Food Scrap Composting Challenges and Solutions in Illinois Report

January 2015

IFSC
ILLINOIS FOOD SCRAP COALITION

Prepared and submitted by **Seven Generations Ahead**
on behalf of the **Illinois Food Scrap Coalition**

Guidance and Grant Funding Provided by:

WWW.ILLINOIS.GOV/DCEO
ILLINOIS
DEPARTMENT OF COMMERCE & ECONOMIC OPPORTUNITY

Table of Contents

I. Introduction

A) The Illinois Food Scrap Coalition (IFSC)

The Illinois Food Scrap Coalition (IFSC) – with over 150 organizational and individual members (see Appendix A) – was formed to build upon the growing interest in Illinois to advance food scrap composting across the state. The IFSC promotes diverting, capturing, and converting organic material to create quality compost that can be sold commercially and used to build soil nutrients, conserve water, sequester carbon, reduce the use of synthetic fertilizers, and replenish Illinois soils on farms, municipal and private sector landscaping and home garden applications. The IFSC also supports the use of food scraps for the creation of renewable energy and other useful by-products through the utilization of anaerobic digestion as an alternative to composting.

The IFSC developed out of a one year planning process initiated by Seven Generations Ahead to organize a half day Food Scrap Composting Forum as part of its regional GreenTown Conference in Highland Park, Illinois on October 18, 2012. The forum attracted 125 food scrap generators, waste haulers and compost facility operators. The planning team - including the Solid Waste Agency of Lake County (SWALCO), the Solid Waste Agency of Northern Cook County (SWANCC), Kane County, DuPage County, Lake County, Cook County, US EPA Region V and Seven Generations Ahead - debriefed the event and decided to continue meeting as a group to explore the development of a coalition that would work to promote food scrap composting. As a result, the Illinois Food Scrap Coalition was created as an unincorporated group of interested parties, both public and private sector, with the mission of advancing food scrap composting in Illinois through program implementation, policy and advocacy.

B) Food Scrap Composting Challenges and Solutions in Illinois

The *Food Scrap Composting Challenges and Solutions in Illinois Report* was funded by the Illinois Department of Commerce and Economic Opportunity (DCEO) and authored by Illinois non-profit organization Seven Generations Ahead (SGA) on behalf of the IFSC. SCARCE authored the Compost Quality Standards section of the report, and the IFSC Core Team (see Acknowledgements) provided overall content guidance and revision support. This report complements the *Executive Summary of Recommendations*, which was submitted to the Illinois General Assembly Task Force on the Advancement of Materials Recycling in October, 2014. (See Appendix B)

The *Food Scrap Composting Challenges and Solutions in Illinois Report* is the culmination of national and regional research conducted on policies, programs, strategies, and economic development potential related to food scrap composting, and input through stakeholder forums. Five forums were held across Illinois between May and October 2014. At each forum, presentations were given on policies, programs and best practices across the country that promote food scrap composting across different sectors. Current initiatives in private and public sectors were also highlighted. Following the presentations, attendees participated in breakout groups to discuss current challenges and solutions related to advancing food scrap composting. Forums were open to all interested parties, regardless of geographical location. The forums were organized by Seven Generations Ahead, SCARCE and the IFSC, and were promoted in collaboration with associations including SCARCE, the Illinois Recycling Association (IRA), Solid Waste Association of North America (SWANA) Illinois Chapter, Illinois Counties Solid Waste Management Association (ILCSWMA), and the founding member organizations of the IFSC.

May 21, 2014 – Northeast Illinois – Chicago/Cook County at GreenTown Chicago at University of Illinois-Chicago

September 16, 2014 – Northwest Illinois – Wheaton/DuPage County at Cantigny Park

September 22, 2014 – Central Illinois – Champaign/Champaign County at Champaign Public Library

October 6, 2014– Southern Illinois – Edwardsville/Madison County at Lewis and Clark Community College

Wrap Up Session: October 22, 2014 – statewide - Bloomington/Normal at the Illinois Counties Solid Waste Management Association conference (ILCSWMA)

The recommendations generated through the forums were discussed, reviewed and organized through meetings of an IFSC Core Team, convened by Seven Generations Ahead with participation from SWALCO, SWANCC, US EPA Region V, Kane County, SCARCE, Illinois Sustainable Technology Center and the Illinois Environmental Council.

C) The Goal of the Report

This report is designed to educate elected officials, composting industry stakeholders and advocates, and the public at-large about opportunities and strategies related to developing a robust food scrap composting industry in Illinois. This report and the *Executive Summary of Recommendations* support the work of the Task Force on the Advancement of Materials Recycling, and include recommendations already being addressed by the Task Force – including the SB850 transfer station pilot program, Illinois food labeling and national labeling standards, state procurement policy requiring the use of Illinois compost, and compost site permitting revisions. The IFSC *Executive Summary of Recommendations* has been included within the Task Force's final report to the Illinois General Assembly, and supports the Task Force's initiatives and long-term waste reduction goals as they relate to food scrap composting. The IFSC intentionally decided to limit the scope of the report to food scrap composting, while fully recognizing and supporting the role of food scraps in the creation of renewable energy and other useful by-products through the utilization of anaerobic digestion as an alternative to composting.

D) Illinois Commercial Compost Facility Survey

A survey of Illinois composting facilities was conducted by members of the Illinois Food Scrap Coalition to provide information regarding their current organics and food scrap composting capacity or their intent to process food scraps. The survey represented a shortened version of a survey used by BioCycle magazine in a state-by-state survey quantifying composting activity across the country.[1] Six of the 40 permitted commercial composting facilities in Illinois responded to the survey requests. See Table 1 for the results of the Illinois survey.

TABLE 1 – Results of the IFSC Illinois Composting Survey (July 2014)

Facility Name	Address	Facility Design Capacity	Total Acres	Acres for Food Scrap Composting	Types of Materials Accepted	Interest in Expanding to Food Scraps	Average Annual Throughput
City of Monmouth	836 186th Ave Monmouth IL 61462	20,000 cubic yards	3.5	3.5	Yard waste	Yes	18,000 cubic yards
Christiansen Farms	12151 W. Wilmington Road Peotone, IL 60468	85,000 cubic yards	38	20	Yard waste, Manure, Other Agricultural/ farm waste	Yes	64,000 cubic yards
Compost Supply	2970 US 52 Sheridan, IL. 60551		25	20	Food scraps, Yard waste, Manure	Yes	152,983 cubic yards
DeKalb County RDF	18370 Somonauk Road DeKalb, IL 60115	80,000 cubic yards	10	9	Food scraps, Yard waste	Yes	7,761 tons
Garden Prairie Organics	11887 US RTE 20 Garden Prairie, IL 61038	300,000 cubic yards	28	20	Yard waste, Other Agricultural/farm waste	No	-
New Earth Compost Facility	11189 Samuel Road Carterville, IL 6918	15000 cubic yards	7 acres	4 acres	Yard waste	Yes	6500 cubic yards

A more accurate assessment of the current level of food scrap composting that is taking place in Illinois and the potential to expand this infrastructure is vital. This data is not currently available through one agency and gathering the data has proven challenging. To gain a complete picture of potential infrastructure for food scraps, a way of tracking this information at the state level is needed. This would be possible if the IEPA were to revise its required Annual Report to include reporting volumes of food scraps processed and the total permitted capacity for compost volume on the site. Illinois does have significant infrastructure and capacity developed for yard waste composting. Several compost facilities have expanded to accept food scraps up to 10% of their permitted volume, or greater than 10% if approved by permit modification. Further development of this infrastructure, as well as the growth of anaerobic digestion infrastructure, has Illinois poised to greatly expand the volume of food scraps that can be diverted from landfills, and be reclaimed as a valuable resource.

E) The Illinois Task Force on the Advancement of Materials Recycling

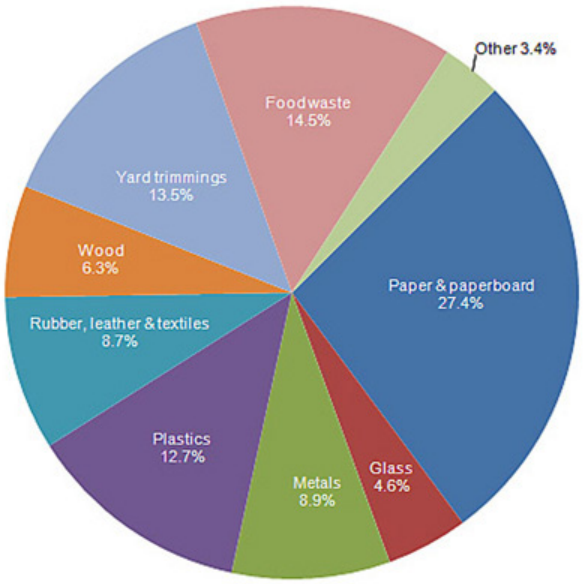
In 2013, Public Act 97-853 (HB 4986 - Rep. May) created the Task Force on the Advancement of Materials Recycling ("Task Force") to review the status of recycling and solid waste management planning in Illinois. The goal of the Task Force was to investigate and provide recommendations for expanding waste reduction, reuse, recycling, and composting in Illinois in a manner that protects the environment and public health and safety, and promotes economic development. The Task Force was comprised of four legislators (2 from each party and 2 from each chamber) and 17 other appointments made by the Directors of the Illinois Department of Commerce and Economic Opportunity (DCEO) and the Illinois Environmental Protection Agency (IEPA). The Task Force submitted its report to the Governor and Illinois General Assembly by the January, 1 2015 deadline.

II. Background: The MSW and Composting Landscape

A) The Changing Paradigm: From Waste Management to Materials Recovery

Organic material, including food scraps, is the single largest component of municipal solid waste (MSW) that enters landfills and incinerators across the United States. After MSW recovery through recycling and composting, 164 million tons of MSW were still discarded into landfills in 2012. In the same year, food scraps accounted for 14.5 % of total MSW generated in the United States, the largest component of discards.[2]

FIGURE 1 - Total MSW Generation (by Material), 2012 - 251 Million Tons (before recycling)



Food waste	14.5%
Yard trimmings	13.5%
Wood	6.3%
Rubber, leather & textiles	8.7%
Plastics	12.7%
Metals	8.9%
Glass	4.6%
Paper & paperboard	27.4%
Other	3.4%

USEPA Report Municipal Solid Waster Generation, Recycling and Disposal in the United States: Facts and Figures for 2012

In 2009, the USEPA's 2020 Vision Workgroup completed an evaluation of the materials management landscape in a report titled: *Sustainable Materials Management: The Road Ahead*. The authors estimated that between 2000 and 2050, world population will grow 50%, global economic activity will grow 500%, and global energy and materials use will grow 300%. The authors further noted that heads of major research institutes in the United States, Germany, Japan, Austria, and the Netherland determined that "unless economic growth can be dramatically decoupled from resource use and waste generation, environmental pressures will increase rapidly." The report provided the following three recommendations: (1) promote efforts to manage materials and products on a life-cycle basis; (2) build capacity and integrate materials management approaches in existing government programs and (3) accelerate the broad, ongoing public dialogue on life-cycle materials management. USEPA staff leaders recommended that our nation shift its focus *from waste management to materials recovery*, while being attentive to the principle of sustainability and the perspective of life cycle. The report acknowledges that materials reuse is an important component of natural ecosystem protection and is an essential strategy for ongoing economic development and prosperity. The report acknowledged that the USEPA and the states are already doing important work along the lines recommended in the report - but taken as a whole, this strategy would be an important shift of emphasis.[3]

Incorporating food scrap composting practices into waste management and agricultural practices has been part of an ongoing discussion nationally amongst academic and policy experts. At the 1975 Fifth Annual Composting and Waste Recycling Conference: *Composting, Fertilizer and Food Production,* EPA Administrator Russell Train called for an end to the usual methods of waste removal by re-examining the role organic materials could play in agricultural practices because of their ability to contribute valuable nitrogen to soil at a lower cost to farmers. *BioCycle* founder Jerome Goldstein also advocated for a national soil policy that would underscore the importance of soil as a valuable natural resource that needed to be replenished by transforming organic wastes, such as food scraps, into soil amendments. Since 1999, the USEPA has recommended reducing food waste by recycling food through composting. In 2014, the USEPA encouraged a systematic approach that provides a *transition* from waste management to sustainable materials management (SMM).[4]

B) National Municipal Solid Waste and Organic Materials Data

Total MSW generation in 2012 (including recycling) was 251 million tons. Food scraps accounted for 14.5% (36.4 million tons), of that total. Total MSW material recovery in 2012 was 87 million tons, or 34.6% of material generated. Of the total volume of food scraps generated 4.7% (1.74 million tons) was recovered. By comparison, yard trimmings made up 13.5% of the total MSW generated in 2012. The total volume of yard trimmings was 33.8 million tons, and 19.6 million tons were recovered – or 58% of total yard trimmings generated. The 58% yard trimmings recovery rate is a dramatic increase from the 12% recovery rate in 1990. Accompanying the surge in yard trimmings recovery is a composting industry that has grown from less than 1,000 facilities in 1988 to over 2280 in 2010.[5] Once dominated by public-sector operations, the composting industry has become increasingly entrepreneurial and private-sector-driven, led by firms that collect, process and market compost.

FIGURE 2 – Amount of Yard Trimmings and Food Scraps Being Composted in the United States

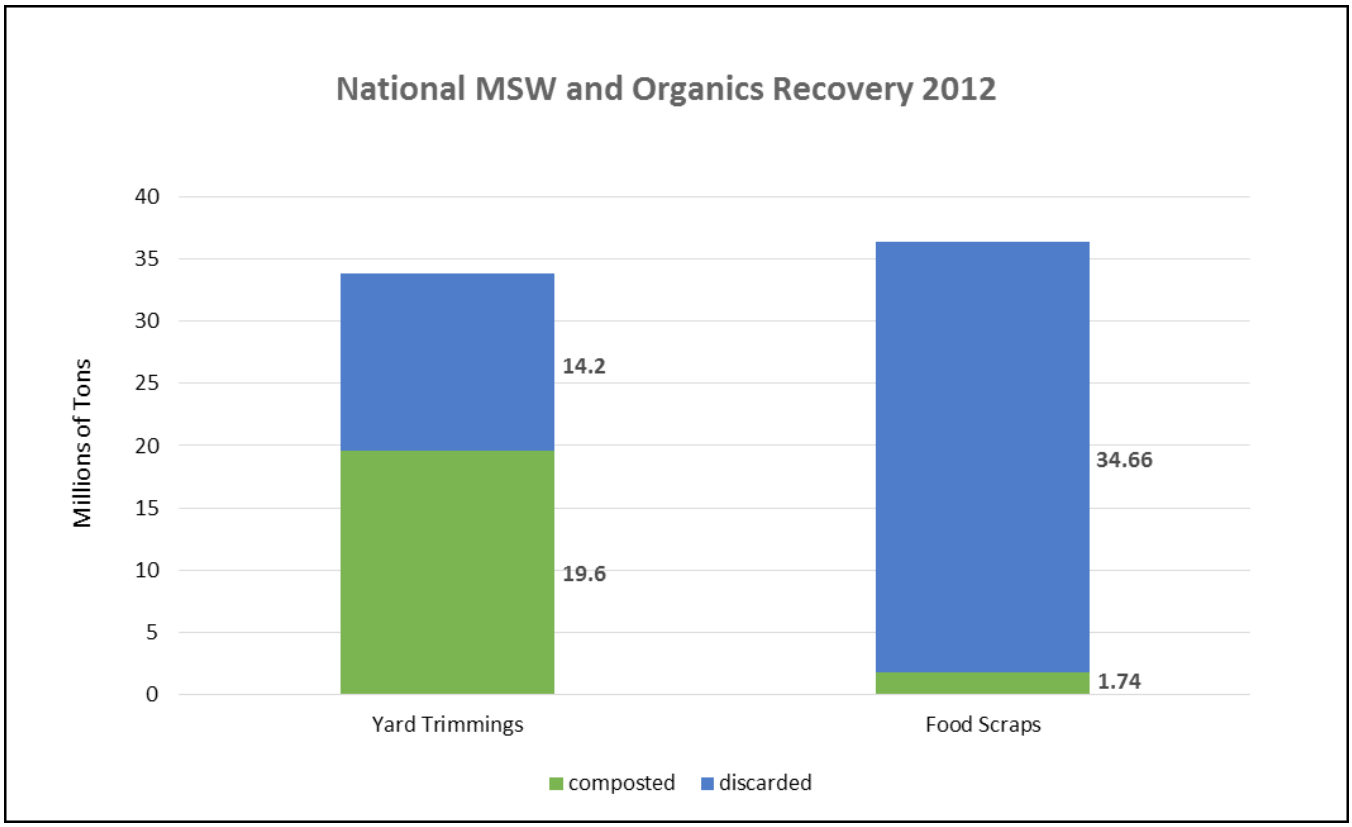


Chart created by Seven Generations Ahead using data from the USEPA Report – Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012

Additionally, as shown in Table 2, the total per capita volume of discards after recovery going to landfills is lower in 2012 compared to any of the past decade markers going back to 1960. Correspondingly, per capita total materials recovery (recycling and composting) has increased consistently over the past five decades. In summary, changing attitudes and practices regarding the discard and reuse of materials has resulted in people sending less material to landfills. Efforts to reduce, reuse and recycle are paying off.

TABLE 2 – Generation, Materials Recovery, Composting, Combustion With Energy Recovery, and Discards of MSW, 1960 to 2012

(in pounds per person per day)

Activity	1960	1970	1980	1990	2000	2012
Generation	2.68	3.25	3.66	4.57	4.74	4.38
Recovery for recycling	0.17	0.22	0.35	0.64	1.03	1.14
Recovery for composting*	Negligible	Negligible	Negligible	0.09	0.32	0.37
Total Materials Recovery	0.17	0.22	0.35	0.73	1.35	1.51
Discards after recovery	2.51	3.03	3.31	3.84	3.39	2.87
Combustion with energy recovery†	0	0.01	0.07	0.65	0.66	0.51
Discards to landfill, other disposal‡	2.51	3.02	3.24	3.19	2.73	2.36
Population (millions)	179.979	203.984	227.255	249.907	281.422	313.914

***Composting of yard trimmings, food waste, and other MSW organic material. Does not include backyard composting.**

† Includes combustion of MSW in mass burn or refuse-derived fuel form, and combustion with energy recovery of source separated materials in MSW (e.g., wood pallets, tire-derived fuel).

‡ Discards after recovery minus combustion with energy recovery. Discards include combustion without energy recovery.

Details might not add to totals due to rounding.

Source: USEPA Report - Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012

C) Landfill Infrastructure

The number of U.S. landfills has declined over the years, but the average landfill size has increased, resulting in greater overall landfill capacity nationwide. The number of landfills has steadily declined over the years, from 6,326 in 1990 to 1,754 in 2006. The EPA reports in its 2006 MSW study that

> *"while the number of U.S. landfills has steadily declined over the years, the average landfill size has increased. At the national level, landfill capacity appears to be sufficient, although it is limited in some areas."*[6]

In 2013, 42 landfills in Illinois reported receiving 45,094,197 gate cubic yards of waste and a combined capacity of 947,107,568 gate cubic yards (see Table 3) with a statewide landfill life expectancy of 21 years at current disposal rates. Illinois accepts MSW from out of state from as many as 9 states, and as far away as South Dakota located 800 miles away from Chicago. The Illinois regions range from a low of 11 years of current landfill life in Region 2, to a high of 50 years of landfill life in Region 7. Chicago has the lowest life expectancy in the state at 11 years, and is also limited in capacity to increase the number of landfills because of density, lack of available land, lack of political interest, and competing developments in the area. Southern Illinois, by contrast, has wide open spaces that are available, less population and is generating lower volumes of waste..[7]

TABLE 3 – Illinois Landfill Capacity (January 2014)

Illinois Landfills: Remaining Capacities as of January 1, 2014

Region	Landfills Reporting Capacity 1-1-2014	Reported Capacity, Gate Cu. Yds.	Capacity Share of State Total	Landfill Life, Years[1]
1: Northwestern Illinois	7	226,005,015	23.86 %	15
2: Chicago Metropolitan	6	86,582,740	9.14 %	11
3: Peoria/Quad Cities	8	159,662,998	16.86 %	35
4: East Central Illinois	7	197,462,333	20.85 %	30
5: West Central Illinois	5	37,055,823	3.91 %	20
6: St. Louis Metropolitan East	4	154,106,752	16.27 %	22
7: Southern Illinois	5	86,231,907	9.10 %	50
Totals	**42**	**947,107,568**	**100 %**	**21[2]**

Illinois Landfills: Remaining Capacities as of January 1, 2014
Source: IEPA Illinois Landfill Projections of Disposal Capacity Report as of January 1, 2014.

D) Composting Infrastructure

Across the country people are becoming more familiar with the benefits of composting, with programs being established and infrastructure being developed in a number of different states. Cities, schools, institutions and residential neighborhoods are beginning to develop composting infrastructure and some states and local municipalities are enacting policy to mandate composting of organics. While recognition of composting, and education about its benefits are important, it is equally important to have the infrastructure to manage organic waste streams. This is neither the case nationally nor in Illinois.

In 2013, BioCycle conducted a state-by-state survey to determine the composting infrastructure currently in place in the United States. This survey found that there are 3,453 yard trimming composting facilities in the US. This survey also found that there are a total of 357 food scrap composting facilities. Note that there may be some duplication in these numbers as most food scrap composting facilities also take yard trimmings. As was noted

earlier, US EPA figures show that less than 5% of food scraps are being recovered through composting. Composting infrastructure needs to be expanded to be able to process the more than 36 million tons of food scraps in the US.

