Colorado, Montana, S. Dakota, Utah, Wyoming	38
9	Arizona, California, Hawaii, Nevada	20
10	Alaska, Idaho, Oregon, Washington	30
None:	Alabama, Illinois, Louisiana, Minnesota, Mississippi, N. Dakota	
	<b>TOTAL</b>	<b>266</b>



# Trends / Challenges

- Competition for wood waste from biomass plants
- Inexpensive landfill disposal
- Space requirements for composting
- Nuisances, esp. for low-tech/cost systems
- Regulations: (e.g. CA air regs)
- Other competing Class A technologies
- Continued Class B land application (west)
- Operator & public perception of value
- Methods less based on climate, more on regs



## Hard to control some trends...



The 2010 floods ended the West Warwick, RI biosolids compost operation (in large building in foreground) – at least temporarily. Plans are to start up again in 2011.



# Trends / Positives

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- Lengthening history and experience
- Improved expertise & management (odor control)
- More regional facilities
- Value recognized in professional markets (golf course design, sports fields, landscaping, etc.)
- Most facilities sell: \$5 - \$30+ / cu yard
- Many high-visibility applications
- In most areas - standard part of soil markets

<http://www.akwater.com/compost.shtml>

# Fairbanks, AK

## The Benefits of Compost

“The production of compost produced from the biosolids at the Golden Heart Utilities Wastewater Treatment Plant is a true success story for the arctic.”

~1,500 dry Mg biosolids, amended with wood chips



The screenshot shows the website for Utility Services of Alaska, Inc. The navigation menu includes 'About Us' and 'Your Account'. Under 'OPERATIONS', there are links for 'Water Quality', 'Compost', 'College Utilities', 'Golden Heart Utilities', and 'FAQ'. The main content area features a map of the wastewater treatment plant location at 4247 Paper Rd. and text describing the compost production process and its benefits.

compost as Exceptional Quality (EQ), their highest rating for compost and it has no restriction on use.

The Wastewater Treatment Plant at 4247 Paper Rd. During 2004, the compost operation processed more than 9,300 wet tons of biosolids from the wastewater treatment plant. By the end of August, the department had sold the entire 2003-2004 compost production of 9,350 cubic yards.

For additional information see our informational handout [442K] about the benefits of using compost. You may also contact us.

Compost can safely be used on flower and vegetable gardens.