Currently the Illinois food scrap composting infrastructure is still not sufficient throughout the State. One way to create infrastructure for food scrap composting is to allow existing yard waste (also referred to as landscape waste) composting facilities to accept food scraps along with current organic feedstocks. While Illinois has not developed sufficient food scrap composting infrastructure, Illinois does have a ban on yard waste going to landfills that has been in place since July 1, 1990.[8] This existing infrastructure currently composts over 500,000 tons of organic waste each year.[9] These facilities provide sufficient infrastructure for food scrap composting.

According to the 2013 IEPA Permitted Landscape Waste Compost Facilities Annual Report, 45 compost facilities were active and accepting organic materials. The Annual Reports provided data on permitted volumes for each facility but did not require facilities to report whether food scraps were being processed. Of the 45 active facilities, 28 were current 832 permit holders permitted as yard waste compost facilities, 10 facilities were 807 permit holders permitted as storage/treatment facilities for any organics and the remaining 8 facilities were 813 permit holders permitted as an expansion of an existing landfill.[10] (See Appendix C)

In Illinois, a composting facility, through notification to the IEPA, is able to include food scraps (and other organic "additives") up to, but not exceeding, 10% of the volume of organic materials being accepted for composting. If a compost site intends to exceed the 10% additive provision in the composting rules, it must apply for a permit modification, as several sites have. The IEPA does not maintain a formal list of how many sites have notified them regarding the 10% rule or how many sites have been granted permit modifications to accept greater than 10%. The IEPA did develop an informal list of sites it believes accept organics and shared this list with the IFSC in 2013. Four active facilities specified the amount of food scraps collected in their annual reports to IEPA (Waste Management Quarry Compost Facility in Romeoville, Midwest Organics in McHenry, DeKalb County Landfill and Waste Management Harbor View Compost in Chicago).

Therefore, it is not possible at this time to report the volume of food scraps being composted in Illinois. Nor are we able to report the current capacity for food scraps. In examining food scrap composting infrastructure, it is important to note that some Illinois yard waste composting facilities operate year round, but many only operate a portion of the year. Food scrap composting would be a year-round business and this will need to be factored in regarding both the workforce (adding or expanding jobs to be year-round) as well as maintaining the correct ratio of organic materials (nitrogen and carbon) for effective composting that creates a product that meets quality standards.

Figure 3 – Illinois Compost Facilities

Map created by IFSC using data from the 2013 IEPA Permitted Landscape Waste Compost Facilities Annual Reports.

III. The Benefits of Composting

The prospect of developing a robust composting industry has captured the interest of many policy makers and stakeholders nationally because of the mutual benefits of economic development and environmental conservation. The ability of compost to sequester carbon, rebuild depleted soil nutrients, conserve and retain water, limit erosion, reduce the use of negatively impactful synthetic chemical fertilizers, and reduce greenhouse gas emissions are strong environmental benefits that, combined with the demonstrated potential to create jobs and develop new local businesses, has made the developing of a composting industry appealing to many states.

Image: Belleville, Illinois - St. Louis Composting

It is well documented within the scientific literature that compost derived from a variety of raw materials through an aerobic process improves soil characteristics.[11-17] Compost in comparison to inorganic fertilizer (anhydrous ammonia, urea, phosphate, potash, etc.) is more sustainable from a resource use perspective i.e. compost is not mined but is an organic reuse process. The composting process puts the elements (particularly N, P, and K) into a form more readily available to plants and to soil microorganisms, resulting in reduced potential for leaching and run off of these elements. Research has shown that compost application to sandy soils decreases nitrate leaching[18]. Compost that is mature and that has been cured increases soil humus (organic matter) with positive effects on soil fertility – an effect inorganic fertilizer does not have. Increasing soil organic matter (through the application of compost) has additional benefits to inorganic fertilizer application such as improved water holding capacity and improvement in oxidation/reduction potential. Compost application improves soil buffering ability (pH) without the addition of limestone and when applied in conjunction with limestone has the same efficacy as limestone application but less limestone (tons: acre) is required. Research has shown that compost can substitute for all or a portion of mineral fertilizer without compromising yield.[19]

These significant benefits of composting include:

A) Compost Reduces Soil Erosion and Improves Soil Structure

Estimates indicate that one-third of the world's arable land has been lost to soil erosion.[20] The United Nations Food and Agriculture Organization (FAO) is calling for urgent action to improve the health of the world's soil resources.[21] In the US, 99 million acres of soil (28% of cropland) are eroding beyond soil tolerance rates - which means that long-term soil productivity cannot be maintained and new soil is not adequately replacing old soil. Erosion reduces the ability of soil to store water and support plant growth. About 60% of the soil that is washed away ends up in rivers, streams and lakes, contaminating waterways with fertilizers and pesticides.[22] Nationally, soil is being swept away 10 to 40 times faster than it is being replenished.[23]

When topsoil is lost, so are the most important nutrients and organic matter needed by crops to grow. Climate change is accelerating soil erosion through extreme weather events, leading to concerns among leading soil experts about increases in soil erosion. Humus, a key material in compost, functions as the "glue" that binds soil together and makes soil more resistant to erosion. The more organic material that is present, the more resistant to erosion the soil will be. The inverse is also true, soil with little to no organic matter will not be able to retain water, easily becomes compacted and is highly susceptible to erosion. Soil void of organic matter will not support life. While

various strategies to reduce soil erosion are essential (conservation tillage, cover crops, wind breaks, contour farming), amending soil with compost is an effective strategy that increases the soil's ability to retain water and reduce erosion.

Compost's organic matter is the fuel that feeds billions of microorganisms. The microbial process produces room for stormwater infiltration, drainage and moisture-holding capacity and provides a strong, stable soil structure. These passageways and a higher bulk density allow plant roots to establish and expand. Compost also makes the soil more fertile for plant growth by controlling pH levels and increasing buffering capacity against pH change. Research shows that certain organisms found in compost protect against soil borne diseases and plant pathogens.[24]

Figure 4 – Illinois Soil Regions

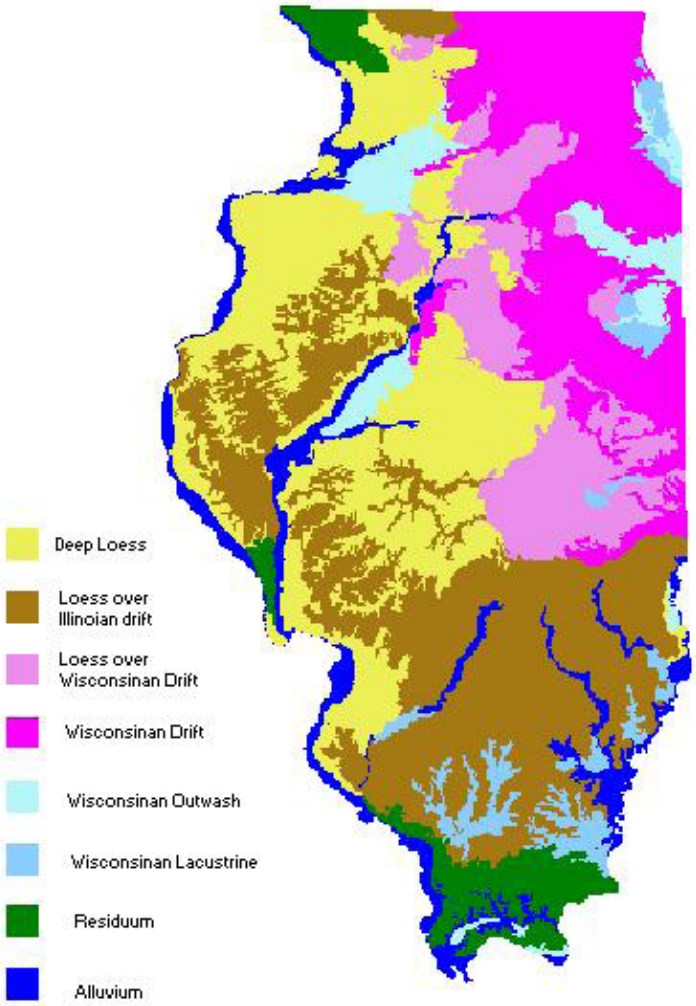


Image: www.nrcs.usda.gov

B) Compost Improves Water Retention and Reduces Irrigation Needs

The high organic matter content in compost (40-60%) increases water infiltration rates and the soil's ability to retain water.[25] Soil organisms create pore spaces for air and water, increasing permeability and storage capacity. Compost increases water storage capacity by 16,000 gallons per acre foot for each 1% of organic matter.[26] This allows rainwater that would otherwise be lost to evaporation or runoff to remain within and replenish soil ecosystems. Integrating compost into existing soil reduces irrigation needs (by up to 50% in the summer) and lowers runoff rates.[27] Research indicates that compost has a higher absorption and storage capacity than other soil amendments, including raw manure, commercial fertilizer and anhydrous ammonia.[28] Compost's ability to capture rainfall reduces the need to treat stormwater runoff at water treatment facilities, thereby saving money.

C) Compost Reduces Synthetic Chemical Needs and Protects Watersheds

Amending soil with compost creates a controlled, slow release of phosphorous, potassium, sulfur and other micronutrients that are critical to plant growth and survival. These nutrients are less prone to being lost through leaching as the stable organic matter allows plants to take what they need when they need it. Compost supports low-maintenance landscapes while reducing or eliminating the need for synthetic chemicals which pollute water systems through runoff.

Through the federal Clean Water Act, states are required to meet Total Maximum Daily Load (TMDL) limits (the maximum amount of a pollutant that a body of water can receive and still meet water quality standards).[29] Runoff

from agriculture, urban and suburban landscapes carries pollutants, nutrients and sediment into local watersheds which reduce water quality and harm aquatic life. Dead zones are low-oxygen areas in the world's oceans and large lakes, caused by excessive nutrient pollution from human activities coupled with other factors that deplete the oxygen required to support most marine life in bottom and near-bottom water. The most notorious dead zone is in the Gulf of Mexico, which annually grows to the size of the state of Connecticut. The zone is formed by nutrients that wash into the Gulf's waters -- largely agriculture fertilizer and wastewater coming down the Mississippi River. These nutrients boost algae blooms that suck up the oxygen in deep water, according to National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey.[30]

Nutrients from agricultural chemicals feed massive algae blooms, which sink to the ocean floor and decompose, consuming most of the available oxygen in the water and leaving worms, clams and other bottom-dwelling sea life to suffocate. Use of chemical fertilizers is considered the major human-related cause of dead zones around the world.

Compost has been shown to suppress plant diseases and pests, reduce or eliminate the need for chemical fertilizers, and promote higher yields of agricultural crops.[31] Amending soil with compost increases water retention and can prevent pollutants in stormwater runoff from reaching surface water resources. It has also been shown to bind heavy metals and prevent them from migrating to water resources or being absorbed by plants.[32] Integrating compost into soils reduces chemical usage and protects watersheds, including the Great Lakes. In addition to minimizing the need for the use of chemicals, compost prevents soil erosion and runoff, converts nitrogen into a more stable and less mobile form, and serves as a filter and sponge for stormwater and agricultural runoff. Scientists have documented for years compost's ability to immobilize and degrade pollutants, bind pesticides, herbicides and metals, and improve overall water quality.[33]

Lastly, compost's ability to treat non-point source pollution and manage nutrient stormwater and agricultural runoff has demonstrated significant cost savings related to water treatment. One study indicated that under a 3-inch, 24-hour period storm, a typical 10-acre development with loosely applied compost would reduce runoff volume compared to an impervious site and avoid $181,428 per year in water treatment costs.[34] Compost-based strategies are recognized by the US EPA as stormwater best management practices, and with increasing severe weather and flooding events affecting Illinois communities, composting will play a significant role in green infrastructure improvements that mitigate the impacts of increased stormwater.

D) Compost Reduces Greenhouse Gas Emissions

Compost supports greenhouse gas emissions reductions by: a) reducing the volume of biodegradable materials that end up in landfills and create methane; b) naturally sequestering carbon; and c) providing feedstock for biogas development. Today, methane accounts for nearly 9% of all greenhouse gas emissions in the US, and landfills are the third-largest source of human-related methane in the country, accounting for 18% of methane emissions in 2012.[35] According to the US EPA, disposing food scraps into landfills is a contributing factor to climate change. Methane gas is generated from buried and decaying organic material, such as food scraps, in landfills. Methane's lifetime in the atmosphere is much shorter than carbon dioxide (CO_2), but methane (CH_4) is more efficient at trapping radiation than carbon dioxide. According to a 2013 report issued by the Intergovernmental Panel on Climate Change (IPCC), the comparative impact of methane on climate change is 34 times more potent than carbon dioxide over a 100-year period (exceeding previous calculations of 25 times more potency), and 84 times more potent over a 20-year horizon (exceeding previous calculations of 72 times more potency).[36,37] Landfills are one of the leading emitters of methane, making them a target in efforts to reduce greenhouse gas emissions.

Image: Belleville Illinois Food Scrap Composting Facility - St Louis Composting

Methane Capture

Technologies for capturing methane have improved, though capture rates are not uniformly agreed upon. The USEPA has stated that the Landfill Gas (LFG) capture rate is 75%. The initial basis for the US EPA's 75% efficiency estimate is based on what the EPA assumed are the best – *not the average* – gas collection efficiencies.[38,39] Some landfills perform optimally, while others may have less efficient or incomplete gas control systems. Technical reports from independent sources indicate that instantaneous gas collection efficiencies range between 34% and 50% averaging at approximately 40%.[40] The IPCC has determined that the best collection systems operated at the optimum times (when the landfill is sealed) may achieve efficiencies greater than 90%. However, the IPCC also noted that not all landfills perform optimally and that "there are fugitive emissions from landfilled waste prior to and after the implementation of active gas extraction" such that "estimates of 'lifetime' recovery efficiencies may be a low as 20%". Regulatory and voluntary programs, including the USEPA's Landfill Methane Outreach Program (LMOP), report that they have helped reduce emissions from landfills by 30% from 1990 to 2012. Although some landfills across the United States have implemented technology to collect methane gas through the USEPA LMOP Program, this remains a voluntary program. Of the 2,400 or so currently operating or recently closed MSW landfills in the United States, about 590 have landfill gas utilization projects according to the USEPA. In Illinois, there are 34 operational LMOP programs, and 24 landfills are not participating.[41]. The USEPA states that methane emissions are projected to increase through 2030 if further actions are not taken. This assertion is leading to proposed federal legislation that requires new landfills to capture two-thirds of their methane – 13% more than is currently mandated – and to update emissions guidelines for existing landfills. In addition to landfill gas capture, the USEPA advocates the diversion of food scraps and organic materials from landfills for use in generating compost, and asserts that composting the current of volume of food scraps nationally would be equivalent to taking 1.7 million passenger vehicles off the road.[42,43]

Carbon Sequestration

The top 3.2 feet of the world's soil stores more than 3 times the amount of carbon held in the atmosphere. Soils release greenhouse gases to the atmosphere when soil structure is poor, soils are degraded, and unsustainable land management practices are used.[44] The Marin Carbon Project found that rangelands in California amended with compost could result in significant offsets to greenhouse gas emissions (28 MMg COÐe) when scaled to 5% of rangelands.[45] The European Union recognizes that "soil plays a huge role in climate change" and states that "a tiny loss of 0.1% of carbon emitted from European soils would be the equivalent to the carbon emission of 100 million extra cars on our roads."[46] One estimate of the potential value of this approach -- which assumed that 20% of agricultural topsoil in the EU could be used as a sink for carbon -- suggested it could constitute about 8.6% of the total EU emission-reduction objective.[47] In a report released in September 2014 by the University of Exeter which discussed the impact of climate change on the release of additional carbon dioxide from soils, scientists revealed that "the response of soil microbial communities to changes in temperature increases the potential for more carbon dioxide to be released from the world's soils as global temperatures rise"[48] While debates continue on the impact of climate change on future carbon dioxide emissions from soils and the most effective ways to scale up carbon sequestration within soils, there is widespread scientific agreement that compost improves soil structure, reduces erosion, increases carbon sequestration, and reduces the overall release of greenhouse gases into the atmosphere.

Biogas

In addition to providing feedstock for the generation of compost, food scraps can supply anaerobic digestion operations with material to create renewable energy through biogas development. Biogas is a biofuel that is a net energy producing process, provides very efficient decomposition, and is a direct replacement for energy created from fossil fuels – which supports climate change mitigation efforts. According to the American Biogas Council, if the full potential was realized, a cost-effective biogas industry could produce energy to power 1 million American homes. The USEPA advocates for the diversion of food scraps and organic materials from landfills for use in generating compost and biogas, and asserts that keeping organic material out of landfills in the first place is a viable strategy for reducing landfill-generated methane.

E) Compost Supports Waste Reduction Goals

States, counties and municipalities across the nation are establishing waste diversion goals for a variety of economic and environmental reasons. Forty-two states have recycling or waste diversion goals. Most are voluntary. Many include both goal targets and dates for achievment. Eighteen states have goals to recycle or divert 50% or more of their waste. Other states have set lower goals. California has established the most aggressive waste diversion goal (originally 50% diversion by 2010, and now 75% diversion by 2020), and is the only state that passed a waste diversion "mandate" with penalties for non-compliance. Almost half of the materials Americans discard (food scraps, yard trimmings, soiled paper) are compostable. Along with increasing the volume of materials that are recycled and reducing waste at it source, diverting food scraps from landfills is a key strategy with great potential to help achieve waste diversion targets.

F) Compost Extends Landfill Capacity

While the nation's and Illinois' landfill capacities are currently sufficient to meet waste disposal needs, there are areas across the U.S. that will be faced with the prospect of building new landfills in the midst of high land costs, landfill siting and development costs, and "not in my backyard" pressure from constituents. The lifespan of the nation's inventory of landfills has been extended due to increased landfill sizes and collective efforts to increase recycling and reduce waste volumes going to landfills. Diverting organic material from landfills extends landfill capacity, and reduces the need to build new landfills.

IV. The Importance of Composting for Illinois

As our state leaders continue the debate about strategies that will drive the Illinois economy forward, there is some agreement that using the existing asset base to develop local Illinois businesses is part of the solution. Illinois Governor Bruce Rauner's transition team report – Building a Better Illinois: Report of the Transition Co-chairs to the Governor-elect (January 2015) – advocates strongly for environmental and natural resource policies that enhance quality of life, conserve resources, and attract and develop new businesses, and asserts that nurturing natural resources will be critical to sustaining Illinois' economy and quality of life. The report states that Illinois should focus state resources on a defined set of industries with potential for rapid growth, and should make targeted investments in infrastructure necessary to support innovation and entrepreneurship. The report additionally addresses the need for Illinois to take necessary actions to ensure that water resources are clean and properly protected, and acknowledges that Illinois is the largest contributor of phosphorus and nitrogen into the Mississippi River Watershed (from the use of chemical fertilizers) – a problem which threatens the quality of water in Illinois. Finally, the report advocates for minimizing waste and the use of landfills through the strengthening and expansion of successful recycling programs across the state.

A robust food scrap composting industry would support some of the key tenets within Governor Rauner's transition team report by building Illinois soils, protecting Illinois water resources, and supporting Illinois' efforts to minimize waste and the use of landfills – while serving and growing local business opportunities that strengthen the Illinois economy.

A) Soil and Local Agricultural

A backbone of Illinois' economy is fertile, nutrient-rich soil that provides the basis and economic benefits for a high level of corn and soy production. Studies nationwide are documenting soil erosion and nutrient loss, requiring more and more synthetic fertilization leading to other water quality and economic problems (previously addressed in this report). Excessive erosion rates decrease soil fertility and productivity.[49]

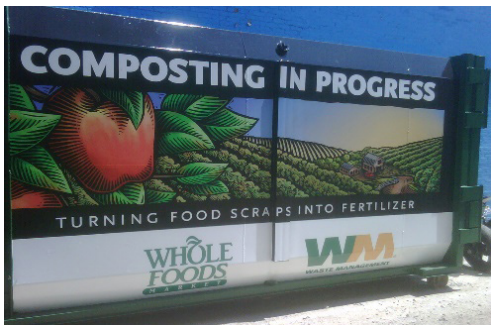
The *Local Food, Farms & Jobs: Growing the Illinois Economy* report introduced to the Illinois General Assembly in 2009, identified that although Illinois consumers spend $48 billion annually on food, very few of our food dollars are spent on products grown, processed, and distributed in state. The report found that most of our fruit and vegetables travel an average of 1,500 miles. The report recommended policies that would direct state agencies to align their missions to support local, farm-based economic development to promote job creation, public health and food security. The report emphasized the importance of building a local food economy for multiple reasons including economic development, lower costs, greenhouse gas emission reductions, food security, and development of a local food system that is resilient to changes in climate and security threats. The report identified that local food demand is real and has extended into larger volume markets such as hospitals, universities and restaurants. Furthermore, the report cited studies that show when money is spent at local businesses, it creates a multiplier effect which internally circulates the same dollars up to eight times within the local economy.[50] Composting will enable Illinois to maintain its competitive edge and long-standing history as a leading agricultural producer through rebuilding our most valuable asset – our soils. Building on the composting industry through food scrap diversion will support local food system goals by creating the volume of locally-produced compost needed to replenish soils and maintain an agricultural edge.

B) Watershed Protection

The IEPA, IL Department of Agriculture and other organizations produced the *Illinois Nutrient Loss Reduction Strategy* which is designed to decrease nutrient loss in waterways, protect water quality, and reduce the downstream impacts on the Gulf of Mexico dead zone. The strategy report was developed in response to the *US EPA 2008 Gulf Hypoxia Action Plan* which calls for the 12 Mississippi River Basin states to develop a plan to reduce the

amount of phosphorous and nitrogen that is carried through the states to the Gulf. The report states that nutrient loss and runoff is a major threat to water quality, and new strategies are needed to secure the future health of water in Illinois and the Mississippi River Basin.

Synthetic chemical runoff from Illinois farms and urban/suburban landscapes contributes to the Gulf of Mexico's dead zone, and has recently garnered increased attention regarding the quality of the region's Great Lakes and rivers. Chicago Mayor Rahm Emanuel in September 2014, hosted a forum for Great Lakes mayors on this issue, declaring that the Great Lakes are in unprecedented danger. The forum was convened to strategize about how to respond to this emerging threat, driven largely by a phosphorus overload from agriculture runoff that is plaguing the Great Lakes. Emanuel specifically referenced August 2, 2014 as the day a poisonous algae bloom in Lake Erie knocked out the water supply for nearly 500,000 residents in the Toledo area. "What happened in Toledo…it's the first time the reliability, the sustainability of our safe drinking water was threatened," Emanuel told a packed conference room at the Shedd Aquarium.[51]

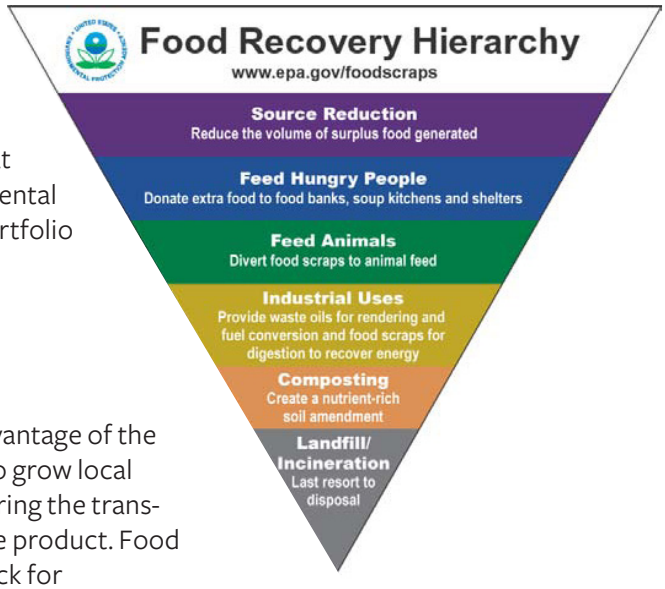


Nitrogen and phosphorous from synthetic fertilizers, waste water treatment effluent, and urban/suburban runoff are the primary causes of nutrient pollution in Illinois waterways. Composting food scraps has the unique ability to improve soil health, reduce nutrient loss, and protect waterways by regenerating soil structure, nutrition and biology. Composting organic materials such as food scraps, leaves, grass clippings, and manure through a controlled, natural microbial decomposition can provide a valuable soil amendment to help reduce soil erosion. This natural application of fertilizer will reduce the need to use the synthetic chemicals that are polluting the water supply.

C) Sustainability and Materials Diversion Goals

Illinois has invested time, resources and energy to become a leader in materials diversion from landfills – being one of the first states to institute a yard waste ban in 1990. Removing food scraps from landfills would build upon the yard waste ban, helping Illinois maintain its waste reduction leadership role and achieve higher rates of diversion. Food scrap composting is recognized as a fundamental sustainability strategy nationally that conserves and reuses resources while reaping multiple environmental benefits. Composting will bolster Illinois' overall sustainability portfolio in its efforts to be a national leader.

FIGURE 5: EPA Food Recovery Hierarchy



*The US EPA Food Recovery Hierarchy (above) advocates for many uses of food scraps – including composting – as alternatives to landfilling or incineration.

D) Economic Development

Capturing value, seizing new market opportunities and taking advantage of the assets that are present locally are strong principles upon which to grow local economies. Due to its nature, composting is a local activity, requiring the transport of organic material to facilities that can create a high end use product. Food scraps are an asset with growth opportunities, providing feedstock for waste-to-energy anaerobic digester projects, feeding animals, or feeding people through donation (see US EPA Food Recovery Hierarchy, right). In short, depositing food scraps in landfills is in essence throwing away a valuable resource that can support local economic development, social and environmental goals

As the recent *State of Composting in the US* report states, "Whether on a per-ton basis or on a per-dollar-capital investment basis, composting sustains more jobs than other waste handling options such as landfilling and incineration." Unlike dead-end disposal and incineration, composting creates a value-added product that supports gardening, landscaping, farming, green infrastructure projects, and other end markets that also build Illinois' economy and support additional environmental, aesthetic, and economic goals.

In a landmark study developed by the Institute for Local Self Reliance entitled *Pay Dirt: Composting in Maryland to Reduce Waste, Create Jobs & Protect the Bay*, researchers documented the potential for job creation that the composting industry offers, including the following assertions:

- Composting (including mulching and natural wood waste recycling) operations in Maryland already sustain more total jobs than the state's three trash incinerators, which handle nearly twice the tonnage.
- On a per-ton basis, composting in Maryland employs two times more workers than landfilling, and four times more than the state's trash incinerators.
- On a per-dollar-capital investment basis, for every $10 million invested, composting facilities in Maryland support twice as many jobs as landfills and 17 times more jobs than incinerators.
- Composting supports an entire new industry of contractors who use compost and compost-based products for green infrastructure.
- Wages at compost facilities range from $16-$20 per hour.
- Infrastructure has emerged, presenting an opportunity to establish a new made-in-America industrial sector, creating even more jobs.
- Utilizing 10,000 tons of finished compost annually in green infrastructure can sustain one new business. For every 10,000 tons of compost used annually by these businesses, 18 full-time equivalent jobs can be sustained.
- For every one million tons of organic material composted and used locally for green infrastructure, approximately 1,400 new full-time equivalent jobs could be supported, paying $23 to $57 million per year.

TABLE 4 – Potential New Maryland Jobs By Composting 1 Million Tons of Organics

Option	FTE Jobs
Burning	120
Landfilling	220
Composting	740
Compost Use	620
Total Composting	1,360

FTE = full-time equivalent

Composting jobs based on one-third tonnage composted at small facilities, one-third at medium-sized facilities, and one-third at large facilities. Compost use jobs based on data from 13 companies using compost for soil erosion control, stormwater management, and other green infrastructure applications.

TABLE 5 – Jobs Comparing Composting vs. Disposal in MD

Type of Operation	Jobs/ 10,000 TPY	FTE Jobs/$10 Million Invested
Composting Sites[a]	4.1	21.4
Compost Use	6.2	n/a
Total Composting & Compost Use	10.3	
Disposal Facilities		
Landfilling	2.2	8.4
Burning (with energy recovery)	1.2	1.6

a Includes mulching and natural wood waste recycling sites.

TPY = tons per year (of material composted)
FTE = full-time equivalent

Incinerator data based on Eileen Berenyi, Governmental Advisory Assoc. Inc., 2012-2013 Municipal Waste to Energy in the United States Yearbook & Directory. Westport, Connecticut. 2012.

Source: Paydirt: Composting in Maryland to Reduce Waste, Create Jobs, and Protect the Bay, by Brenda Platt, Bobby Bell and Cameron Harsh of the Institute for Local Self-Reliance, 2013

In the Delta Institute October 2014 report, *Waste Management: Unrealized Environmental and Economic Benefits for Chicagoland*, researchers estimated that if the Chicago area were to achieve a 60% materials diversion rate by 2040, more than 39,000 jobs would be created through expanded recycling, composting, processing and collection. Their estimates indicate that 25% of those jobs would be within the composting industry.[52]

E) Summary of Composting Benefits

Composting has the potential to be a job-creating industry from materials that are currently being thrown away. Capturing this valuable, unused resource addresses many of Illinois' most critical environmental and resource protection needs, providing a strategy to achieve triple bottom line economic, environmental and social equity goals. Further development of a composting industry will preserve landfill capacity needed to support disposal of non-recyclable and reusable materials. Investing in a composting industry will support Illinois watershed protection and greenhouse gas emission reduction goals, which have their own related environmental, economic and social benefits. A robust food scrap composting industry in Illinois would bring:

- greater potential for job creation that composting has in relation to landfilling (4:1);
- opportunity to create a local Illinois industry using material that is currently being thrown away;
- the benefit of extending current landfill capacity;
- greenhouse gas emission reductions related to reduced methane from landfills;
- carbon sequestration benefits supporting reduced greenhouse gas emission reduction goals;
- benefits of healthy, nutrient-rich soil related to water conservation, landscaping and agricultural production;
- the ongoing need to replenish our Illinois soils with nutrients;
- the protection of Illinois drinking water through reduced synthetic chemical fertilizers that contaminate our waterways; and
- the ability to harness renewable energy and other useful byproducts of anaerobic digestion technology.

V. Food Scrap Composting Model Policies and Programs

A) Overview

Across the nation, composting is developing as a viable, locally-based industry that achieves multiple objectives related to economic development, job creation, cost savings, and environmental sustainability. In 2014, 4,914 facilities are licensed to accept organic material – with yard waste facilities leading the way. Over 180 communities have residential curbside food scrap collection programs. 20 states have yard waste disposal bans (including Illinois), and a small handful of states have enacted ordinances which ban organics, including food scraps, from entering landfills. Nearly 20 states have revised, or are in the process of revising, their permitting regulations for yard waste composting facilities to allow for the inclusion of food scraps. Some states have developed landfill diversion goals and regulatory processes to increase recycling, eliminate waste, and divert organic material from landfills toward the higher end uses of compost or biogas.

B) Policies

1. Banning Food Scraps From Landfills

Similar to "yard waste" bans that have been enacted in approximately 20 states across the US since the 1990's (including Illinois), some states are beginning to enact legislation that bans all organic material – including food scraps – from entering landfills. Massachusetts, Connecticut, and Vermont have all pursued comprehensive organics bans that came into effect in 2014, and New York City passed legislation which takes effect in 2015. While each state's ban varies, they possess some common features. The bans apply to the largest generators of food scraps, and require that food scrap generators producing a certain level of volume (or weight) must divert their food scraps from landfills. In Vermont, the threshold is two tons per week; in Massachusetts, it is one ton per week. Vermont's "graduated" legislation will gradually lower the threshold to lower volume food scrap generators until it reaches all food scrap generators (including residences) by 2020. The intention of graduated bans is to begin with the largest food scrap generators in part to buy time for infrastructure development and education for the many lower volume generators of food scraps. Another feature of organic materials bans is related to proximity of food scrap composting facilities, and the requirement that a compost facility must be located within a defined proximity of the food scrap generators in order for the ban to apply.

Connecticut

One third of the state's annual contribution to the landfill is made up of food scraps and other organics like yard trimmings, food residues, and compostable paper. Connecticut became the first state to mandate food scraps generated by large-scale generators be recycled when it first passed Public Act 11-217 in 2011. The law was updated and expanded in 2013 by Public Act 13-285. The law targets commercial and industrial food wholesalers, distributors, manufacturers and processors; supermarkets; resorts; and conference centers. These entities must divert food scraps if their volumes are greater than 104 tons per year by 2014 and greater than 52 tons per year by 2020. Institutions such as schools, universities and prisons are encouraged to recycle food scraps, but are exempt from the law. The mandate applies to targeted food scrap generators if they are within 20 miles of a facility that accepts and processes food scraps. Materials include food scraps, food processing residue and soiled paper. Generators are required to source separate organic materials, and either: a) compost, or treat source-separated organic materials on site using permitted equipment, or b) ensure that such source-separated organic materials are recycled at an authorized source-separated organic material composting facility.

According to a March, 2012 article in the *American Public Works Association Reporter*, there were three key steps in setting the stage for Connecticut's organics recycling mandate. Connecticut:

- Created a **GIS-based map and database** of the state's large-scale food scrap generators to demonstrate that there would be sufficient volume to sustain full-scale processing facilities and map the location of generators that could potentially supply those facilities with feedstock.
- Conducted a state-wide **waste characterization study** to determine the weight, type and generator sector of food scraps being disposed of in Connecticut. The 2009 study found that:

  -Over 321,000 tons/year of food scraps were disposed.

  -Food scraps alone represented 13% of all solid waste disposed.

  -Collectively, food residuals, other organics and compostable paper (soiled, waxed or otherwise unrecyclable) represented about one-third of the total waste sent to resource recovery facilities.
- Prioritized food scrap recycling in the state's **Solid Waste Management Plan and Climate Action Plan** and established the following solid waste management order of priority:

  -Source reduction > recycling > composting of yard waste or vegetable matter > bulky waste recycling > resource recovery or waste-to-energy plants > incineration and landfilling.[53,54,55]

Massachusetts

The driver of the organics ban in Massachusetts comes from the aggressive *Global Warming Solutions Act*, establishing the goal to reduce greenhouse gas emissions 25% below 1990 levels by 2020, and 80% by 2050. The state also established the goal to increase its diversion of organic materials by 350,000 tons per year by 2020. In January 2014, Massachusetts enacted legislation requiring large-scale foodservice operations to compost, including food and beverage manufacturers, grocery stores, wholesale distributors, universities and correctional facilities (the state of Connecticut has a similar focus for its organics ban legislation). This mandate was an addition to the existing Solid Waste Ban, which also requires full-scale recycling programs. If a facility is not in compliance, a violation and fine can be cited varying from $860-$1,725.[56] As of October 2014, any entity that generates at least one ton of organic material per week must either donate or repurpose useable food. The remaining organic material is sent to a biogas facility to be converted to clean energy or compost. The ban affects about 1,700 businesses and institutions, including supermarkets, colleges, universities, hotels, convention centers, hospitals, nursing homes, restaurants and food service and processing companies. In order to provide the infrastructure needed for the ban, the Massachusetts Department of Environmental Protection is working to site composting and biogas plants on farms, wastewater treatment plants and other locations by providing technical assistance and up to $1 million in grants. Massachusetts' legislation is unique in that it is the only legislation of its kind that does not incorporate a "proximity loophole" allowing businesses that are not within 20 miles of a compost site to be exempt from the ban.[57]

Vermont

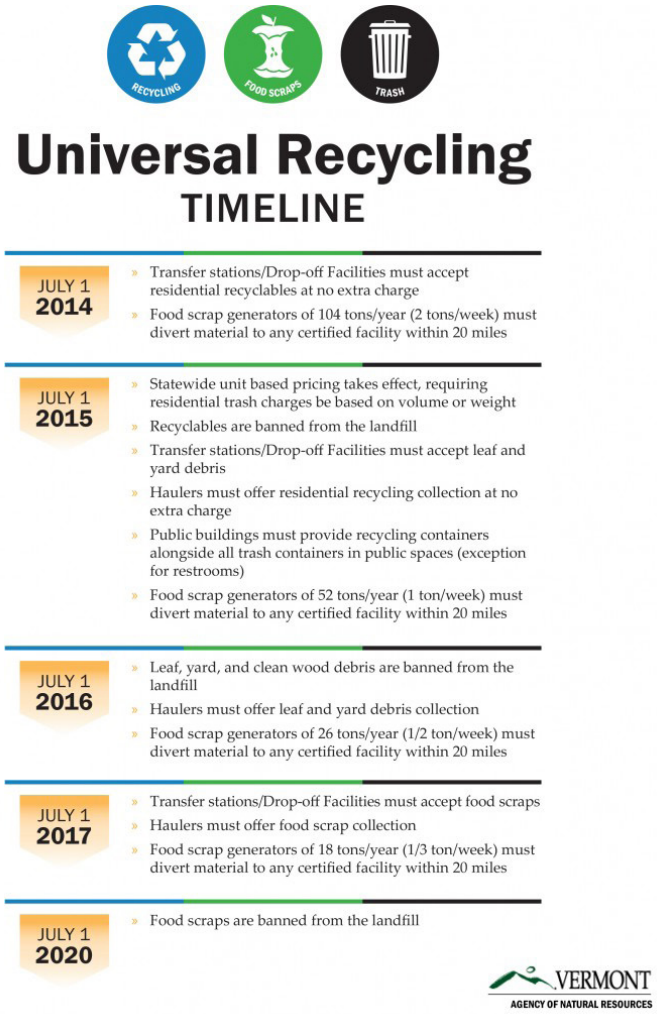
Vermont boasts the most comprehensive ban on organics, gradually decreasing the producer size to which the ban applies until all organics are legally mandated to be diverted from landfills in 2020. Vermont decreases the minimum weight over the course of six years as displayed in Table 6.

TABLE 6 – Vermont Organics Ban Phase-In

Year	2014	2015	2016	2017	2020
Tons/week	>2	>1	>0.5	>0.25	>0

In order to reach this ambitious goal, Vermont enacted corresponding policies. Act 148, creating the Universal Recycling (UR) law, was passed by the General Assembly in May 2012. The bill updated Vermont's Waste Management Statutes. Although the UR law went into effect July 2012, the food diversion component of the UR law went into effect July 2014. The Agency of Natural Resources (ANR) is responsible for overseeing statewide implementation of the UR law, and municipalities are responsible for the management and regulation of the storage, collection, processing, and disposal of solid waste within their jurisdictions. Under this policy, waste management facilities and haulers that collect waste must provide services for food scraps by 2017 without a separate charge for food scraps. Until 2017, businesses and institutions to which the law already applies must negotiate with haulers in order to have their food scraps collected to comply with the law. In Vermont, an adequate composting infrastructure includes 11 commercial food scrap haulers and 13 compost facilities that accept food scraps. Tipping fees in Vermont are much higher at landfills ($60-$125 per ton) than they are at compost facilities ($30-$40 per ton).[58]

FIGURE 6 – Waste Management & Prevention Division, State of Vermont



Projected Financial Impact:

- Increases in system costs are expected to fall mainly on the users of the system, paid through the increase of an estimated $7 to $9 per month per household in fees for services.
- Haulers will need to invest in new equipment as they improve their capacity to provide new services.
- Total capital investments are estimated at $42 – $45 million over the nine-year implementation period, or an average about $5 million per year.
- Recommendations are being considered to establish a grant/loan program funded by increased per ton franchise fee (from $6 to $12) to raise an estimated $2.5 million per year[59]

New York City

In December of 2013, NYC passed its Commercial Organics Law, which is set to take effect July 1, 2015. This law mandates specific large-scale generators to arrange for the recycling of their organic materials or employ department-approved methods to process the material themselves. NYC's Bureau of Waste Prevention, Reuse and Recycling is responsible for enforcing the law. This legislation is expected to have an impact that reaches beyond NYC's five boroughs, as the country's largest city sets an example on a national stage. The law defines "organic waste" as any material found in the waste stream that can be broken down into, or otherwise become part of, usable compost, such as food scraps, soiled paper, and plant trimmings. The organic material generators explicitly targeted include: a) food manufacturers with ffl25,000 sq ft; wholesalers with ffl 20,000 sq ft; retail food stores with ffl 10,000 sq ft or a chain of ffl 3 stores with a combined ffl10,000 sq ft; food service establishments with ffl 7,000 sq ft; food preparation establishments with ffl 6,000 sq ft; catering establishments for ffl 100 people; food service for hotels with ffl100 sleeping rooms; and sponsors of temporary public events.

By law, the Commissioner of the NYC Department of Sanitation will determine on an annual basis if there is sufficient capacity within a 100 mile radius of the city to process organic waste and that the processing cost is competitive with the disposal cost of landfill or incineration. The provisions of NYC's Commercial Organics Law relating to private caterers will be enforced by the NYC Business Integrity Commission, and the provisions relating to covered establishments will be enforced by the Sanitation Department, the Department of Health and Mental Hygiene, and the Department of Consumer Affairs. After a 12-month warning period, any covered establishment, transfer station or private entity that violates the Commercial Organics Law will be liable for a civil penalty of $250-$1,000 per violation.[60]

2. Waste Diversion Mandates and Goals

The State of California is the only state that has a waste diversion mandate that has an enforcement component, while other states and municipal governments have established waste diversion, reduction and recycling goal targets without enforcement. These goals are helping to drive the development of a food scrap composting industry within these states. San Francisco and Berkeley have set zero waste (by 2020) goals; Boulder and Seattle passed zero waste resolutions, establishing more modest (but still ambitious) diversion targets of 70% by 2017 and 85% by 2025; Portland has set a target of 75% diversion by 2015; and New York City set a goal of diverting 30% by 2013 and 70% by 2025. Although typically nonbinding, such goals motivate city staff while enabling composting supporters to hold them accountable.[61]

Some examples include:

The California Integrated Waste Management Act of 1989

California's waste diversion mandates have been effective in establishing local organics diversion programs for both yard trimmings and food scraps. The California Integrated Waste Management (CIWM) Act of 1989 (AB 939) mandated local jurisdictions to meet solid waste diversion goals of 25% by 1995 and 50% by 2000. The CIWM Board would determine this diversion by looking at the base-year solid waste generation (waste normally disposed of into landfills) to determine the amount of solid waste diverted. To increase diversion rates, each jurisdiction is required to create an Integrated Waste Management Plan with regard to recycling programs, recycled-product procurement, and waste minimization. Penalties for non-compliance include fines of up to $10,000 per day on cities and counties.[62] In 2011, California increased its diversion goal to 75% by 2020 through passage of AB 341, up from 65% in 2013, though not enforceable by law. To reach 75% diversion, food scraps are a likely target as they comprise about 13% of a typical waste stream. Industry experts acknowledge that California's high diversion rate is partly due to policies that allow activities such as waste-derived materials being used at landfills for Alternative Daily Cover, intermediate cover, tipping pads, roads and waste tires and fuel.