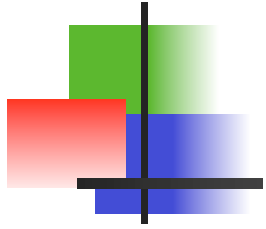


- Erosion reduction
- Versatility
- Reduces water loss
- Ready to use

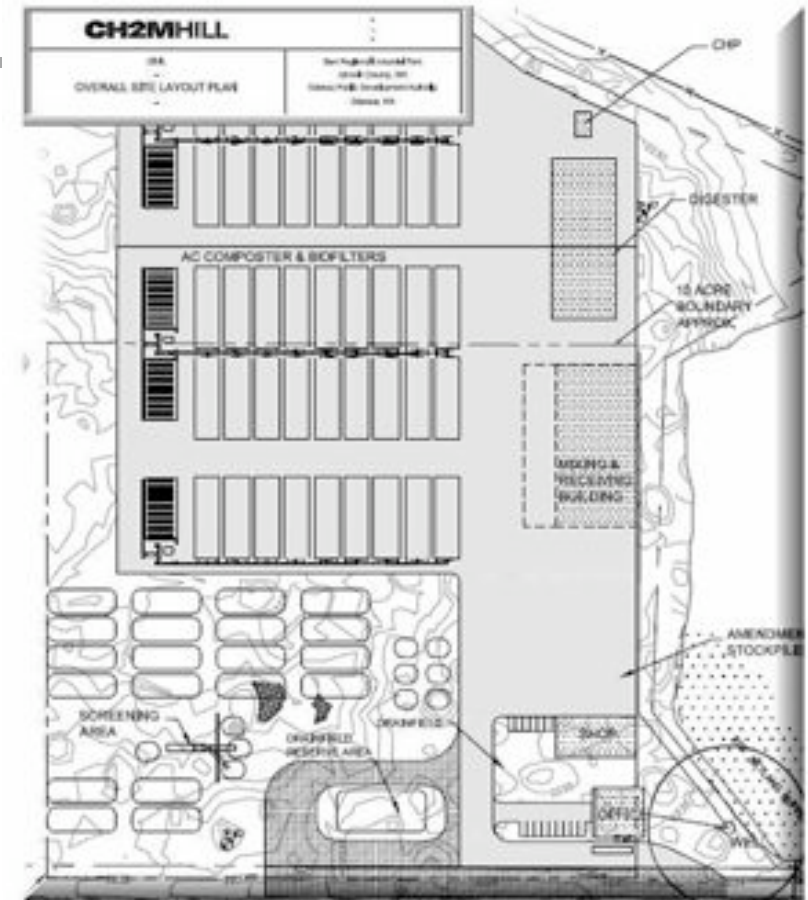


structure

<http://www.barrtech.net/>



# BarrTech, Spokane, WA



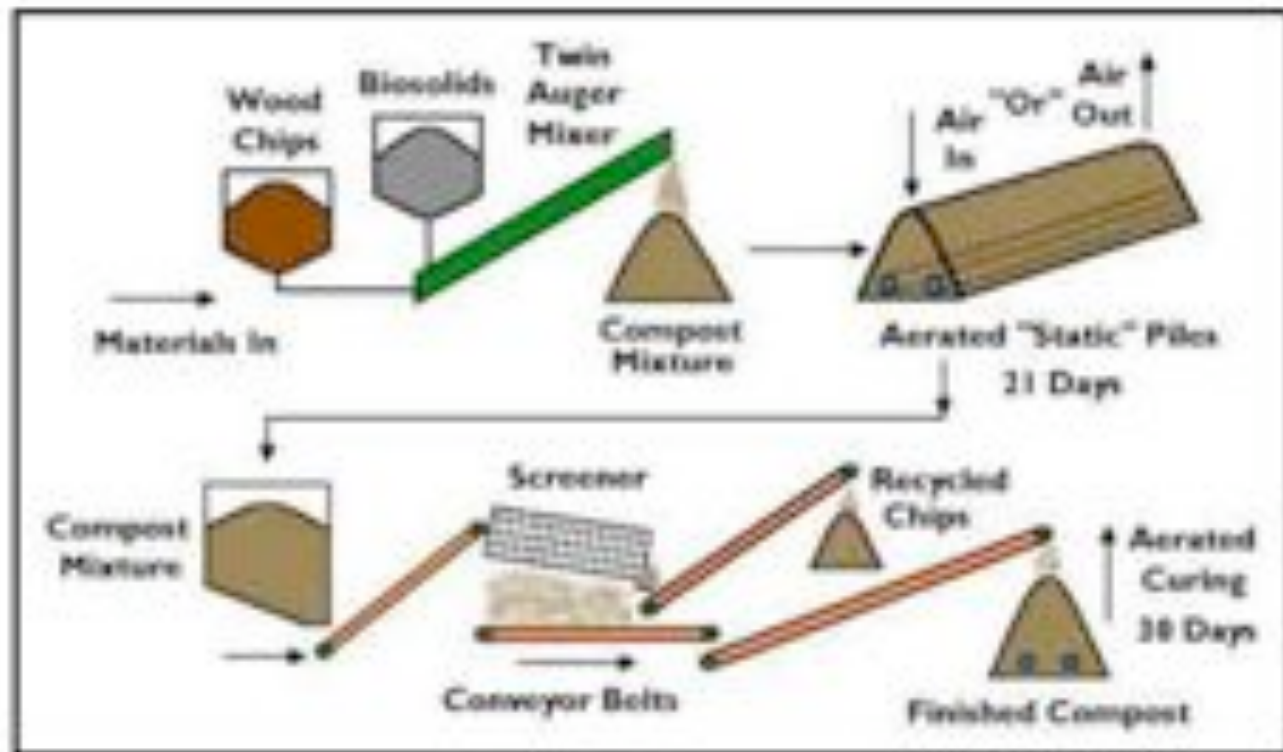
~7,500 dry Mg  
biosolids,  
amended with  
food waste,  
green waste,  
wood, crop  
residues,  
cardboard,  
FOG



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# “Couer d’Green” – Couer d’Alene