Massachusetts Waste Stream Reduction Goals

Massachusetts' 2014 commercial organic waste ban includes "food material and vegetative material from any commercial or institutional entity, public or private, that disposes of more than one ton of that material per week." Residential food waste is not be affected by the ban. The proposed ban is part of the plan to help the state reduce its overall waste stream by 30% in 2020 and by 80% in 2050. Currently, Massachusetts diverts 100,000 tons annually of its 1.2 million tons of food waste, and plans through the ban and other strategies to quadruple that number over the coming years and meet its waste reduction goal targets.[63]

San Francisco's 100% Diversion Goal

San Francisco introduced its zero waste goal in 2002, two years after rolling out its curbside compostables collection system. Many municipal officials cite the city's ambitious targets of 75% diversion by 2010 and 100% diversion by 2020 as critical to boosting composting rates. These goals have motivated the city to develop additional policies and outreach methods that enhanced composting participation, as well as overall waste diversion. Similarly, some municipalities with preexisting waste reduction goals have raised their targets after launching composting programs, as a way to boost participation in waste diversion.[64]

Oak Park and River Forest, Illinois – PlanItGreen Goal Targets

Oak Park, IL and River Forest, IL established a joint environmental sustainability plan in 2011 that incorporates goals targets and strategies across 9 core topic areas, including waste reduction. The "PlanItGreen" project established goals through a 10-month community engagement and technical expert process, including a 50% Diversion Rate by 2015 and a 62.5% Diversion Rate by 2020. These goal targets are currently driving a variety of food scrap composting initiatives, including a Zero Waste Schools Program, Residential Food Scrap Curbside Pick-Up, and a commercial initiative designed to help the communities' major institutions establish food scrap composting diversion systems and hauling agreements.

3. Compost Site Regulations

States are modifying their regulations for permitting and siting to be more streamlined and less costly to facilitate composting of source separated organics. In 2013, the US Composting Council released a Model State Compost Rule Template to guide states on developing or revising composting rules for source separated organic waste streams. In Florida, a revision of compost site regulations based on the size and type of facilities made it easier to build the composting infrastructure and related businesses. In the states of Washington and New York, compost site regulations revisions supported the expansion of the composting infrastructure and industry. Revised regulations create distinct categories for source separated organic materials including food scraps. Rule changes have had an impact on the number of permitted compost facilities that accept both yard trimmings and food scraps. One of the recommendations of the Illinois General Assembly Task Force on the Advancement of Materials Recycling was to draft new rules for compost sites and potentially operators. Examples of tier-based permitting regulations accommodating for different sizes of compost site operations and feedstock materials include:

California: Research facilities are eligible for simplified permitting procedures if they have less than 5,000 cubic yards (cy) on site and maximum 2-year duration.

Maine: Categorizes feedstocks and establishes permitting categories based on feedstock C:N ratio and potential for human pathogens. Facilities composting less than 400 cy/month of feedstock with C:N ratio between 15:1 and 25:1 (such as produce and vegetable waste) have reduced procedures for obtaining a permit.

Maryland: Using the US Composting Council template, Maryland used the tiered approach and feedstock types as well as utilizing a concept of contact water vs. storm water and the need to manage them differently (more information on page 67 of the Maryland Register at http://www.dsd.state.md.us/MDRegister/4125.pdf).

Massachusetts: Composting facilities handling less than 40 cy/day of vegetative food waste (or 20 cy/day of any food waste) are eligible for reduced permitting procedures.

New Jersey: Yard trimmings composting facilities with less than 10,000 cy/year are exempt from regulations provided they meet basic site requirements.

New York: Facilities handling less than 1,000 cy/year of source separated organic waste have simplified procedures for obtaining a permit (fewer requirements for submittal, design, engineering and reporting).

North Carolina: Classifies composting facilities based on the type of feedstock and the size of operation. Facilities handling less than 1,000 cy/quarter of source separated organics (e.g. food waste or paper) or less than 6,000 cy/quarter of yard trimmings have simplified procedures for obtaining a permit (fewer requirements for submittal, design, engineering and reporting).

Virginia: Chipping and grinding facilities of any size are exempt from regulations provided they meet basic environmental control and site requirements.[65]

Washington: Washington has comprehensive composting regulations that facilitate composting by conditionally exempting several types of composting facilities – including those that process limited amounts of food scraps – from the requirement to obtain a permit. Washington also aims to protect the environment and human health by requiring composters to test for pathogens and adhere to specific performance-based standards. Washington, along with Oregon and several other states, separate compostable material into several tiers based on its potential to produce negative public health and environmental consequences. Listed below are several classifications of compost facilities, which may be exempt from the permit requirement. All composters must meet performance-based requirements, some of which are listed below. The current state regulation went into effect on February 10, 2003.

On-site, small-scale food scrap composting and exemptions

Washington exempts several types of composting operations from the requirement to obtain a permit. Exempt activities include:

- Production of substrate used solely on-site to grow mushrooms;
- Vermicomposting, when used to process the following materials if generated on-site: yard trimmings, food scraps, or manure and bedding from herbivorous animals;
- Composting of yard and garden trimmings, pre-consumer food scraps, and manure and bedding from herbivorous animals with a volume limit of 40 cubic yards of material on-site at any time;
- Composting of food waste generated on-site and composted in containers designed to prohibit vector attraction and prevent nuisance odor generation; total volume of the containers shall be 10 cubic yards or less;
- Agricultural composting when all the agricultural wastes are generated on-site and all finished compost is used on-site;
- Agricultural composting when any agricultural wastes are generated off-site, and all finished compost is used on-site, and total volume of material is limited to 1,000 cubic yards on-site at any time;
- Composting of yard and garden trimmings, pre-consumer food scraps, and manure and bedding from herbivorous animals when more than 40 cubic yards and less than 250 cubic yards of material are on-site at any one time;
- Agricultural composting, when any of the finished compost is distributed off-site and when it meets the following requirements: More than 40 cubic yards, but less than 1,000 cubic yards of agricultural waste is on-site at any time;
- Agricultural composting is managed according to a farm management plan written in conjunction with a conservation district, a qualified engineer, or other agricultural professional able to certify that the plan meets applicable conservation practice standards.

All facilities must adhere to specific performance standards, which are designed to prevent public nuisance and negative environmental or public health consequences. Washington's regulations vary depending on the type of feedstock being composted. This is evident in regulations regarding exemptions from the permit requirement, pathogen reduction and site design. The **tiers,** summarized below, are fully defined in WAC 173-350-100.

- **Type 1 feedstocks:** source-separated yard and garden wastes, wood wastes, agricultural crop residues, wax-coated cardboard, pre-consumer vegetative food wastes, other similar source-separated materials that the jurisdictional health department determines to have a comparable low level of risk in hazardous substances, human pathogens, and physical contaminants.

- **Type 2 feedstocks:** manure and bedding from herbivorous animals that the jurisdictional health department determines to have a comparable low level of risk in hazardous substances and physical contaminants.

- **Type 3 feedstocks:** meat and post-consumer source-separated food wastes or other similar source-separated materials that the jurisdictional health department determines to have a comparable low level of risk in hazardous substances and physical contaminants, but are likely to have high levels of human pathogens."

- **Type 4 feedstocks:** mixed municipal solid wastes, post-collection separated or processed solid wastes, industrial solid wastes, industrial biological treatment sludges, or other similar compostable materials that the jurisdictional health department determines to have a comparable high level of risk in hazardous substances and human pathogens.[66]

Iowa: Iowa's compost site regulations changes revolve around on-farm, small-scale food scrap composting, and exemptions from the requirement to obtain a permit. The Iowa Administrative Code Chapter 567, Environmental Protection Commission, Subchapter 105.5(1), Organic Materials Composting Facilities, states: Small composting facilities are exempt from obtaining a solid waste composting permit provided the facility complies with 105.3(455B,455D) and 105.5(455B,455D). Iowa allows facilities to accept up to two tons of food scraps from off-site per week without obtaining a permit. Yard waste and food residuals may be received from off premises up to two tons per week for composting either singly, in combination, or with agricultural waste. Any clean wood waste free of coating and preservatives may be used as a bulking agent. The two tons per week weight limit does not apply to bulking agents. However, the amount of bulking agent received must be appropriate for the amount of compostable materials received. Facilities composting over two tons of food residuals and yard waste per week in any combination from off premises must obtain a permit (Form 50A (542-1542A)) and adhere to the solid waste composting requirements stipulated in 105.7(455B,455D) through 105.14(455B,455D).

Although a permit is not required, sections 105.3 and 105.5 outline the requirements to which exempt facilities must adhere. These sections contain specific site requirements including, but not limited to, the requirement that compost facilities shall be greater than 500 feet from any existing inhabited residence, outside of wetlands, and 200 feet from any public well. Composting shall be performed in a manner that minimizes the formation of leachate, and "measures shall be taken to prevent water from running onto the facility from adjacent land and to prevent leachate and runoff from leaving the composting facility. Runoff from the composting facility must be properly managed."[67]

Figure 7 – Florida Compost Facilities

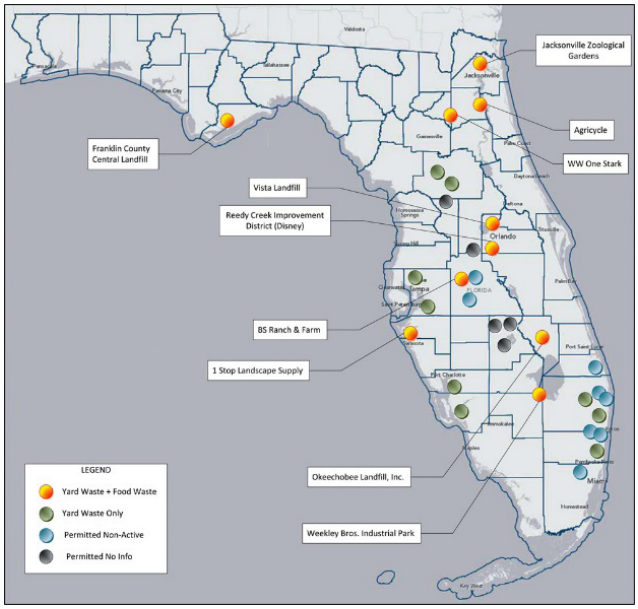


Image: BioCycle.net

Florida: The Florida Department of Environmental Protection has made several recent revisions to its composting regulations. The newly revised organics recycling facility regulations (Chapter 62Ð709) were officially adopted on February 15, 2010. These revisions were made following the formation of a Compost Rule Technical Advisory Group, consultation with stakeholders and the public, input from the Florida Environmental Regulation Commission, and review of a report compiled by The Florida Organics Recycling Center for Excellence (FORCE), which summarized existing composting regulations in Florida and possible revisions that may help encourage composting. The state of Florida revised its compost site regulations based on recommendations made by the Florida Composting Regulatory Report. Recommendations included: a) establish a more complete system of tiered facility classifications that reduces the regulatory burden for a much wider array of facilities; b) modify regulatory definitions for feedstocks and procedures in support of the tiered facility classification; c) simplify the types of compost defined by regulation and update the pollutant standards; d) establish a multi-stakeholder process for draft rule making and public comment; and e) implement an outreach and development program targeted at increasing recovery and beneficial use of organic materials. The more notable recommendations are: 1) make yard trimmings facilities with less than 50,000 cy/year exempt from regulations, provided that they conform to general environmental protection requirements; 2) enable registered yard trimmings facilities to accept vegetative food residuals provided that they handle less than 5,000 cy/acre; keep C:N ratio greater than or equal to 35:1; and materials do not remain on site for more than 18 months.[68]

4. Pay As You Throw Model

Variable-rate (or unit-based) pricing for waste collection, commonly known as Pay-As-You-Throw (PAYT), is an economic incentive policy typically enacted on a local municipal level. The policy encourages residents to reduce the amount of waste they generate and to recycle more by charging directly for waste services based on the amount of waste they throw away—similar to the way they pay for electricity, gas, and other utilities. The US EPA reports that when consumers pay for every bag or can of waste they generate, they are typically motivated to recycle more and look for creative ways to prevent waste in the first place. In communities that implement PAYT, overall waste disposal has declined by 14% to 27% on average. In addition, recycling rates typically have increased by between 32% and 59%. PAYT is available in over 7,100 communities throughout the US and has been statistically found to be one of the most cost effective methods to reduce trash disposal and encourage recycling. There are 170 PAYT communities in Illinois.[69]

Traditionally, residents pay for waste collection through property taxes, utilities, or a fixed fee, regardless of how much or how little trash they generate. In a PAYT system, waste generators are charged based on the number, size, or weight of the containers they put at the curb. Cities with PAYT have long used it to create incentives to recycle—charging lower rates (or no charge) for recycling and graduated rates for large waste containers. Using variable rates to incent residents to separate food waste would involve only a minor change in the system. PAYT systems are in place in nearly 80% of the communities that collect food scraps. The USEPA supports the PAYT approach to solid waste management because it encompasses three interrelated components that are key to successful community programs:

1. **Environmental Sustainability** - Communities with programs in place have reported significant increases in recycling and reductions in waste, due primarily to the waste reduction incentive created by PAYT. Less waste and more recycling mean that fewer natural resources need to be extracted for new products. In addition, greenhouse gas emissions associated with the manufacture, distribution, use, and subsequent disposal of products are reduced as a result of the increased recycling and waste reduction PAYT encourages. In this way, PAYT helps slow the buildup of greenhouse gases in the atmosphere which leads to global climate change.

2. **Economic Sustainability** - PAYT is an effective tool for communities struggling to cope with soaring MSW management expenses. Well-designed programs generate the revenues communities need to cover their solid waste costs, including the costs of such complementary programs as recycling and composting. Residents benefit through the ability to control of their waste bills.

3. **Equity** - One of the most important advantages of a variable-rate program may be its inherent fairness. When the cost of managing waste is hidden in taxes or charged at a flat rate, residents who recycle and prevent waste subsidize their neighbors' wastefulness. Under PAYT, residents pay only for what they throw away. Some argue that lower income residents benefit from PAYT systems because household waste is "generally positively related to household income, so poorer families are likely to face lower waste collection charges under PAYT systems."

The risks of PAYT systems include general public resistance when there is a change to any established municipal service. Charging for waste can also sometimes result in illegal dumping (fly-tipping) or the waste being passed to unlicensed or illegal disposal methods. However, most PAYT communities have found this not to be the case according to the US EPA.[70,71]

PAYT systems are generally categorized into five major types:[72]

Variable or Subscribed Can: Households sign up for a specific number of containers (or size of container) as their usual garbage service, and are billed when disposal volumes increase.

Bag Programs: Households purchase specially marked bags sold at convenience stores, grocery stores, and City halls. The price of the bag includes some or all of the cost of collection and disposal of the amount of waste in the bag. Some programs have a customer charge or base fee in addition to the bag fees to help make sure they cover fixed costs.

Sticker or Tag Programs: Households purchase special tags or stickers to put on their bags of garbage sold at convenience stores, grocery stores, and City halls. The sticker price includes some or all of the cost of collection and disposal of the amount of waste in the bag. As with bag programs, some programs have a customer charge or base fee in addition to the sticker fees to help make sure they cover fixed costs.

Hybrid Programs: Households only pay for waste beyond a specified "base" volume. They pay a fixed bill or a tax bill that entitles them to a first can or bag of garbage (size limits are usually around 30 gallons). Additional waste is charged on a per-bag or per-sticker system as described above. This system is a "hybrid" between existing garbage programs and the new incentive-based approach, which minimizes billing and collection changes.

Weight-Based: Garbage cans are weighed on scales of retrofitted collection trucks, and the household is charged for the pounds of waste it actually generates. This system is more equitable, and communities can use large cans but still provide a strong recycling incentive.

In addition, some communities have drop-off programs, where customers pay by the bag or weight at transfer stations using fees, bags, stickers, or pre-paid punch cards. Some haulers offer PAYT as an option, or customers may choose unlimited collection for a fixed disposal fee.

Some states have implemented legislation and policies around PAYT. The most recent inventory finds four states mandating PAYT with some caveats. One state includes PAYT as a menu choice of programs from which communities must select. Thirteen states offer financial incentives or grants with PAYT preference, and 33 actively offer promotion or education about PAYT, and many others have voluntary recommendations. Extensive statistical analysis (published in *Resource Recycling* over the last decade) shows that PAYT reduces total residential waste generation by about 17%. One-third of this impact is an increase in recycling, one-third is an increase in organics diversion and one-third is source reduction and waste prevention strategies. The recycling impact alone is an increase of 30-100% - an average of about 50% reported by Frable and Berkshire in 1995 and numerous SERA studies.[73]

Boulder, CO

In Boulder (population 98,889) low landfill tipping costs in the region meant that private haulers faced no incentive to promote waste diversion among customers that paid a flat rate for all waste services. To change the incentives facing haulers, the city required them to provide recycling and composting. At the same time, it required them to institute a PAYT system, in which citizens are charged for waste collection based on container size. In 2005, Boulder launched a pilot curbside compostables collection program. In 2010, single-family households diverted 3,540 tons of organics (food scraps plus yard waste), or about 370 pounds per participating household.[74]

Massachusetts

40% of the communities in Massachusetts (143 total communities) now have PAYT policies. Trash disposal costs were an expensive and growing part of local community budgets, so they stopped using the property tax to pay for it and started charging per bag. With no fees for recycling, trash tonnage went down by as much as 30% and recycling increased by a similar amount in most communities. Communities are also saving a lot of money (one reported saving $1.5 million annually) using PAYT.[75]

Additional Community Snapshot Examples

- Gainesville, FL (pop. 95,500) saved $200,000 in landfill tipping fees after implementing PAYT in 1994, reduced solid waste collection by 18%, and increased recycling rate by about 25%.
- Wilmington, NC (pop. 75,800), saved $400,000 in the first year of PAYT in 1992.
- Worcester, MA (pop. 172,600) decreased waste management costs by $1.2 million and increased recycling rate from 3% to 36% immediately following the introduction of PAYT in 1993.
- The recycling rate in San Jose, CA (pop. 895,000) rose from 28% to 43% in the first year of its program in 1993, and to 55% by 1998.
- In Tacoma, WA (pop. 194,000) solid waste management costs fell by more than 50% in the PAYT program's first year, and the recycling rate tripled.
- Falmouth, ME (pop. 4,100) decreased waste volume by 35% and increased recycling by more than 50% after establishing PAYT in 1992.
- In Mount Vernon, IA (pop. 3,400) PAYT helped the community reach a 50% recycling rate.[76]

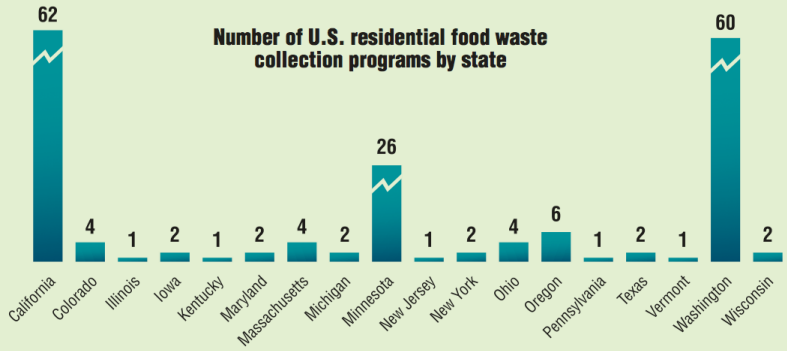
C) Programs

Across the nation, composting is developing as a viable, locally-based industry that achieves multiple objectives related to economic development, job creation, cost savings, and environmental sustainability. Over 180 communities now have residential curbside food scrap collection programs, many of which incorporate a "3-bin" system of collecting food scraps and yard waste, recycling and refuse. The number of communities in the U.S. with residential food waste collection service has grown by more than 50% since 2009.[77] Commercial composting initiatives are developing rapidly within business districts, large food retailers, hospitals, schools, universities and other institutions.

1. Residential

Figure 8 – Number of US Residential Food Waster Collection Programs by State (2013)

Source: Rhodes Yepsen, "Residential Food Waste Collection in the U.S.," BioCycle (March 2013, Vol. 54, No. 3, p. 23).



A 2014 MIT study on *Municipal Curbside Compostables Collection* across the U.S. concluded that the conditions present for the most successful residential food scrap collection and composting programs included an ambitious state or county waste diversion mandate; high or rising landfill costs; nearby processing facilities; and a pre-existing infrastructure for collecting and processing yard waste.[78]

The Institute for Local Self Reliance in their 30 years of study on model programs concludes that the conditions that generate the most successful programs include:

- convenience for participants (bins provided; frequent collection)
- education and outreach (participants need to understand the benefits, what materials are accepted and how to sort properly)
- targeting a wide range of materials (year-round yard trimmings, all types of food scraps, food-soiled paper)
- elimination of sources of contaminants (such as banning polystyrene foodservice ware and requiring reusable, recyclable or compostable ware) pay as you throw trash fees (which provide an economic incentive to reduce waste, recycle and participate in composting programs)[79]

California

Alameda County: Alameda County has been collecting residential food waste since 2002, and currently has 365,000 single-family homes with Source Separated Organics (SSO) service. In 2010, a total of 173,914 tons of residential yard waste and food scraps were collected. "We estimate that about 5 to 10% of that tonnage is food waste," reports Brian Mathews, Senior Program Manager for StopWaste.Org. All food wastes, including meat, dairy, and food-soiled paper are accepted with weekly collection of all materials streams (waste, recycling, organics). Compostable bags are allowed in specific programs. A variety of outreach techniques are used to boost participation rates, including creative regional media campaigns, bill inserts and contests. Organics are composted at Recology Grover and Newby Island facilities (Allied/Republic).[80,81]

Image: San Francisco Department of Environment

San Francisco: About 90 percent of San Francisco's 350,000 households now have food waste composting service, a major increase after organics collection became mandatory in 2009. "While it is mandatory that everyone participate, and this impacted single-family households quickly, we are still bringing on new apartment buildings," reports Jack Macy, Commercial Zero Waste Coordinator for SF Environment. "Recology currently collects about 600 tons per day of organics in San Francisco, or 150,000 tons per year." In November 2011, the city passed a monumental landmark of diverting 1 million tons of organics since the start of the program. About 20 to 40 tons of food waste (mostly commercial) are digested at the East Bay Municipal Utility District (EBMUD), and a new project is expected to increase this amount to 120 tons/day.[82] The remaining organics are composted at Jepsen Prairie Organics. A pilot project is planned to test less frequent waste collection to determine effectiveness in increasing participation and diversion numbers. The city is currently at 78% diversion.[83]

San Francisco has adopted the most comprehensive approach to composting in the US. Events held in the city are required to offer recycling and composting. All residential and nonresidential properties receive collection service, and are required by city ordinance to sort compostables. San Francisco residents receive recycling and composting

service with landfill service at a flat rate. Apartment buildings (6 units or more) and businesses pay a reduced rate for recycling and composting service. SF Environment offers recycling and composting resources for residents and businesses such as trainings, sample letters notifying tenants of new programs, and door-to-door multi-lingual outreach materials. As a result, San Francisco's results are unparalleled. The city collects over 600 tons of food scraps and yard waste each day, about 220,000 tons annually. This is 541 pounds per capita—more than any other city in the country. To achieve 100% zero waste, SF Environment continues to advocate for state legislation and partner with producers to develop a producer responsibility system, where producers design better products and take responsibility for the entire life-cycle of a product, including take-back and recycling.[84,85]

Colorado

Boulder and Louisville: The cities of Boulder and Louisville, as well as unincorporated Boulder County, are up to 33,000 households with food waste collection. The city of Boulder went citywide in 2008, and has 19,014 single-family waste accounts, all of which are required to include organics and recycling collection. Boulder has 63 multi-unit properties participating. ,The city provides a rebate to the hauler to make the program more cost-effective due to Colorado's extremely low landfill tipping fees. A pilot is being planned to increase participation of more multifamily units. Due to the prevalence of bears, Boulder does not permit meat. Louisville and Boulder County do allow meat in their food scrap programs.

The combined residential organics tonnage collected from these three areas in 2010 was around 7,300 tons. Organics collection is biweekly, and there is a PAYT structure as an incentive for participation. Kitchen pails are not distributed. Residents can put organics directly into the curbside cart, although use of certified compostable bags is promoted as a means of increasing participation. "However, with our open windrows the light material comes to the sides and doesn't break down, so we've purchased a vacuum system for removing remaining film after the compost exits our trommel screen," says Bryce Isaacson of Western Disposal, which hauls and composts most of the organics for the area.[86]

Illinois

Oak Park: In 2012, the Village of Oak Park conducted a pilot curbside compost collection program with 110 households. The pilot determined that 20 pounds of food scraps per household per week were diverted from the landfill, about 8,800 pounds per month. Due to this positive participation rate the program is now a permanent component of waste management services. The Village offers residents the opportunity to have food scraps collected like trash on a weekly basis.

As of August 2014, 700 out of 12,000 households are participating. The Village has worked closely with Waste Management to offer this service. Between April and November food scraps are collected along with yard waste. During the winter season, food scraps only are collected. All materials are transported to the Waste Management commercial composting facility in Romeoville, Illinois. The facility is owned and operated by Waste Management. The program is a voluntary paid subscription. The subscription costs $14 per month (equivalent to the cost of one yard waste sticker per week which residents pay for additionally). The program also offers residents the option to share the service with neighbors to lower costs.[87,88]

image: www.oakpark.com

Lake County: In 2014, the Solid Waste Agency of Lake County began encouraging its members to request bids from their residential haulers (typically during discussions for contract renewals or formal request for proposals) for curbside collection of organics year round. The range in costs to provide a third organics container (including the cost of a large cart) with every week collection of organics and recyclables and every other week for refuse has been an additional $3.50 to $5.82 per household per month. To date, three municipalities have received such bids, but none have decided to accept the program change yet.

With respect to commercial rates for food scrap/organics collection, the Agency helped five of its municipal members enact commercial franchises in 2014 whereby one hauler was given exclusive rights to collect waste , recyclables and organics from all the businesses in that municipality. The competitive pricing for organics collection resulted in costs that ranged from $41 per month for once a week collection of a 65 gallon cart (the currently preferred method for collecting food scraps from commercial businesses) to $64.50 per month. Alternatively, the cost to have a 65 gallon cart of refuse collected once a week ranged from $15 to 28$ per month. In most cases the cost for organics collection was at least twice and up to four times greater than refuse collection. The hope is that route density, as more businesses contract for the service, will enhance the productivity of the hauler and lead to lower rates that are more in line with refuse rates. None of these franchises has been implemented yet (they all become effective in 2015) so it is not known how many businesses signed up for the organics option under the contract (organics collection is not mandated, it is an option for the business).

Michigan

Ann Arbor: The city of Ann Arbor currently has 13,700 households out of 24,000 subscribed for yard trimmings and food waste collection. This has grown since the program was launched in 2009, due to promotions for the program in 2010. Residents must purchase the cart, and then the service is covered by taxes that pay for garbage collection. While the residential program still only permits raw vegetative food waste, some other facets have changed. "Most notably, we've privatized the composting operation to realize significant savings to the city," says Tom McMurtrie, solid waste coordinator. "WeCare Organics now operates the composting facility, which is still owned by Ann Arbor, and they are actively looking to expand organics throughput." Only about 30 businesses participate in the commercial food waste program, and the city is looking to get another dozen on board this year.[89]

Minnesota

Hennepin County: Communities in Hennepin began composting residential food waste in 2005 (in Wayzata), and programs continue to be strong, albeit with minimal growth. In February 2014, the Hennepin County Board approved a requirement for Minneapolis to collect food scraps citywide starting in 2015 (it has had several small pilots), and a requirement that county staff provide a schedule for the rest of the communities in Hennepin County (there are 47 in all). The city of Minneapolis has 106,000 households with 1 to 8 units (about 60% of the population); the timeline for rollout is 25% of households in 2015, with the remaining 75% in 2016, staggered to allow for purchasing of carts, trucks and hiring staff. The program will be opt-in, where all residents pay for the service but must sign up to receive a cart dedicated to food scraps (yard trimmings will continue to be collected separately in residents' own cart or compostable bags).[90]

Oregon

Marion County: The cities of Salem and Kaizer have been collecting residential food scraps since 2010, with service offered to about 48,000 single-family households. The communities have weekly collection of trash and organics, and biweekly recycling collection. A PAYT pricing structure allows residents to reduce their trash cart to 20-gallons. All organics are permitted in the green cart, including food-soiled paper (napkins, pizza boxes, etc.), but compostable bags and compostable paper packaging are not, as specified by the processor, Pacific Region Compost.

Newport: In July 2014, the town of Newport rolled out a residential food scraps and yard trimmings program to 2,400 households. The service adds $6.59 per month to a customer's bill for weekly collection of the 65-gallon organics cart (trash and recycling are also collected weekly), with the possibility to opt-out. With an aggressive PAYT pricing structure, residents have the ability to offset the cost by downsizing their trash container.

Portland: The City of Portland piloted residential food scraps collection in 2010 and went citywide to all 147,000 single-family households (up to four units) in 2011. The city implemented less-than-weekly trash collection with the rollout of the organics program, and is now targeting multi-family buildings, about 200 of which are on the program so far. In 2013, 76,000 tons of residential organics were collected, roughly 10% of which are food scraps, and composted at Nature's Need and Pacific Region Compost. The city does Spring mailings to people in multi-family buildings, reaching about 18,000 units/year, and in 2015 will expand this to reach 50,000 units. "From our vantage point, every other week garbage collection has been very successful," reports Arianne Sperry in the city's Solid Waste & Recycling office. "Since the food scraps collection program started three years ago, Portland residents have reduced garbage going to landfill by 36%. No other single program change could make such a significant difference." The every other week trash collection was also key to Portland's high participation rate in the food scraps program — a field study showed that almost 80% of Portland households are placing food scraps in the green cart.[91,92]

Texas

San Antonio: In September 2011, San Antonio rolled out a large-scale pilot project, reaching 30,000 households. "We have 340,000 collection points, so we wanted the pilot project to be substantial," says Josephine Valencia, Assistant Director of San Antonio Solid Waste Management. "We just finished rollout of automated blue and brown carts in the last two years, and it was a difficult transition with mixed feedback. We have strong individualism in Texas, so we communicate that residents are not mandated to participate in the food waste pilot, but it's an option." Specific neighborhoods were targeted for the pilot that are reflective of the larger demographic, looking at education, income, recycling rate, etc. "We want a realistic picture of what can be expected with citywide expansion of the program," notes Valencia. So far, waste diversion goals are driving the program, not economics, because landfill and composting tipping fees are about the same. The city may be able to negotiate lower composting tip fees in the future, once the program is full-scale.

San Antonio expanded to a subscription-based program in 2013, offered to 120,000 households for $3/month. Participants receive either a 48- or 96-gallon cart, with weekly collection of food scraps and yard trimmings. Currently about 19,000 households are subscribed, with 4,829 tons collected in FY 2014, composted at New Earth Soils & Compost. Starting in Fall 2015 through 2017, the program will go citywide to all 344,000 households, and transition from subscription into an embedded/opt-out part of the trash and recycling service. Also at that time the city will move to a PAYT tiered rate structure.[93]

Washington

King County: King County began offering residential food scraps collection to its 38 jurisdictions in 2004 (Seattle operates separately), completing the rollout in 2011. It reaches about 319,500 single-family homes, and 59% are in subscription-based programs: currently about 225,500 households are signed up for food scraps and yard trimmings collection. More than half of the communities collect organics EOW, and most have EOW recycling, while only Renton has EOW trash. Households subscribed divert about 27.4 lbs/week, of which about 2.1 lbs/week is food and food soiled paper. While disposal of yard trimmings in residential trash is prohibited, many multi-family buildings contract directly for removal of yard debris, and don't have an organics cart for food scraps. The city of Bellevue embedded food and yard trimmings in its new contract for multi-family buildings (one 96-gallon cart per building, more at an extra cost), and the county expects other cities to follow suit as new contracts come up for bid. Currently, about 4,242 multi-family buildings in the county have food scraps collection.

Seattle: The City of Seattle introduced curbside yard trimmings collection in 1989, included vegetative food waste in 2005, and then expanded to all food waste in 2009. This service is required for the 147,950 single-family households, unless exempted for backyard composting (6,183 households), as well as for the 5,843 multi-family buildings (five or more units), representing 149,618 units (only 25 buildings were exempted due to space constraints). In 2013, the city diverted 134,761 tons of organics, including 6,290 self-haul tons, that were processed at Lenz Enterprises and Cedar Grove Composting (the latter until the Pacific Clean facility comes on line).[94] In 2014, Seattle passed a law requiring all organics (including food-soiled paper) from all sectors to be diverted to composting beginning January 1, 2015. Starting July 1, 2015, a fine of $1 per violation may be assessed against single-family customers with more than 10 percent organics (visually) in their carts or cans; a $50 fine can be assessed against multifamily and commercial customers after two warnings.[95]

Toronto, ON

Toronto is the largest city in Canada and fifth largest in North America. In 2005, Toronto (population 2,791,140) introduced its Green Bin program. Organics are collected weekly from 510,000 single-family households. The program is currently expanding to cover multi-unit residential properties, is notable because it allows the use of plastic bags and the disposal of diapers, animal waste, meat, and dairy products. Moreover, Toronto is distinct because it has invested in two large-scale anaerobic digester processing facilities. As of 2012, Toronto collected 136,000 tons of residential organics and 14,000 tons of commercial organics. Taking into account an approximate 15% residue rate, that amounts to 91 pounds per capita of organics. This number includes the 101,200 tons per year of yard waste and Christmas trees that are collected.[96]

2. Commercial and Institutional

Commercial compost programs are increasing significantly as interest in food scrap diversion expands across the country. These entities offer opportunities for greater volume of collected material, increased route density for haulers and the accompanying price reductions that volume and route density support. Typical commercial programs have the following characteristics:

- Focused on "targeted" high-food businesses
- Material collected in 64-gallon carts
- Service provides options for collection at least 3 times per week
- Voluntary and charge additional rates that are lower than MSW

- Include staff outreach (often by hauler)
- 53% in suburban communities; 25% in rural areas; 18% in urban communities; remainder in colleges, tourist areas or isolated communities[97,98]

A few examples of commercial/institutional programs include:

Charleston County

Charleston County, South Carolina

Charleston County has used a scaled approach to diverting organic materials from its primary landfill. In September 2009, Charleston County banned all yard waste from the Bees Ferry landfill. The Bees Ferry Compost Facility processes 100% of the yard waste, nearly 59,000 tons a year. In September 2010, Charleston County began a Food Waste Composting Program when the South Carolina Department of Health and Environmental Control (DHEC) approved Charleston County Environmental Management Department's request to implement a 12-month Food Waste Composting Pilot Program.

Charleston County began its pilot program in 2011 targeting commercial food waste generators. 1,859 tons of food waste was processed under the pilot program, with 500 tons of food waste processed in the first six months. The pilot program was deemed a success and received an operating permit from the DHEC, effective June 2012 to process food at the Bees Ferry Compost Facility. The facility is the first in the state to implement two major innovations: (1) using compost as Alternative Daily Cover in the landfill, and (2) conducting a food waste composting pilot. In January 2013, the Program earned the US Composting Council's (USCC) Seal of Testing Assurance (STA), which testifies that the finished compost consistently meets high quality standards. Currently, Charleston County is the only producer in the South Carolina to have this certification. Charleston County is the largest compost producer in the state and one of the largest on the East Coast. With landfill tipping fees at $66 per ton and compost facility tipping fees at $25 per ton, businesses and institutions save money by diverting their food scraps from the landfill. To realize these savings, businesses must contract with one of five food waste haulers in the area in order to deliver their organics to the county-owned compost facility.[99]

City of Austin

Austin, Texas

As a result of a city council ordinance, all Austin restaurants must compost by 2017, and restaurants over 5,000 square feet by 2016. Restaurants will be allowed choose a private contractor to haul their food scraps for composting. The City of Austin Zero Waste initiative and new rules aim to reduce the amount of waste sent to landfills and help Austin meet its zero waste goal of by 90% materials diversion from landfills by 2040.100

Jewel Osco

Itasca, Illinois

Jewel-Osco, a 176-store grocery chain based in Itasca, IL, has 169 stores within a 70-mile radius in the Chicago area diverting food scraps for composting, according to Jon Dunsing, project manager. The average store sends between 6 and 7.5 tons/month to composting sites. The annual total for all stores on the program is 12,000 tons. Five haulers transport food scraps from Jewel-Osco stores: Republic Services/Allied Waste, Waste Management, Veolia USA, Midwest Fiber and Organix. Composting sites in Illinois receiving the material include Midwest Fiber in Lexington, and three Waste Management facilities in Calumet City, Dekalb and Romeoville. All of the stores' meat fat and bones go to rendering. To get employees up to speed, Jewel-Osco provided in-store training to explain what can go in the 65-gallon wheeled bins (fitted with compostable liners) and how to separate food packaging material, which is also recycled. Jewel provided training to 75 to 80 employees at each store during 2012, which helped explain the rationale behind the project and generated buy-in, enthusiasm and momentum.[101]

Davis Joint Unified School District

Davis, California

The Davis Joint Unified School District piloted comprehensive food scrap diversion projects at three elementary schools. Two schools reduced their total waste stream by 40%. The third school has the potential to decrease its waste stream by 20% if the program continues. The programs included a switch to the "offer versus serve" method, food recovery for food banks, recycling, and the collection of organic materials for on-site composting and vermicomposting systems. The contract accomplished the goals of integrating the composting and vermicomposting systems into the school garden program, as part of a larger farm-to-school vision.

image: wbez.org

Oak Park Elementary District 97

Oak Park, Illinois

In 2008, Oak Park Elementary District 97 piloted a comprehensive Zero Waste Schools initiative at Holmes Elementary. The project included strategies, policies and systems changes for increasing recycling, eliminating specific waste sources and converting food scraps to compost, educational activities, and stakeholder communications. The following year, additional schools participated and were support by Illinois DCEO Zero Waste Schools Grant Program, which provided funding for hard cost implements, including on-site composters, hand dryers, bins, dishwashers and other materials. To date, 9 of the 10 schools have increased their waste diversion rates from 20% to over 80%, with one school reaching the 97% mark. Most of the schools are now participating in the Village of Oak Park's residential food scrap collection program, where material is hauled to a compost facility 20 miles away.

Emory Hospital

Atlanta, Georgia

Since 2009, Emory's composting program has directly supported Emory's goal of diverting 65% of its waste from landfills by 2015. Emory partners with Southern Green Industries to process the compostable material collected on campus. The compostable material is delivered to a facility where the materials are mixed with other compostables to achieve an ideal balance of nitrogen and carbon. This industrial-scale composting system uses very high temperatures to destroy pathogens and better decompose items, which enables Emory to compost meat bones, paper products, and other items that are not usually compostable in residential composting systems. After a 90-day process during which the composting windrows and beds are turned regularly, the compost is returned to Emory's campus where it is used in semi-annual planting beds[102]

3. Watershed Protection Projects

State and local governments dealing with costly stormwater runoff, erosion and water quality protection issues are incorporating the use of compost and composting strategies as components of watershed protection and stormwater runoff mitigation plans. Compost provides greater capacity to hold water, reduce erosion, filter contaminants, and replace the use of synthetic lawncare and agricultural chemicals. These elements are used in planning watershed protection projects. Sample projects and programs include:

Washington State: "Soils for Salmon" Project

Developed by the Washington Organic Recycling Council (WORC), the project implements guidelines, best practices, and policy change to protect western Washington's Puget Sound. By educating the public about the soil to water connection, the program drives landscapers, builders, developers, and citizens to use compost-based low impact development (LID) to reduce stormwater runoff. Soils for Salmon program criteria is being implemented into the Sustainable Sites Initiative™ (SITES™) a LEED equivalent national benchmark for sustainable site development which will be launched in 2013.[103]

Montgomery County, Maryland: RainScapes Compost-Amended Soil Requirement

Montgomery County is implementing policies to reduce non-point source pollution and enhance stormwater management through its RainScapes Rewards Rebate program. The initiative was set forth to comply with the EPA's National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit Program, as part of an overarching effort to meet the goals of the Clean Water Act. The RainScapes Rewards program currently calls for amending soil with compost as a best management practice for rain garden projects. The program requires a 3-inch layer of compost for all conservation landscape projects. RainScapes offers property owners a rebate for low impact development (LID) installations, and has been replicated by the City of Rockville and City of Gaithersburg. The Montgomery County Department of Environmental Protection is the lead department coordinating a multi-agency effort to comply with the stormwater permit issued to the County by the Maryland Department of the Environment.[104]

Hennepin County, Minnesota: Hennepin County Department of Transportation Compost Pilot Project

From 2006-2007, the Hennepin County DOT conducted a pilot project using finished compost as an erosion control and surface water quality protection method. As compared to conventional practices, positive results included quicker seed germination and vegetation; easier movement, placement, and precision of compost logs (i.e. knitted mesh tubes filled with composted material and also known as compost filter socks) compared to silt fences (especially in difficult, awkward construction areas like highways); and an "all-in-one convenient operation", providing erosion control and slope stabilization with materials that would otherwise go to landfills or incinerators. The findings included a cost savings of $1,429 using the compost-based system versus machine-sliced silt fence and sod option.[105]

Greeley, Colorado: Greeley Public Services

For over a century, the City of Greeley has enforced water restrictions, and in recent years has realized the added benefit of compost-amended soils in water quality. Greeley's Public Services – Section 14.08.195 through 14.08.310 requires new lawn installations to use 4 cubic yards of compost per 1,000 square feet of area, incorporated at a depth of 6 inches. According to Ruth Quade, the City's Water Conservation Coordinator, "you can drive through a new development (in March/April) and tell just from appearance which lawns were amended and which ones weren't."[106]

4. Drop-Off Models

One of the most economical ways to engage residents in food scrap composting by avoiding hauling service costs is to establish local community drop-off centers where residents can aggregate their food scraps. A few model programs include:

Northampton, Massachusetts

Northampton is a community with a population of 28,370 and 12,771 households. Since June 2010, a food scrap drop-off program is provided at the Locust Street Recycling Center. The Northampton Department of Public Works is running this free pilot program for at least a year and then will assess the level of interest in diverting organics from the residential waste stream by measuring participation and generation rates. Two hundred and fifty participating household received collection container for use inside their homes. The participants need a valid vehicle permit for the center that can be purchased for $25 per year ($5 for seniors). There are 10 64-gallon carts available for food scrap such as meats, fish, dairy, food-soiled paper, and other non-recyclable paper products. No bio-bags are allowed in the program. The food scraps may not be combined with yard waste, which collected at a separate facility for free.. Since residents do not have curbside collection, many use the Recycling Center drop-off for waste and recycling. There are, however, many private haulers that offer waste and recycling services. Within 10 weeks, less than 5 tons of food scraps had been collected. The goal is to collect 1 ton per week once the program becomes more wide-spread. "The residents love it!" says Karen Bouquillon from the DPW, "This is a very inexpensive way to offer composting of food waste to residents." The city budgets $5,000 per year for the program which included the purchase and distribution of indoor containers. The diversion rate is 47% not including yard waste. Northampton previously had a successful food waste program that had to be discontinued when the composting facility shut down. Since then, the city had been waiting for another composting facility to open that was close enough to make the program economically feasible. There is also a desire to have a back-up plan in case an issue occurs at the compost facility.[107]

Duluth, Minnesota

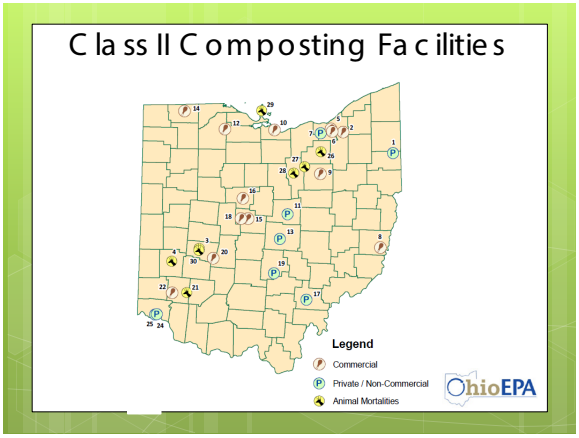
Duluth has a population of 84,419. It is part of the Western Lake Superior Sanitation District (WLSSD) which also includes Cloquet, Hermantown, Proctor, Carlton, Scanlon, Thomson and Wrenshall, and surrounding rural townships of Silver Brook, Thomson, Twin Lakes, Canosia, Duluth, Grand Lake, Lakewood, Midway, Rice Lake and Solway for a total of 43,895 households. The WLSSD coordinates a residential food scrap drop-off program at 7 sites in the area. These sites are also available to residents of Superior, WI which increases the potential households by 11,515 for a total of 55,410 households. The first food scrap drop-off site was opened in 2004 after a curbside pilot ended and residential interest continued. Additional sites were added through 2008 and were spread-out among the area for convenience. In 2009, a commercial drop-off was added. All drop-off sites are open daily, with some open 24 hours.