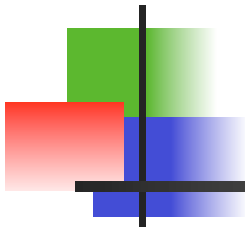
*Plant Profile*



~800 dry Mg  
biosolids,  
amended with  
wood chips

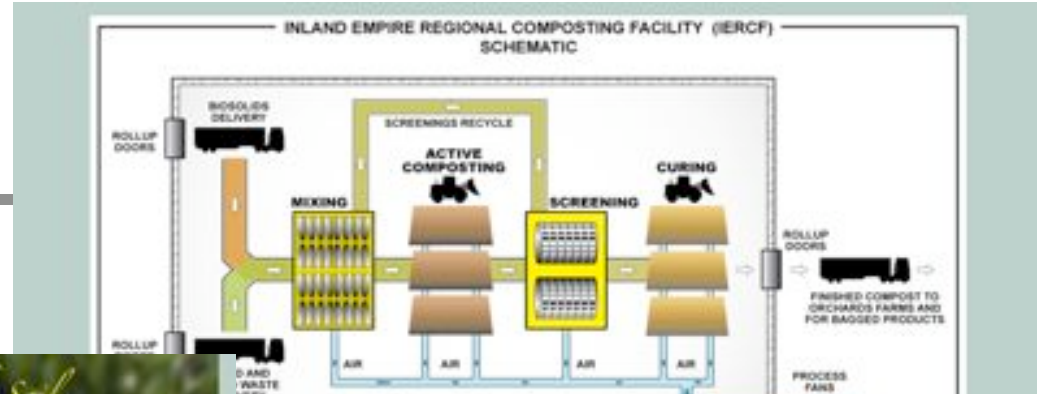
[http://www.cdaid.org/index.php?module=pagemaster&PAGE\\_user\\_op=view\\_page&PAGE\\_id=41](http://www.cdaid.org/index.php?module=pagemaster&PAGE_user_op=view_page&PAGE_id=41)

**BIOCYCLE**



# California

## big regional facilities



IERCA - A Regional, Cost-Effective Approach to Sustainable Organics Management

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Welcome to the Inland Empire Regional Composting Facility. IERCA operates the nation's largest composting facility located in Rancho Cucamonga, CA. The facility produces a high-quality, nutrient-rich, compost made from municipal solid waste (MSW) and stable bedding.

The IERCA focuses on producing high-quality compost in the United States Composting Council's National Composting Program. Our quality control process follows the U.S. Army's Natick Laboratories Quality Assurance Program guaranteeing Master Compost Certificates through the National Composting Association.



potential for turning compostable materials into value-added products. IERCA is committed to transforming organic materials into valuable SoilPro Product, compost and marketing SoilPro Products to a wide variety of horticultural, landscape, agricultural and erosion control uses. Stay environmentally conscious and buy SoilPro Products today to help close the recycling loop. Call the IERCA Sales Department at 909-993-1500.

Private facility	Year started	Biosolids processed (U.S. dt / yr)
Liberty Composting	2007	64,000
Synagro, South Kern County		41,465
Inland Empire		29,000

Composting

Composting



Why is it important to use organic materials in products?

...in economic sense, but it also allows us to divert organic materials from landfill disposal in a more sustainable way.

...to improve soil health, efficiency and economics.



# Bentley Agrowdynamics, NV

~2,500 dry Mg  
biosolids,  
amended with  
wood chips &  
ground wood



Wood products in process of composting

## Process and Benefits

Composting is a natural process that integrates nature's essential resources: air, water, sunlight, and soil to yield soil amendments from reusable materials. The composting process occurs when microorganisms transform organic waste materials into a soil like product called humus. Leaves, grass clippings, paper, wood, agricultural crop waste, and animal manures are all excellent organic waste materials that can be composted. Compost can also be made from municipal

solid waste. Bentley Agrowdynamics blends these materials to produce high quality compost.

Compost may either be applied directly to the soil or used as a starter to produce a microbial product called "Compost Tea." Best results are attained by applying combinations of aerated compost and compost tea. This increases populations of beneficial soil organisms that increase the rate at which soil nutrients become available to plants and protect plants from potential pathogens.

## Some Benefits of composting:

Composting helps reduce the amount of waste going to landfills. It is estimated that 40%-60% of the total waste stream are reusable and can be composted.