The program provides free drop-off for food scrap contained in compostable bags. The bags are free at the WLSSD facilities, or can be purchased from the host sites. Bag use reduces contamination and keeps the host sites cleaner. Accepted food scrap includes meats, dairy, fish, small bones, bread, coffee, and spoiled and moldy foods. Most sites have 2 cubic yard dumpsters for the food scrap collection, but a few have 95-gallon carts. Material is collected once a week. The food scrap is collected, mixed with shredded yard waste, composted year-round, and sold as "Garden Green Compost". The composting facility processes over 40 tons of organics per month, including commercial accounts and residential drop-offs. At the most heavily used drop-off sites, between 400 and 750 pounds of food waste are collected per week. Each pick-up costs $20 each, tipping fees for organics are $0 per ton, and waste is $45.28 per ton. The WLSSD offers free Waste Free Party Kits to further promote the food scrap program.[108]

D) Statewide Approach: Comprehensive Strategy in Ohio Builds a Food Scrap Composting Industry

The State of Ohio has implemented a multi-faceted strategy including stakeholder forums, infrastructure mapping, grants to support infrastructure, and compost site regulatory changes designed to advance its food scrap composting industry. Ohio EPA, US EPA Region 5, and specific stakeholders have developed and implemented food scrap recovery projects. In many cases, communities and businesses have launched food scrap recovery programs on their own. Since 2009, City of Huron (Erie County), Village of Luckey (Wood County), Fairborn (Greene County), West Milton (Miami County), and Miami Township (Montgomery County) residents have been offered food scrap collection along with their yard waste collection. Private institutions such as the Kroger Company have also implemented corporate initiatives to divert over 3,500 tons from Ohio landfills into compost. Cleveland sporting venues such as the Browns Stadium, Cleveland Metroparks Zoo, Progressive Field, and Quicken Loans Arena also began collecting food scraps. Colleges, universities, and other organizations continue to compost on-site, when available as an option.

FIGURE 9 – Ohio Composting Facilities



Source: Ohio EPA Composting Infrastructure Map

In Ohio, composting is considered a form of solid waste disposal. (Chapters 3745-560 and 3745-501 of the Ohio Administrative Code) Ohio law defines composting as a method of solid waste disposal using controlled biological decomposition (OAC Rule 3745-560-02). Composting activities occurring at a residence, and activities using under 300 square feet at a non-residential location, are not subject to Ohio composting regulations. The solid waste composting regulations require that a facility obtains a registration, license and permit, as applicable. Other requirements established by the program include: types of wastes that can be accepted for composting, operational requirements of the facility, and testing requirements for the

finished product prior to distribution. Solid waste composting facilities which fall into the following categories are regulated by the Division of Materials and Waste Management: Class I – mixed solid waste; Class II – source-separated yard waste, agricultural waste, animal waste, and food scraps; Class III – source-separated yard waste, agricultural waste, and animal waste; and Class IV – source separated yard waste. Source-separated means that the waste (feedstock) has been separated at the point of generation or collection from other solid wastes. In the Midwest, Ohio composting regulations (OAC Chapter 3745-560: Composting Facilities) are a great model. Officials have designed rules to suit various land uses (i.e. rural, suburban, urban) and made special effort to adapt to contemporary community needs via permit exemptions.

Ohio rules went into effect in April 2012. The updated regulations allow a registration (i.e. permit) exemption for any composting operation under 300 square feet. This is largely "to accommodate community gardens and urban farms," explains Angel Arroyo-Rodriguez, an environmental planner and composting specialist for the Ohio EPA. Facilities over 300 square feet must register and obtain a license (essentially permit-by-rule) which requires an annual fee based on the daily amount of tonnage handled, a plan of financial assurance, and a daily maximum amount of materials to be indicated by the operator. This allowed daily maximum waste receipt prevents the facility from receiving any more material then it can handle in 24 hours, giving the operator a baseline to avoid material back up and long term issues.

Ohio regulation includes standards without imposing restrictions on the exact way to operate. Operators of registered composting facilities are responsible for determining their own capacities and abiding by them. Citizens can bring off-site material (i.e. yard waste, animal waste, agricultural waste, food scraps, bulking agents and additives) to community gardens, for example, and use the finished product anywhere "as long as there are no odors and air or water pollution." Even in the case of larger facilities that require an on-site material limit, Ohio has avoided constrictive thresholds for the most part, and thus allows the operator to indicate this amount based on facility capacity. Arroyo-Rodriguez likes this approach because the amount, "Is not an arbitrary number. They designed the facility to handle an amount of material, so we'll hold them to that," he says. "At any time, they can make the necessary changes to accept more material. They just need to update their registration and license." Such performance-based standards foster innovation and take into account different site qualities, such as climate and soil type. These rules thereby acknowledge no one model as the best option for every facility.[109]

E) What Leading States Have Done

The top five states that are diverting the greatest volume of organic material (yard waste, food scraps, biosolids, manure) and creating compost include:

1. California - 5.9 million tons annually
2. Florida – 1.5 million tons annually
3. Iowa – 1.3 million tons annually
4. Washington – 1.2 million tons annually
5. New York – 1.0 million tons annually

*Illinois is diverting 500,000 tons annually (according to the 2013 IL EPA Permitted Landscape Waste Compost Facilities Report)[110]

In California, the biggest driver was the establishment of the California Waste Management Act of 1989, which required local municipalities to divert 50% of all materials from landfills by the year 2000 through recycling or composting – and its 2013 update to require 75% diversion by 2020 (In September 2014, California passed legislation banning yard trimmings and food scraps from landfills for commercial sector generators). In Florida, a revision of compost site regulations based on the size and type of facilities made it easier to build the composting infrastructure and related businesses. In Iowa, the state instituted a ban on sending yard waste to landfills, which has driven the composting industry. In Washington state, compost site regulations revisions similar to Florida supported the expansion of the composting infrastructure and industry. And lastly, in New York a combination of compost site regulatory changes, New York City's recent organics ban, and the State Executive Order #4 requiring all state agencies to implement sustainable strategies (including food scrap composting) are driving the high food scrap diversion volume. Average landfill tipping fees for each of the states – compared to Illinois' average fee of $43.46/ton – are as follows: California-$52.07; Florida-$43.65; Iowa-$34.15; Washington-$70.44; and New York-$86.30.[111]

A 2014 MIT study on *Municipal Curbside Compostables Collection* across the US concluded that the conditions present for the most successful residential programs included an ambitious state or county waste diversion mandate; high or rising landfill costs; nearby processing facilities; and a pre-existing infrastructure for collecting and processing yard waste.[112]

VI. Compost Quality Standards and Economic Potential

Like many of the Midwestern states, agriculture is the base of Illinois' economy. Illinois directly depends on its fertile soil for agricultural production, including its main crops of soy, corn, and pumpkins. This richness of the soil was developed over millennia from glaciers depositing minerals and nutrients. However, over the past 50 years or so conventional farming methods have depleted the soil quality. This is due to unnecessary and extreme chemical fertilization and chemical herbicide application. Additionally, much of the topsoil has been lost in runoff due to excessive tilling practices.

In order to restore the quality and maintain the integrity of the soil in Illinois, it is imperative to adopt practices that replenish soil nutrients and minerals without the use of chemicals. Food scrap amended (FSA) compost is a natural and proven material used to revitalize soils. FSA compost is an organic material created from the combination of yard waste and food scraps. The process for compost production is a simple two–step process: mix the two source materials and allow them to decompose. There is a ready and inexhaustible supply of these resources from commercial and residential sectors.

Currently, there is a commercial industry for yard waste compost. Residents, businesses, and consumers understand and accept the process of separating yard waste from municipal trash collection. Within the industry there is already knowledge of the process for creating quality compost from yard waste. Expanding the program to take food scraps out of the waste stream and include it in an enhanced statewide composting program will involve adapting the current program. With such an increase in materials collected for composting, there is immense potential for growth within the composting industry in Illinois.

In order to facilitate the restoration of soil productivity, thus supporting Illinois agriculture, and ensure growth of the industry based on best practices, Illinois needs to adopt a set of composting quality standards that align with national standards. These standards should be based on case study models and policies that encourage and support economic development, specifically in the production and sale of quality FSA compost.

A) Compost Quality and Contaminants

There are several challenges to producing quality FSA compost. Recently, contaminants such as plastics, heavy metals and herbicides have been detected in the finished product at FSA compost facilities across the nation. These contaminants can be grouped into two categories: ones that will not decompose, and ones that will decompose over time if processed correctly. Plastics and metals are of the former category and herbicides are of the latter.

Two of the most common plastic contaminants are produce stickers and plastic bags (Top 3 Contaminants, 2013). Plastics are not easily removed from food scraps during processing. Some of the problematic plastics are too small to be removed with processing equipment. Larger plastics such as shopping bags and plastic wrap often break into smaller pieces during transportation and processing. Removing these small pieces by hand is not economically feasible.[113]

Produce stickers are used on most every piece of fruit and vegetable sold in bulk. They are problematic through food processing, consumption, and disposal. During processing, produce is placed on a conveyor belt and a machine drops down to place a sticker on each piece. Often, the stickers jam the machine leaving many pieces of produce without a label. During consumption, stickers may easily be discarded with the scraps, as with oranges or bananas. In Seattle, the stickers cause a problem in marketing and selling the finished compost. According to Susan Thoman, spokeswoman for Cedar Grove Composting in Seattle, the stickers have a definite cumulative effect.[114] She explains that stickers do not decompose and their facility is not equipped to pick out each sticker. The result is finished compost being sold to the consumer with micro-plastic bits in the mix.

Some possible alternatives to plastic produce stickers have emerged. One simple idea is to make the stickers from biodegradable materials, use water-based adhesive and plant-based inks. This option results in a sticker that is fully compostable. Scott Amron has designed a produce label, called FruitWash Soap. It is a produce label that dissolves into a cleansing agent that washes off wax, pesticides, dirt, and bacteria.[115] In the normal routine of washing produce before consumption, the sticker would be dissolved, therefore never reaching water treatment plants or persisting in compost piles. Another alternative developed by Greg Drouillard is a machine that uses lasers to imprint a label on the top layer of the produce. This label requires no ink, plastic, or glue and does not damage the produce. The machine has been approved for use in Canada and other countries, but so far has only been approved by the FDA for use on citrus fruits.[116]

Images: Belleville, Illinois - St. Louis Composting

Plastic shopping bags are problematic across the board as they pollute land, water, and FSA compost. They have become such a nuisance that counties and states are starting to enact plastic bag bans, including the City of Chicago and the State of California.[117,118] As previously explained, the bags become fragmented in the compost and are not easily removed. Where bans are not in place, educating consumers and retailers to use paper or reusable bags will help alleviate the problem.

Inaccurate information has led well-intentioned consumers to inadvertently contaminate compost with plastics from coated disposable dishware and cups. Many products are coated with polyethylene (PE) which does not fully decompose in compost. The misunderstanding comes from both inaccurate product claims as well as compost facilities knowingly accepting PE coated products.[119] To solve this problem, manufacturers, consumers, and facilities must be educated about PE coating. They must know that compostable paper and plastic products need to be labeled with ASTM 6400, EN13432, or by the Biodegradable Products Institute (BPI) standards.[120]

Another source of plastic contaminants is from yard waste. Yard waste has been banned from going to landfills in Illinois since July 1990.[121] Yard waste facilities often find plastics in collected waste such as litter, garden stakes, toys, and gardening tools. To avoid contaminating yard waste, lawns and gardens should be inspected for obvious contaminants prior to performing yard waste clean-up. This same practice will also prevent metal objects from contaminating the material. In addition, studies show that heavy metals are found in some compost. The source of these heavy metals is not fully understood. Currently, literature has not been found that describes a feasible way to remove heavy metals from finished compost. However, due to the natural sponge-like quality of compost, these metals are not detected in runoff from areas treated with compost containing heavy metals.[122]

The US Composting Council (USCC) is concerned with persistent herbicides such as Clopyralid, Aminopyralid, Aminocyclopyrachlor, and Picloram. These herbicides were formulated to resist decomposing.[123] They are used on agricultural fields and commercial and residential lawns. They can pass through livestock into manure and contaminate compost. The harmful effects of these herbicides are not limited to compost, as they may infiltrate ground

water or local waterways. Each of these products has been banned in at least one state. The USCC feels strongly that persistent herbicides should be kept out of compost:

> "Persistent herbicides found in compost and soils directly harm the environment and threaten the economic viability of many industries, including the multi-billion dollar composting industry in the United States. Composters face liability claims, product testing, and financial losses. With every new incident of crop damage due to herbicide-contaminated compost, consumer confidence in the use of compost will decline."[124]

These chemicals will eventually break down, but require a much longer period of time to decompose than would be allotted for FSA compost processing, anywhere from 6 months to 3 years.[125] The short term solution is to keep material that has a high probability of being contaminated (i.e. commercial yard waste and agricultural waste) separate from the rest of the material (i.e. residential yard waste and all food scraps) at commercial compost facilities. Testing in accordance with Standard Testing Assurance (STA) as outlined by the USCC must be performed to certify that the material is below contaminant thresholds before it is then added into standard FSA compost processing or sold (2013). The long-term recommendation is to ban these products from commercial and residential use in the state of Illinois. This will save money on testing and prevent these harmful chemicals from negatively impacting the environment.

In order for the solutions outlined above to be effective, Illinois needs to develop quality standards for FSA compost. These standards will guide training and certification programs. Consistent education of the public, haulers, compost facility staff, and employees at businesses that generate food scraps (i.e. cafeterias, grocery stores, etc) is vital. There are some agencies in place to train and certify interested parties in commercial composting (as well as home composting) practices. The Solid Waste Association of North America offers one-day certification courses. A collaboration between several Midwestern public university extension services offer an annual 3-day Midwest Extension Composting School, an intensive workshop aimed at anyone looking to learn best practices for large-scale composting. Education of the public and businesses will help to ensure that contaminants do not enter the waste stream. Proper training and accountability of commercial composters will ensure that compost procedure is followed correctly, helping to break down and remove contaminants in compost during processing. This education may come from public and private sectors, municipalities, and state sponsored initiatives.

B) US Composting Council Standards

To ensure the compost being made, sold, and used is of good quality, the US Compost Council (USCC) has designed a program called the Seal of Testing Assurance (STA). STA uses physical, chemical and biological testing to rate the quality of the compost and offers proper labeling and information to the customer. Compost that is being analyzed is sent to laboratories approved by the USCC in the US and Canada where technicians use the Test Method for the Examination of Composting and Compost (TMECC). TMECC is the analysis and comparison of the compost that can determine the quality of the compost. TMECC establishes the standards of compost and the standards have continued to increase.

Standardized methods for testing and evaluating compost quality are needed by compost producers, state regulatory and permitting agencies, compost product marketing specialists, state and commercial testing laboratories, and agriculturalists, horticulturalists, landscapers, and other consumer sectors. Compost and compost blends are subject to extensive interstate transit and are used on public and private lands (USCC). To participate in this program, USCC provides two forms and a checklist on preparing compost samples for testing to laboratories on their website.

TABLE 7 –Consumer Use Standards for Commercial Compost

					Consumer Use Standards	
Parameter	Unit	Min.	Max.	Mean	Preferred	Acceptable
Stability	Mg CO2-C/g OM/day	0.04	31.77	2.2	<2	<4
Maturity Germination	% seed emergence	0	100	89.27	90 - 100	80 - 100
Maturity Vigor	% seed vigor	0	100	83.73	90 - 100	80 - 100
Moisture	% wet wt.	3.18	74.95	39.4	40 - 50%	35 - 65%
Organic Matter	% dry wt. basis	14.91	96.93	50.74	35 - 60%	25 - 65%
pH	ph units	3.8	9.25	7.46	6.0 - 7.5	5.5 - 8.5
Soluble Salts	Ds/m (mmhos/cm) Dry wt. basis	0.15	19.11	4.98	5 Max.	15 Max.
Contaminants	% dry wt. basis	0	1.13	0.02	<0.5%	<1%

Note: One Lab - 760 Samples

US Composting Council

C) Economic Development Potential

Other states have witnessed the economic benefits of nurturing a commercial composting industry. This sector could grow exponentially with the addition of food scrap collection. The FSA composting industry in Maryland supports twice as many jobs per ton of organic waste as landfill disposal.[126] Consider the number of haulers, processors, accountants, sales representatives, and support staff that would be needed to support this expansion. The Texas Department of Transportation (DOT) created the country's largest compost market when they specified its use in highway maintenance projects.[127] This demand for compost on highway projects spurred the development of an entirely new specialized industry of innovative contractors focusing on applying compost to roadsides.

In Illinois, the same specification could have similar effects by creating a consistent demand. Furthermore, not only would a compost requirement for highway maintenance support the growth of the industry by creating demand for the product, the use of compost would also realize cost savings. This is not limited to its use in highway maintenance but rather applies broadly to any application of compost in landscapes and agriculture. According to studies conducted at Iowa State University, use of compost in highway road construction and maintenance reduces erosion, water runoff, and the need to apply pesticides and fertilizers and better maintains the health of the plantings. This leads to reduced maintenance costs as well as reduced demand on municipal and state stormwater systems. This cost savings is realized to some degree whether it is applied along roadsides, parks, private property or farm fields.

In the state of Illinois, landfill capacity is of great concern. According to the Illinois EPA, the priority of solid waste management is reducing the volume of solid waste at the source. This emphasizes the need for diverting food scraps from the landfill by creating an FSA composting program. This would result in a cost savings due to eliminating expenses associated with landfilling waste such as tipping fees, operation and maintenance of both open and closed landfill facilities, environmental monitoring, etc..[128]

D) Conclusions – Composting Quality Standards

There are a number of challenges to ensuring quality FSA compost. Fortunately, most offer a fairly straightforward solution in the form of education. Creating a set of quality standards to guide FSA compost education and training will provide consistency and a better product. However, more research is needed on sources of heavy metals in compost in order to provide a solution. As shown in case studies in other states, Illinois' economy stands to benefit immensely from the expansion of our composting program to include food scraps. This expansion will create jobs and realize cost savings across a wide range of fields: landscape maintenance, stormwater management, and landfill diversion. In the long run, the application of FSA compost in Illinois will restore the vitality of the soil thereby supporting current and future agricultural performance along with reduced greenhouse gas emissions from its carbon sequestration properties.

VII. Analysis

Our nation's recycling efforts have reduced the amount of material going to landfills. Since 1990, the total volume of MSW going to landfills dropped by 4 million tons, from 142.3 million to 138.2 million tons in 2006. Despite this progress, our recycling rates as a nation have not significantly increased over the past decade, and have hovered between 31.4% and 34.5%.[129] With compostable material making up one-third to one-half of MSW (food scraps making up close to 15%), there is a tremendous opportunity to increase overall waste diversion and recycling rates. In addition to the inherent value of reusing materials in an expanding economy so as to not deplete our base of natural resources or the health of our ecosystems, composting offers the opportunity to protect watersheds (as scientists underscore the links between healthy soils and healthy watersheds); decrease greenhouse gas emissions, and develop a locally-based industry that build economies while protecting natural environments.

Many of the barriers that are stalling the advancement of food scrap composting as an industry in Illinois are related to the current costs associated with food scrap composting compared to landfilling, the small scale demand for food scrap diversion by haulers from commercial food scrap generators (restaurants, food markets, institutions, etc.), lack of policy to generate demand, outdated compost facility regulations, and the related lack of compost sites permitted to accept food scraps.

Sending material to landfills is very inexpensive in Illinois, comparable in cost to sending food scraps to compost facilities, and at this juncture easier to do. High transportation costs – a symptom of an undeveloped composting infrastructure that has few licensed facilities that accept food scraps – and low landfill tipping fees in Illinois have made food scrap composting an option for only those who value the benefits of composting and are willing to set up internal systems and go the extra mile to make it happen. In states where tipping fees at landfills are much higher than fees for food scraps at compost facilities, the market developed more rapidly.

Low tipping fees in Illinois, lack of policy to drive demand for food scrap composting, and lack of adequate infrastructure spread across the state that accept food scraps, make the prospect of developing this industry challenging despite the triple bottom line of economic, environmental and social benefits that food scrap composting generates. More education is needed to make the case for developing a statewide food scrap composting industry.

VIII. Challenges and Solutions

The IFSC offers the following recommendations to address the major challenges that currently are impeding the development of an Illinois food scrap composting industry. Recommendations with an asterisk* denote recommendations that the Illinois General Assembly Task Force on the Advancement of Materials Recycling has made.

CHALLENGE #1 – Need for Education

Policymakers and citizens have not received adequate education about the benefits of developing a food scrap composting industry in Illinois. Education is needed about the urgency and value of the material as a resource that is currently being landfilled.

PRIORITY SOLUTIONS #1:

1A. Conduct an economic analysis and forecast that demonstrates the opportunity for building a food scrap composting industry in Illinois and related jobs.

1B. Conduct broader education about the environmental benefits of food scrap composting, and shift the dialogue from food as "waste" to food as "resource" that can be harvested to create high value compost and deliver valuable economic and environmental benefits.