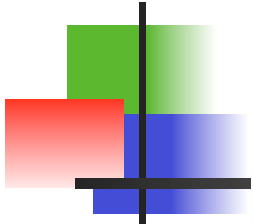
Composting allows better yields from agricultural processes. Compost technology is a valuable tool already being used to increase yields by farmers interested in more sustainable agriculture practices. Commercial and home growers are discovering that compost enriched soil can also help suppress diseases and ward off pests. These beneficial uses of compost can help growers save money, reduce their use of fertilizers, herbicides, and pesticides, and protect our natural resources.

Compost can be used to remediate contaminated land, reclaiming it for beneficial uses.



Chipper minimizing wood products for faster composition

OCYCLE



# “Dillo Dirt” – Austin, TX



Dillo Dirt™ Uses and Application Rates

List of Vendors

Vendor Information

The Treatment Process

Frequently Asked Questions

Toxicological Evaluation of Compost and Digested Sludge

Center for Environmental Research (CER)

Hornsby Bend Biosolids Management Plant (pdf)

Hornsby Bend Biosolids Management Plant Spanish (pdf)

Hornsby Bend Bird Observatory



## Introduction to Dillo Dirt™

“Dillo Dirt™ is a compost made by the City of Austin since 1989. If you know Austin, you will not be surprised to learn that it was the first program of it's kind in the state and one of the oldest in the nation. All yard trimmings collected curbside across the City as well as some of our treated sewage sludge are combined and composted to create Dillo Dirt™. The heat generated in composting (130 to 170 degrees fahrenheit) is sufficient to virtually eliminate human and plant pathogens. After active composting for over a month, our compost is “cured” for several months, then screened to produce finished Dillo Dirt™.

Dillo Dirt™ easily meets all Texas and EPA requirements for “unrestricted” use, which even includes vegetable gardens, if you desire. Like many other composts, Dillo Dirt™ has many benefits to the soil and plants. Composts add to the organic matter in the soil, reducing watering. Organic matter feeds the microbes in the soil as well as plants, making a more healthy environment. Dillo Dirt™ is made from totally recycled materials, and this recycling is less expensive



Curbside collected leaves, grass, branches and Christmas trees are used to make Dillo Dirt™.



Dillo Dirt™ - a quality soil amendment made from recycled materials.



<http://www.ci.austin.tx.us/water/dillo.htm>



# Davenport, IA

City of Davenport IOWA  
2007 City Livability Award

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DAVENPORT COMPOST FACILITY

DEPARTMENT SERVICES

In This Department

Section 1

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Useful Li



2007

## New Iowa State Fair Record!



or

Congratulations to Walcott native Mike Frantz shown in photo above with his new 2007 Iowa State Fair record 1,175 pound pumpkin. The pumpkin was grown in Earth Cycle Compost amended soil and at times was growing over 40 pounds per day! The giant will be on display at the Davenport Compost Facility for the next several weeks before being

**DISCIPLE**



# Columbus, OH



~8,500 dry Mg biosolids, amended with ground yard waste & incinerator ash

[http://utilities.columbus.gov/DOSD/Com-til\\_New.htm](http://utilities.columbus.gov/DOSD/Com-til_New.htm)

**EXPERIENCE  
THE  
WONDER  
OF  
PLANTS**



City of Columbus

<http://www.orgro.cc/>

# Orgro, Baltimore City

**BALTIMORE CITY COMPOSTING FACILITY**

ABOUT US  
PRODUCT  
HOW TO USE ORGRO  
VOLUME CALCULATOR  
PROJECTS & CLIENTS  
CAREERS  
RELATED LINKS  
CONTACT US

**NEWS HIGHLIGHTS**  
Baltimore City Composting Facility  
sells ORGRO biosolids compost to  
the White House

Composting is a natural biological process, carried out under controlled conditions, which converts organic material into a stable humus-like product called compost. During the composting process, various microorganisms, including bacteria and fungi, break down organic material into simpler substances. Composting is an aerobic process, meaning that the microorganisms require oxygen to do their work.

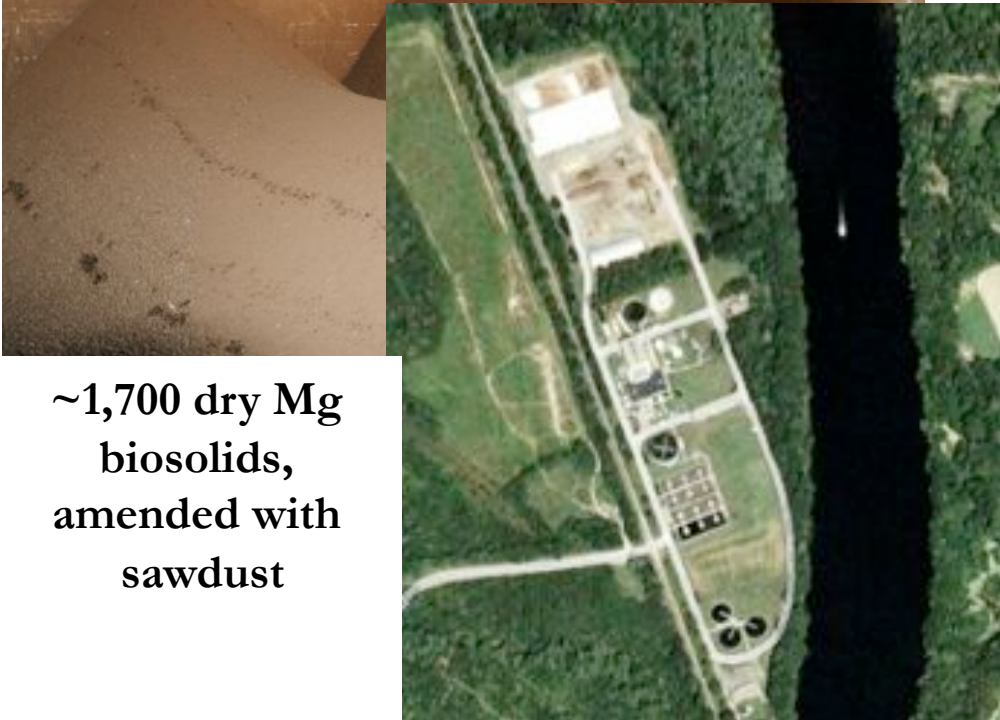
Veolia Water North America  
Baltimore City Composting Facility  
Phone: (410) 354-1636 FAX: (410) 354-0810  
Toll-Free (800) 354-0220

**ORGRO**  
HIGH ORGANIC COMPOST

US COMPOSTING COUNCIL  
The Gold Standard of Composting



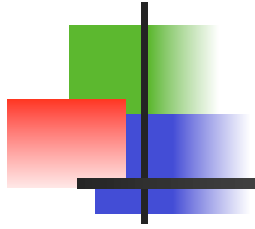
# Merrimack, NH



~1,700 dry Mg  
biosolids,  
amended with  
sawdust



# Hawk Ridge Compost Facility, Unity, ME



<http://www.earthlifegrows.com/>

~Produces 90,000 cubic yards of compost / yr



# Pumpkins...



<http://damariscottapumpkinfest.com/>



Congratulations to Elroy Morgan of Bradford, **Maine**! He used **earthlife™ Compost** to grow **Maine's** largest **pumpkin**, weighing in at 1200 lbs!

This spring, Elroy Morgan filled his pick-up truck with **earthlife™ Compost** from New England Organics' Hawk Ridge **Compost** Facility in Unity, ME. On October 12, he stopped by the Hawk Ridge sign with his giant pumpkin on his way home from the Damariscotta **Pumpkin** Fest where he was recognized as **Maine's** 2009 State Champion **Pumpkin** Grower.





# Nantucket Island



# MSW Recycling

## Based on 2005 Volume



Waste Description	Total Tons	Tons Recycled	Percent Recycled
Alum., Plastic, Tin	780	780	100
HTMW	209	209	100
CRT	55	55	100
Tires	40	40	100
Glass	1459	1,459	100
Household/Commercial	12,125	9,075	75
Sludge	1,164	1,164	100
Manure	79	79	100
Metal	1,475	1,475	100
Leaf & Yard	3,707	3,707	100
Brush	6,832	6,832	100
<b>Total</b>	<b>27,925</b>	<b>23,632</b>	<b>85%</b>





# Contact information

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Ned Beecher, NEBRA

603-323-7654

[ned.beecher@nebiosolids.org](mailto:ned.beecher@nebiosolids.org)

[www.nebiosolids.org](http://www.nebiosolids.org)

*BioCycle*

<http://www.jgpress.com>

**Send updates/corrections to**  
Celeste Madtes [csuedit@jgpress.com](mailto:csuedit@jgpress.com)