CHALLENGE #2 – Low Landfill Tipping Fees

Landfill tipping fees are low in Illinois, which creates a competitive and tough market for advancing food scrap composting and limits Illinois' position as a leader in materials diversion from landfills.

PRIORITY SOLUTION #2:

2A. Restructure the cost of sending material to landfills through policy. Options would include some or all of the following:

i. Enact state legislation to set higher fees for material entering landfills.

ii. Allow counties and municipalities to impose greater surcharges on landfill tipping fees than are currently allowed.

iii. Enact state legislation to impose a greater surcharge by the state on material going to landfills.

iv. Enact Pay As You Throw (PAYT) legislation requiring municipalities to adopt PAYT fee structures for local community garbage collection.

CHALLENGE #3 – Lack of Demand for Composting

There is a "catch 22"with lack of demand for food scrap diversion, hauling and composting, and a limited infrastructure to meet the current demand. A robust infrastructure would develop economies of scale and lower costs that eventually will drive greater demand.

PRIORITY SOLUTIONS #3:

3A. Enact state policies that increase the demand for food scrap composting. Options would include some or all of the following:

i. Enact state legislation banning food scraps and organic material from landfills (similar to Illinois' Yard Waste Ban). Create a "ban with a plan", i.e. – a graduated or tiered "phase in" process that starts with the largest volume generators of food scraps, and allows for the infrastructure and industry to mature before imposing the ban on lower volume producers. Use existing tiered models in Vermont, Connecticut, California, NY City, and Massachusetts as starting points for crafting Illinois policy, and incorporate enforcement.

ii. Enact an enforceable state mandate for material diversion from landfill by local counties that requires 50% diversion by 2020 and 75% diversion by 2030.

3B. Put incentives and tax breaks in place that incentivize food scrap generators to compost their food scraps.

CHALLENGE #4 – Lack of Composting Infrastructure

In addition to food scrap generator challenges listed previously in section 3, the current infrastructure to haul and process food scrap composting is in its infancy, which increases costs related to transportation and inhibits the expansion of the industry.

PRIORITY SOLUTIONS #4:

4A. Review model state compost facility permitting regulations and processes and revise Illinois compost site regulations based on the size and type of facilities. Adjust current compost site permitting processes to facilitate the acceptance of food scraps by current yard waste facilities or new facilities that can handle food scraps.*

4B. Map existing food scrap composting infrastructure, develop a geographical strategy for increasing licensed facilities that compost food scraps to maximize demand, prioritize state investments in the "gap" areas, and provide geographically strategic capital cost state grants/low-cost loans to support compost site and transfer station infrastructure development. Investments need to be coupled with policy that drives demand.*

4C. Pending successful implementation, expand to more sites the Public Act 98-0416/SB850 Pilot Program that allows existing yard waste transfer stations to accept food scraps.

4D. Provide investment incentives in targeted geographical areas for the addition of new yard waste transfer stations that accept food scraps.

4E. Take advantage of low cost processing infrastructure options that exist currently, and market the acceptance of food scraps to waste water treatment facilities with anaerobic digestion and stand-alone anaerobic digester operations.

4F. Develop and implement a training program with IEPA for compost sites and yard waste transfer stations that begin to accept food scraps so that regulations are clear and best practices are implemented to avoid issues with odor, vectors, etc.

4G. Establish 1-day or short-term independent drop-off sites across the state that can temporarily hold food scraps until they are transferred to permitted compost facilities that accept food scraps.*

4H. Support movement toward IEPA certification of compost site operators and in general the development of more professional compost site operators.

4I. Incorporate into annual IEPA reporting requirements data from licensed compost facilities on volume of food scraps received and processed and other data relevant to food scrap composting.

4J. Continue and expand programs such as the Illinois DCEO Food Scrap Composting Grant Program that support food scrap composting infrastructure development and encourage private investment.

CHALLENGE #5 – Contamination of Food Scraps

Contamination of collected food scrap material inhibits the creation of usable compost and thwarts the development of the composting industry.

PRIORITY SOLUTIONS #5:

5A. Provide grants for education and training in the form of workshops and manuals for food scrap generators (restaurants, food markets, universities, institutions, etc.) to facilitate successful, uncontaminated food scrap diversion. Link grants to policy priorities such as a tiered commercial organics ban.

5B. Pass legislation requiring labels on food sold in Illinois to have paper labels, or other feasible strategies (plastic labels create contamination issues).

5C. Facilitate education and communication between food scrap generators, haulers and compost sites. Create a system of checks and balances that catch and significantly reduce contamination at all levels.

5D. Continue Illinois' role as a leader in the development of national standards for labeling (compostable, biodegradable, etc.).*

CHALLENGE #6 – Lack of End Market for Compost

End product composting marketing, sales, and education are very limited and are not effectively increasing the demand for Illinois-produced compost.

PRIORITY SOLUTIONS #6:

6A. Develop a comprehensive end product compost marketing strategy, including education, advocacy and policy for the use of Illinois-produced compost at home, commercially and through state and local municipal procurement and public sector projects.

6B. Require State and government agencies to provide policy for the provision to include a 30% (or determined percentage) compost requirement as part of any public sector project which contains restoration and/or landscaping element as part of any construction project. Provide education to local municipalities which demonstrates the economic benefit in using compost as part of local projects.*

6C. Encourage and/or provide grant funding for facilitating "buy local compost" education and market linking between big box retailers (Walmart, Lowes, Home Depot, etc.) and facilities making Illinois-produced compost to increase local sales of Illinois-produced compost.*

6D. Develop a consumer-targeted composting media campaign based on effective national models – timed with policy recommendations – that educates the general public about composting benefits, normalizes and promotes composting, and creates a positive image of food scrap composting.

6E. Work with the USDA and State of Illinois to develop incentives on the federal and state level that encourage the use of compost within farming operations (in lieu of synthetic chemical fertilizers that contaminate Illinois and regional watersheds) and help reduce the cost of composting applications. Educate farmers on the benefits of using compost instead of synthetic chemical fertilizers.

IX. Acknowledgements

Funding

The Illinois Department of Commerce and Economic Opportunity

Core Report Review and Editing Team - Illinois Food Scrap Coalition

Mary Allen, Recycling and Education Director, Solid Waste Agency of Northern Cook County

Gary Cuneen, Executive Director, Seven Generations Ahead

Jennifer Jarland, Recycling Program Coordinator, Kane County

Kay McKeen, Executive Director, SCARCE

Jen Nelson, Zero Waste Program Manager, Seven Generations Ahead

Cameron Ruen, Marketing Coordinator, Solid Waste Agency of Northern Cook County

Dave Van Vooren, Executive Director, Solid Waste Agency of Northern Cook County

Jen Walling, Executive Director, Illinois Environmental Council

Walter Willis, Executive Director, Solid Waste Agency of Lake County

The Members of the IFSC

For their support of the forums and in providing input to and reviewing the report.

(See Appendix A)

Forum Organizers

Jen Nelson, Seven Generations Ahead, with support from: Kay McKeen (SCARCE), Natalie Lazcek (Consultant), Lisa Daleiden-Brugman (Seven Generations Ahead) and Jordyn Gottlieb (Volunteer)

Forum Planning Teams:

Northeast - Chicago: Julie Schilf (US EPA Region V), Hanh Pham (Loyola), Mary Allen (SWANCC), Julie Leodogar (Seven Generations Ahead), Mark Specht (Intern)

Northwest - Wheaton: Kay McKeen (SCARCE), Sally Jungblut (SCARCE), Carrie Horak (SCARCE), Beverly Jaszczyowksi (SCARCE)

Central - Champaign: Jen Walling (Illinois Environmental Council), Cassie Carrol (Illinois Green Business Association), John Mulrow (ISTC)

South - Edwardsville: Sara Ryan (St. Louis Composting) and Nate Keener (Lewis and Clark Community College)

Statewide - Bloomington: ILCSWMA (Bart Hagston, Marlin Hartman and Mary Allen)

Research Team

Gary Cuneen, Executive Director, Seven Generations Ahead

Jen Nelson, Zero Waste Program Manager, Seven Generations Ahead

Natalie Lazcek, Consultant, Seven Generations Ahead

Jessica Morgan, Intern, Seven Generations Ahead

Mark Specht, Intern, Seven Generations Ahead

Kay McKeen, Executive Director, SCARCE

Sally Jungblut, Program Staff, SCARCE

Carrie Horak, Program Staff, SCARCE

Beverly Jaszczyowksi, Program Staff, SCARCE

Dr. Paul Walker, Illinois State University

Mary Allen, Recycling and Education Director, Solid Waste Agency of Northern Cook County

Cameron Ruen, Marketing Coordinator, Solid Waste Agency of Northern Cook County

Walter Willis, Executive Director, Solid Waste Agency of Lake County

Authors

Lead Author: Gary Cuneen, Executive Director, Seven Generations Ahead with support from:

Jen Nelson, Zero Waste Program Manager, Seven Generations Ahead

Natalie Lazcek, Consultant

Kay McKeen, Executive Director, SCARCE (Compost Quality Standards and Economic Potential)

Sally Jungblut, Program Staff, SCARCE (Compost Quality Standards and Economic Potential)

Report Graphic Design

John Harris, Principal, a5 Group Inc.

Fletch Martin, Creative Director, a5 Group Inc.

SPECIAL THANKS

The IFSC would like to especially thank:

- David E. Smith, Illinois DCEO Energy & Recycling Office – Recycling Programs for his guidance and encouragement throughout the project.
- Nora Goldstein, Editor, BioCycle Magazine, for the tremendous role BioCycle plays in educating leaders on composting and waste-to-energy advancements across the country and for the inspiration BioCycle provided for this project.
- Brenda Platt, Co-Director, Institute for Local Self-Reliance, for her groundbreaking research and report development that supported this project.
- All of the authors and researchers of the many reports that helped to inform the *Food Scrap Challenges and Solutions in Illinois Report*.

Appendix A – IFSC Membership

Illinois Food Scrap Coalition Membership – January 2015

AFFILIATION	FIRST	LAST	POSITION
Founding Members			
Cook County	Christopher	Lipman	Solid Waste Coordinator
DCEO/Task Force Chairman	David	Smith	IL Energy Office – Recycling Programs
DuPage County	Shefali	Trivedi	EDP
Kane County/IRA Board Member	Jennifer	Jarland	Recycling and Resource Conservation Program Coordinator
Kendall County, ILCSWMA Board Member	Marlin	Hartman	Solid Waste Coordinator
Loyola University	Hanh	Pham	Compost Coordinator
SCARCE	Kay	McKeen	Director
Seven Generations Ahead	Gary	Cuneen	Executive Director
Seven Generations Ahead	Jen	Nelson	Zero Waste Program Manager
SWALCO, SWANA President/Task Force Appointee	Walter	Willis	Executive Director SWALCO, SWANA IL Chapter President
SWANA/Village of Oak Park	Karen	Rozmus	Board Member/Environmental Services Manager
SWANCC	Cameron	Ruen	Graphic Designer and Marketing Coordinator
SWANCC/ILCSWMA Board Member	Mary	Allen	Recycling and Education Director
SWANCC/Task Force Appointee	David	Van Vooren	Executive Director
USEPA Region 5	Julie	Schilf	Environmental Scientist - Land and Chemicals Division
Will County/SWANA Board Member	Dean	Olson	Division Director - Will County Land Use
	Pat	Dieckhoff	Sustainability Specialist
Members			
Acres Group	Mark	Teegen	Recycling Manager
Beyond Green	Greg	Christian	CEO
BrightBeat Consulting	Stephanie	Katsaros	Consultant
CB&I	Michelle	Spruth	Project Manager
Chicago Botanic Garden	Jacob	Horn	Compost Crew Leader - Windy City Harvest
Chicago Conservation Corp (C3)	Patrick M.	Weaver	Community Leader
Chicago French Market	Marian	Jarocki	Director of Leasing and Marketing
Chicago Growing Community	Jesus	Martinez	Chef
Chicago Public Schools	Meredith	McDermott	Sustainability Manager
City Colleges of Chicago	Amanda	Smith	Sustainability Coordinator

AFFILIATION	FIRST	LAST	POSITION
City of Elgin	Dan	Ault	
City of Monmouth	Chad	Braatz	Sustainability Coordinator
Collective Resource	Erlene	Howard	Owner
Compost Supply	Lynn	Herlien	Owner
creative werks, llc	Colleen	Coyle	Manager of Corporate Social Responsibility
Decatur DIG	Sue	Hemp	
DeKalb County Community Gardens	Dan	Kenney	Executive Director
Eagle Enterprises Recycling, Inc.	Adam	Jaquet	Vice President
Eisenmann Corporation	Kyle	Goehring	Regional Sales Manager
EISENMANN Corporation	John	McDowell	Sales Manager
Elevate Energy	Bethany	Olson	
Elgin Sustainability Commission/IL Environmental Council	David	Segel	Member / Board Member
Elmhurst College	Mark	Wakely	Services Manager
Environmental Stewardship and Energy	Duane	Friend	Educator
Feed Earth Now	Cathy	Scratch	Founder and CEO
Flood Brothers Disposal	Bill	Flood	
Flood Brothers Disposal/Recycling Services	Bobby	Flood	
Flood Brothers Disposal/Recycling Services	Michael J.	Flood	
Garden Prairie Organics	Michael	DiMucci	
Golder Associates	Heather	Powell-Olson	Senior Project Manager
Goose Island Beer Co.	Ian M.	Hughes	Assistant Brewery Manager
Greeley and Hansen	Dimitri	Katehis, PhD, PE	National Director, Process Engineering
Green Chicago Restaurant Coalition	Sarah	Hidder	Development Associate
Green Chicago Restaurant Coalition	Eloise	Karlatiras	President and CEO
Green Organics, Inc.	David	Gravel	Vice President
Green SEED Energy	Judy	Freeman	
Green SEED Energy	Rennie	Heath	
Greenleaf Pack	Stephanie	Brandt	
Groot Industries, Inc.	Frank	Hillegonds	Municipal Manager
Growing Power, Chicago - Green Era Sustainability	Jason	Feldman	
Heartland Community College	Larissa	Armstrong	Associate Director of the Green Institute
IEPA	Derek	Rompot	Bureau of Land, Disposal Alternative Unit

AFFILIATION	FIRST	LAST	POSITION
IGEN/Heartland Community College/ IRA President	Wynne	Coplea	
IGEN/Kankakee Community College	Bert	Jacobson	Dean for Environmental and Institutuional Sustainability
Illinois Environmental Council/Task Force Appointee	Jennifer	Walling	Executive Director
Illinois Green Business Association	Cassie	Carroll	Executive Director
Illinois Manufacturers' Association	Jerry Peck	Peck	Associate Director of Government Affairs
Illinois Retail Merchants Association (IRMA)	Rob	Kaar	Executive Vice President
Illinois State University	Paul	Walker	Department of Agriculture/Task Force Appointee
Illinois Stewardship Alliance	Wes	King	Interim Executive Director
Illinois Sustainable Technology Center	Shantanu	Santosh Pai	Waste Research Specialist
Illinois Sustainable Technology Center	Joy	Scrogum	Emerging Technologies Resource Specialist
IRA Board Member/USAgain	Carlo	Cavallaro	Director of Govt. Affairs/Senior Legal Counsel
IRMA Government Relations	Alec	Laird	
Jackson County Health Department/ ILCSWMA Board Member	Kerri	Gale	Recycling Coordinator
K. Hoving Recycling and Disposal	Ken	Hoving	Owner
K. Hoving Recycling and Disposal/IRA Board Member	K.J.	Loerop	Partner
Kimmy Compost, Inc.	Kimberly	Fair	Owner
Lake County	Kathryn	Doyle	Sustainability Coordinator
Lake Street Landscape Supply	Mark	Moxley	
Lakeshore Recycling Systems	Joshua	Connell	Managing Partner
Lakeshore Recycling Systems	Joe	Zepeda	
Land of Lincoln Community College	Marnie	Record	
Leed Green Associate	Laura	Matthews	
Lewis & Clark Community College	Nate	Keener	Director of Sustainability
Loyola University	Zac	Brown	
Macon County Environmental Management Department	Laurie	Rasmus	
McCormick Place	Kevin	Jezewski	
McFarlane-Douglass	Sean	Wunderlich	Landscape Design/Construction and Exterior Sales
McHenry County College	Kim	Hankins	Director of Sustainability
Midwest Compost	Charlie	Murphy	President

AFFILIATION	FIRST	LAST	POSITION
Museum of Contemporary Art Chicago	Erica	Erdmann	Sr. Preparator, Exhibitions
Museum of Contemporary Art Chicago	Adrienne	Quint	Administration and Human Resources Coordinator
National Solid Waste Management Association/Land and Lakes	Mary Margaret	Cowhey	President/CEO
New Earth Compost	Joseph	Groskind	Owner
Nixon Peabody LLP	Jodi	Rosen Wine	Partner
Northern Illinois Food Bank	Jeannine	Kannegiesser	Grant Writer
NSWMA/Groot Industries	Josh	Molnar	Municipal Manager
Office of Governor Quinn	Anthony	Cefali	Dunn Fellow
Onion Pub & Brewery, Barrington	Jennifer	Kainz	Owner
Onyx	John	Hamilton	President
Organix	Andy	Taylor	National Account Executive
Prairie Land Disposal	Mary	Schweinsberg	owner
Québec Government Office in Chicago	Kerith	Iverson	Public and Governmental Affairs Officer
Republic Services	Rick	Bulthuis	
Roosevelt University	Paul	Matthews	Asst. VP Campus Planning & Operations
Roy Strom Company	George	Strom	Vice President
School of the Art Institute	Rachel	Krcmarich	Associate Dir of Administration
SCS ENGINEERS	Lori	Hamburg Edwards	Senior Project Professional
Seven Generations Ahead	Sandra	Jackson-Wood	Intern
Sierra Club	Barbara	Klipp	
Sims Recycling Solutions	Kimberly	Bell	Strategic Account Manager
Social Ecologies	Nancy	Klehm	Founder
St. Louis Composting	Tyler	Loucky	Sustainability Coordinator
St. Louis Composting	David	Gavlick	President
St. Louis Composting	Sara	Ryan	Marketing Assistant
St1 Biofuels Ltd – subsidiary of St1 Oy	Ms. Satu	Saksman	Business Development, North America
Sustainable Urban Development	Lauren	Levinson	DePaul University - grad student
SWALCO	Peter	Adrian	Recycling Coordinator
The Field Museum	Daniel	Guico	Sustainability Intern
The Plant	John	Mulrow	
The Resiliency Institute	Michelle	Hickey	Co-founder
University of Illinois at Chicago	Ning	Ai, Ph.D.	Assistant Professor, Dept. of Urban Planning and Policy
University of Illinois at Chicago	Cynthia	Kline-Banai, PhD	Associate Chancellor for Sustainability
USCC	Jim	McNelly	Co-founder
Vegware US	Craig	Schuler	Green Products Director

AFFILIATION	FIRST	LAST	POSITION
Vegware US	Julia	Wetstein	Compostable Products Advocate and Consultant
Waste Management	Alex	Canelo	
Waste Management	Lisa	Disbrow	
Waste Management	Matt	Hernandez	Municipal Marketing Manager
Waste Management Recycling Services	Dana M.	Lee	Recycling Account Manager
Will County	Katie	Nelson	Environmental Health Division
Will County	Joan	O'Keefe	Environmental Coordinator
Will County	Kathy	Pecora	
Will County/IRA board Member/Task Force Appointee	Marta	Keane	President of the Illinois Recycling Association
Worcester Polytechnic Institute	Dana	Valentine	ISTC Intern
Zero Percent	Rajesh	Karmani	CEO
	John	Lardner	Consultant
	Elwin	Ried	
	Jeff	Stauter	operating an in-vessel composter in Lee County
	Matthew	Zastrow	

Appendix B – Executive Summary of Recommendations

Illinois Food Scrap Coalition

Food Scrap Composting Challenges and Solutions in Illinois Report
Executive Summary of Recommendations – October 2014

I. Overview

The Illinois Food Scrap Coalition (IFSC) – with over 140 organizations and individual members – was formed to build upon the growing interest in Illinois to advance food scrap composting across the state. The IFSC promotes the capturing of organic material that is currently being discarded into landfills and converting that material into quality compost that can be sold commercially and used to build soil nutrients, conserve water, sequester carbon, eliminate the use of synthetic fertilizers, and replenish Illinois soils on farms, municipal and private sector landscaping and home garden applications. The IFSC also promotes the creation of renewable energy and other useful by-products through the utilization of anaerobic digestion as an alternative to composting.

This Executive Summary of Recommendations report – designed specifically for the Illinois General Assembly Task Force on the Advancement of Materials Recycling - is part of the larger Food Scrap Composting Challenges and Solutions in Illinois Report, funded by the Illinois Department of Commerce and Economic Opportunity (DCEO) and produced by the IFSC, which will be completed in January 2015. The final report will be the culmination of national and regional research conducted on policies, programs, strategies, and economic development potential related to food scrap composting, and input from stakeholders across Illinois who have participated in five IFSC Food Scrap Composting Challenges and Solutions in Illinois forums in Northeast (Chicago), Northwest (Wheaton), Central (Champaign), Southern (Edwardsville), and Central (Bloomington). The forums provided participants the opportunity to discuss the barriers to advancing food scrap composting across the state and to recommend specific strategies for overcoming those barriers and developing a viable food scrap composting industry in Illinois. The recommendations generated through the forums were discussed, reviewed and organized through meetings of an IFSC Core Team, convened by project lead Seven Generations Ahead with participation from SWALCO, SWANCC, US EPA Region V, Kane County, SCARCE, Illinois Sustainable Technology Center and the Illinois Environmental Council.

This report is designed to support the efforts of the Task Force on the Advancement of Materials Recycling by providing an overview of policies, strategies and recommendations generated through national research and Illinois stakeholder input forums. This report includes recommendations already being worked on by the Task Force – including the SB850 transfer station pilot program, Illinois food labeling and national labeling standards, state procurement policy requiring the use of Illinois compost, and compost site permitting revisions – and hopes to encourage additional strategies that will support the Task Force's initiatives and Illinois' long-term waste reduction goals as they relate to food scrap composting. This initial Executive Summary of Recommendations report does not prioritize its list of recommendations. Priority recommendations based on the greatest capacity to leverage change and the ease or difficulty of implementation will be incorporated in the final IFSC report.

II. The Emerging Composting Industry

Across the nation, composting is developing as a viable, locally-based industry that achieves multiple objectives related to economic development, job creation, cost savings, and environmental sustainability. In 2014, 4,914 facilities across the nation are now licensed to accept organic material – with yard waste facilities leading the way. Over 180 communities now have residential curbside food scrap collection programs. 20 states have yard waste disposal bans (including Illinois), and a small handful of states have enacted ordinances which ban "organics" including food scraps from entering landfills. Just fewer than 20 states have or are in the process of revising their permitting regulations for yard waste composting facilities to allow for the inclusion of food scraps. Some states have developed landfill diversion goals and regulatory processes to increase recycling, eliminate waste, and divert organic material from landfills toward the higher end uses of compost or biogas.

The prospect of developing a robust composting industry has captured the interest of many policy makers and stakeholders because of the win-win benefits of economic development and environmental conservation. The ability of compost to sequester carbon, rebuild depleted soil nutrients, conserve and retain water, limit erosion, eliminate the use of negatively impactful synthetic chemical fertilizers, and reduce greenhouse gas emissions are strong environmental benefits that, combined with the demonstrated potential to create jobs and develop new local businesses, has made the developing of a composting industry appealing to many states. Some of the benefits include:

Soil Quality Enhancement

Note: In the U.S., 99 million acres (28% of all cropland) are eroding beyond soil tolerance rates, which affects the long-term productivity of the soil (NRCS 2007).

– Compost conditions soil; adds organic matter to soil; prevents nutrient runoff and erosion.

Water Quality

Note: Synthetic chemical fertilizer runoff is contaminating Illinois rivers and draining into the Mississippi River to the Gulf of Mexico, creating an aquatic life "dead zone" the size of the state of Connecticut (5,960 square miles) since 1995. Dead zones are also significantly impacting other major watersheds, including the Great Lakes and the Chesapeake Bay.

– Compost reduces the need for pesticides and fertilizers that contaminate watersheds and deplete water of oxygen and aquatic life.

Landfill Capacity

Note: The City of Toronto avoided $300 million in new siting and landfill development costs by building two anaerobic digesters processing facilities for a total of $69 million, according to former City of Toronto Solid Waste Management Services Director Geoff Rathbone.

– Diverting organic material from landfills extends landfill capacity, and reduces the need to build new landfills. According to the US EPA, food makes up over 20% of Municipal Solid Waste. Less than 5% of that is being composted.

Economic Development

Note: A recent study on the composting industry in Maryland (Pay Dirt: Composting in Maryland to Reduce Waste, Create Jobs and Protect the Bay) found that on a per-dollar-capital investment basis composting in Maryland employs twice as many workers as landfills and four times more than incinerators.

- Composting is a local, placed-based industry that creates more jobs per tonnage than landfills or incinerators, and has great potential to add jobs to our economy.

Greenhouse Gases

Note: Landfills are the nation's third-largest source of methane emissions, producing 18 percent of that pollutant. Organic material added to landfills accelerates the production of methane, a greenhouse gas which has 72 times the potency of CO_2 in a 20-year time span, while compost integrated into soil functions as a natural carbon sequestration medium. The technology used to accomplish landfill methane capture is not 100 percent effective, as closed and capped landfills still leak methane gas. Indeed, methods to capture methane from landfills are only 62 percent successful according to the EPA.

- Composting is aerobic decomposition that creates significantly less methane than anaerobic decomposition in a landfill.

Renewable Energy

Note: Diverting food scraps from landfills, in addition to providing feedstock for the generation of compost, supplies anaerobic digestion operations with material to create renewable energy through biogas development. Biogas is a net energy producing process, provides very efficient decomposition, and is a direct replacement for energy created from fossil fuels. According to the American Biogas Council, if the full potential was realized, a cost-effective biogas industry could produce energy to power 1 million American homes.

III. The Importance for Illinois

As our state leaders continue the ongoing debate about the strategies that will drive the Illinois economy forward, there is some agreement that part of the solution will be to use our existing asset base to develop local Illinois businesses. Food scrap composting can serve as one piece of the "grow local" puzzle to help Illinois rebuild its struggling economy. The strategy to grow an Illinois composting industry – in addition to job creation – brings with it a strong portfolio of environmental benefits that support greenhouse gas emission reduction, watershed protection goals, and preserving our precious farm land (most regional landfills in Illinois are built in rural areas and consume significant acreages of high quality farmland in many cases) while also extending our state's landfill capacity.

Fertile, nutrient-rich soil is a backbone of Illinois' economy, providing the basis for our high level corn and soy production and their economic benefits. Across the nation, studies are documenting that our soil is eroding and losing its nutrient base, requiring more and more synthetic fertilization which leads to other water quality and economic problems. Composting is not only viable on its own as an industry to develop, but it will help Illinois maintain its competitive edge and long-standing history as a leading agricultural producer.

The Food, Farms and Jobs Act, enacted by the Illinois General Assembly, produced a report that emphasizes the importance of building our local food economy for multiple reasons – economic development, lower costs, greenhouse gas emissions reduction, food security, and development of a local/regional food system that is resilient to changes in climate and security threats. Building an Illinois composting industry through food scrap diversion will support our local food system goals by creating the volume of locally-produced compost that our state will need to replenish our soils and maintain our agricultural edge.

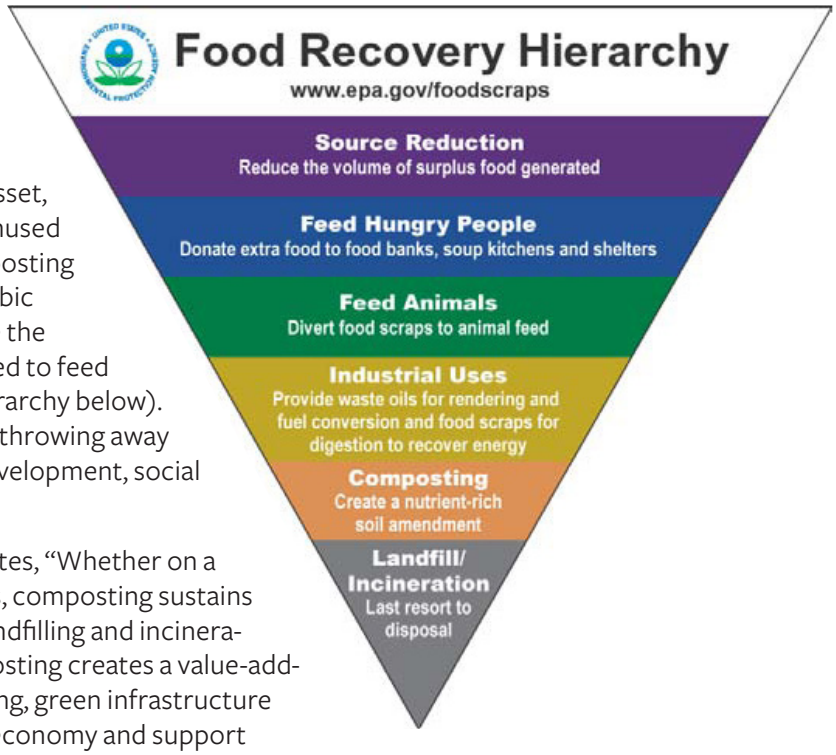
Composting has the potential to be a job-creating industry that has as its basis material feedstocks that are currently being thrown away. Shifting to the development of a composting industry will also preserve our current landfill capacity – which we will need to support disposal of our current rates of non-recyclable/reusable materials. Investing in an Illinois composting industry will support Illinois watershed protection and greenhouse gas emission reduction goals, which have their own related environmental, economic and social benefits. Composting will help Illinois to achieve its goal of reduced greenhouse gas emissions as part of our overall efforts to contribute to our nation's shift toward sustainable economic development.

Lastly, Illinois has invested time, resources and energy to become a leader in materials diversion from landfills – being one of the first states to institute a yard waste ban. Removing food scraps from landfills will build upon our state's yard waste ban, and will help Illinois maintain its waste reduction leadership role and achieve higher rates of waste reduction and materials diversion moving forward.

A summary of the benefits of developing a robust food scrap composting industry in Illinois include:

- the greater potential for job creation that composting has in relation to landfilling (4:1), and the opportunity to create a local Illinois industry using material that is currently being thrown away;
- the benefit of extending the capacity of current landfills;
- greenhouse gas emission reductions related to reduced methane from landfills (created by the mixing of organic and non-organic material);
- the carbon sequestration benefits of compost which support reduced greenhouse gas emissions reduction goals;
- the benefits of healthy, nutrient-rich soil related for water conservation, landscaping and agricultural production;
- the ongoing need to replenish our Illinois soils with nutrients and reduce the use of synthetic chemical fertilizers that contaminate our waterways;
- Harnessing the renewable energy and other useful byproducts of using anaerobic digestion technology to manage food scraps.

IV. Economic Development Potential



Capturing value, seizing new market opportunities and taking advantage of the assets that are present locally are strong principles upon which to grow local economies. Due to its nature, composting is a local activity, requiring the transport of organic material to facilities that can create a high end use product. As an asset, food scraps are currently being discarded, and are an unused resource that could be tapped to develop a viable composting industry, provide feedstock for waste-to-energy anaerobic digester projects, feed animals, or in some cases -where the quality of food meets reuse guidelines - could be diverted to feed people who are hungry (see US EPA Food Recovery Hierarchy below). In short, depositing food scraps in landfills is in essence throwing away a valuable resource that can support local economic development, social and environmental goals.

As the recent State of Composting in the U.S. report states, "Whether on a per-ton basis or on a per-dollar-capital investment basis, composting sustains more jobs than other waste handling options such as landfilling and incineration". Unlike dead-end disposal and incineration, composting creates a value-added product that supports gardening, landscaping, farming, green infrastructure projects, and other end markets that also build Illinois' economy and support additional environmental, aesthetic, and economic goals.

In a landmark study developed by Institute for Local Self Reliance entitled Pay Dirt: Composting in Maryland to Reduce Waste, Create Jobs & Protect the Bay, researchers documented the potential for job creation that the composting industry offers, including the following assertions:

- Composting (including mulching and natural wood waste recycling) operations in Maryland already sustain more total jobs than the state's three trash incinerators, which handle almost twice as much tonnage.
- On a per-ton basis, composting in Maryland employs two times more workers than landfilling, and four times more than the state's trash incinerators.
- On a per-dollar-capital investment basis, for every $10 million invested, composting facilities in Maryland support twice as many jobs as landfills and 17 times more jobs than incinerators.
- An entire new industry of contractors who use compost and compost-based products for green infrastructure has emerged, presenting an opportunity to establish a new made-in-America industrial sector, creating even more jobs.
- Utilizing 10,000 tons of finished compost annually in green infrastructure can sustain one new business. For every 10,000 tons of compost used annually by these businesses, 18 full-time equivalent jobs can be sustained.

*For every 1 million tons of organic material composted, followed by local use of the compost for green infrastructure projects, 1,400 new full-time equivalent jobs could be generated, paying wages from $23 million to $57 million each year.

V. What Leading States Have Done

The top five states that are diverting the greatest volume of organic material (yard waste, food scraps, biosolids, manure) and creating compost include:

1. California - 5.9 million tons annually
2. Florida – 1.5 million tons annually
3. Iowa – 1.3 million tons annually
4. Washington – 1.2 million tons annually
5. New York – 1.0 million tons annually

*Illinois is diverting 500,000 tons annually (according to the 2013 IL EPA Permitted Landscape Waste Compost Facilities Report)

In California, the biggest driver was the establishment of the California Waste Management Act of 1989, which required local municipalities to divert 50% of all materials from landfills by the year 2000 through recycling or composting – and its 2013 update to require 75% diversion by 2020 (In September 2014, California passed legislation banning yard trimmings and food scraps from landfills for commercial sector generators). In Florida, a revision of compost site regulations based on the size and type of facilities made it easier to build the composting infrastructure and related businesses. In Iowa, the state instituted a ban on sending yard waste to landfills, which has driven the composting industry. In Washington state, compost site regulations revisions similar to Florida supported the expansion of the composting infrastructure and industry. And lastly, in New York a combination of compost site regulatory changes, New York City's recent organics ban, and the State Executive Order #4 requiring all state agencies to implement sustainable strategies (including food scrap composting) are driving the high food scrap diversion volume. Average landfill tipping fees for each of the states – compared to Illinois' average fee of $43.46/ton – are as follows: California-$52.07; Florida-$43.65; Iowa-$34.15; Washington-$70.44; and New York-$86.30.

A 2014 MIT study on Municipal Curbside Compostables Collection across the U.S. concluded that the conditions present for the most successful residential programs included an ambitious state or county waste diversion mandate; high or rising landfill costs; nearby processing facilities; and a pre-existing infrastructure for collecting and processing yard waste.

VI. Analysis

In 2013, Illinois diverted just over 500,000 tons of yard waste and food scraps from landfills according to the Illinois EPA. Of that amount, 74,000 tons were food scraps. In 2013, Illinois' total municipal solid waste landfilled was 13.7 million tons. The amount of food scrap is estimated at 13.4% of the amount of material landfilled, or approximately 1.8 million tons. The percentage of food scraps collected and composted in relation to total municipal solid waste landfilled was 0.5% in 2013. In Illinois, 45 facilities are active and accepting organic materials. Of the 45 active facilities, 28 facilities are current 832 permit holders (landscape waste only), 10 facilities have 807 permits (can accept landscape waste and food scraps) and the remainder 8 facilities are 813 permit holders (permit for new or expanded landfill disposal facility to do composting on site).

Many of the barriers that are stalling the advancement of food scrap composting as an industry in Illinois are related to the current costs associated with food scrap composting compared to landfilling, the small scale demand for food scrap diversion by haulers from commercial food scrap generators (restaurants, food markets, institutions, etc.), and the related lack of compost sites permitted to accept food scraps.

Sending material to landfills is very inexpensive, comparable in cost to sending food scraps to compost facilities, and at this juncture easier to do. High transportation costs – a symptom of an undeveloped composting infrastructure that has few licensed facilities that accept food scraps – and low landfill tipping fees in Illinois have made food scrap composting an option for only those who understand the benefits of composting and are willing to set up internal systems and go the extra mile to make it happen. In states where tip fees at landfills are much higher than fees for food scraps at compost sites, the market has been able to develop more rapidly.

Illinois' current low tipping fees, lack of policy to drive demand for food scrap composting, and lack of adequate infrastructure – specifically multiple sites spread across the state that can accept and compost food scraps – make the prospect of developing this industry bleak despite the triple bottom line economic, environmental and social benefits that food scrap composting generates. More education is needed to make the case for developing a statewide food scrap composting industry.

VII. Recommendations

The IFSC offers the following recommendations to address the major challenges that currently are impeding the development of an Illinois food scrap composting industry:

CHALLENGE #1 – Need for Education

Policymakers and citizens have not received adequate education about the benefits of developing a food scrap composting industry in Illinois. Education is needed about the urgency and value of the material/resource that we are currently landfilling.

PRIORITY SOLUTIONS #1:

1A. Conduct an economic analysis and forecast that demonstrates the opportunity for building a food scrap composting industry in Illinois and related jobs.

1B. Conduct broader education about the environmental benefits of food scrap composting, and shift the dialogue from food as "waste" to food as "resource" that can be harvested to create high value compost and deliver valuable economic and environmental benefits.

CHALLENGE #2 – Low Landfill Tipping Fees

Landfill tipping fees are low in Illinois, which creates a competitive and tough market for advancing food scrap composting and limits Illinois' position as a leader in materials diversion from landfills.

PRIORITY SOLUTION #2:

2A. Restructure the cost of sending material to landfills through policy. Options would include some or all of the following:

v. Enact state legislation to set higher fees for material entering landfills.

vi. Allow counties and municipalities to impose greater surcharges on landfill tipping fees than are currently allowed.

vii. Enact state legislation to impose a greater surcharge by the state on material going to landfills.

viii. Enact Pay As You Throw (PAYT) legislation requiring municipalities to adopt PAYT fee structures for local community garbage collection.

CHALLENGE #3 – Lack of Demand for Composting

There is a "catch 22" lack of demand for food scrap diversion, hauling and composting, and limited infrastructure to meet the current demand which will help develop economies of scale and lower costs that eventually will drive greater demand.

PRIORITY SOLUTIONS #3:

3A. Enact state policies that increase the demand for food scrap composting. Options would include some or all of the following:

iii. Enact state legislation banning food scraps and organic material from landfills (similar to Illinois' Yard Waste Ban). Create a "ban with a plan", i.e. – a graduated or tiered "phase in" process that starts with the largest volume generators of food scraps, and allows for the infrastructure and industry to mature before imposing the ban on lower volume producers. Use existing tiered models in Vermont, Connecticut, California, NY City, and Massachusetts as starting points for crafting Illinois policy.

iv. Enact an enforceable state mandate for material diversion from landfill by local counties that requires 50% diversion by 2020 and 75% diversion by 2030.

3B. Put incentives and tax breaks in place that incentivize food scrap generators to compost their food scraps.

CHALLENGE #4 – Lack of Composting Infrastructure

The current infrastructure for food scrap composting is in its infancy, which increases costs related to transportation and is inhibiting the expansion of the industry.

PRIORITY SOLUTIONS #4:

4A. Review model state compost facility permitting regulations and processes and revise Illinois compost site regulations based on the size and type of facilities. Adjust current compost site permitting fees and processes to facilitate the acceptance of food scraps by current yard waste facilities or new facilities that can handle food scraps.

4B. Map existing food scrap composting infrastructure, develop a geographical strategy for increasing licensed facilities that compost food scraps to maximize demand, prioritize state investments in the

"gap" areas, and provide geographically strategic capital cost state grants/low-cost loans to support compost site and transfer station infrastructure development. Investments need to be coupled with policy that drives demand.

4C. Pending successful implementation, expand to more sites the Public Act 98-0416/SB850 Pilot Program that allows existing landscape waste transfer stations to accept food scraps.

4D. Provide investment incentives in targeted geographical areas for the addition of new landscape waste transfer stations that accept food scraps.

4E. Take advantage of low cost processing infrastructure options that exist currently, and market the acceptance of food scraps to waste water treatment facilities with anaerobic digestion and stand-alone anaerobic digester operations.

4F. Develop and implement a training program for compost sites and landscape waste transfer stations that begin to accept food scraps so that regulations are clear and best practices are implemented to avoid issues with odor, vectors, etc.

4G. Establish 1-day or short-term independent drop-off sites across the state that can temporarily hold food scraps until they are transferred to permitted compost facilities that accept food scraps.

CHALLENGE #5 – Contamination of Food Scraps

Contamination of collected food scrap material inhibits the creation of usable compost and thwarts the development of the composting industry.

PRIORITY SOLUTIONS #5:

5A. Provide grants for education and training in the form of workshops and manuals for food scrap generators (restaurants, food markets, universities, institutions, etc.) to facilitate successful, uncontaminated food scrap diversion. Link grants to policy priorities – i.e. tiered commercial organics ban.

5B. Pass legislation requiring labels on food sold in Illinois to have paper labels (plastic labels create contamination issues).

5C. Facilitate education and communication between food scrap generators, haulers and compost sites – and create a system of checks and balances that catches and significantly reduces contamination at all levels.

5D. Continue Illinois' role at the table leading the development of national standards for labeling (compostable, biodegradable, etc.).

CHALLENGE #6 – Lack of End Market for Compost

End product composting marketing, sales, and education are very limited and are not effectively increasing the demand for Illinois-produced compost.

PRIORITY SOLUTIONS #6:

6A. Develop a better end product compost marketing strategy, including advocacy or policy for the use of Illinois-produced compost through state procurement and public sector projects and general procurement by government bodies including municipalities.

6B. Encourage and/or provide grant funding for facilitating "buy local compost" education and market linking between big box retailers (Walmart, Lowes, Home Depot, etc.) and facilities making Illinois-produced compost to increase local sales of Illinois-produced compost.

6C. Develop a consumer-targeted composting media campaign based on effective national models – timed with policy recommendations – that educates the general public about composting benefits, normalizes and promotes composting, and creates a positive image of food scrap composting.

6D. Work with the USDA and State of Illinois to develop incentives on the federal and state level that encourage the use of compost within farming operations (in lieu of synthetic chemical fertilizers that contaminate Illinois and regional watersheds) and help reduce the cost of composting applications. Educate farmers on the benefits of using compost instead of synthetic chemical fertilizers.

Appendix C – Table of Illinois Compost Facilities

Illinois Commercial Composting Facilities - Data from IEPA Annual Reports filed in 2013

Facility Name	Permit Type	Address	City	County	Amount Received (tons)	Food/ Organic Materials (tons)	Compost Generated (Cubic Yards)	Status
Ashalex Compost	SUP Part 807	North Skyline Drive, Marion, Illinois 62959	Marion	Williamson	298	0	9333	Active
BFI Modern Landfill	SM Part 813	5841 Mine Haul Road Belleville, Illinois 62223	Belleville	St. Clair	56,553	0	60,720	Active
Brickyard Disposal and Recycling	SM Part 813	601 E Brickyard Road Danville, Illinois 61834	Danville	Champaign	1,640.51	0	752.18	Active
Calumet Organic Recycling	DEOP Part 832	2040 E 106th Street Chicago, Illinois 60617	Chicago	Cook	0	0	0	Inactive
Cherry Valley Rockford Compost	REN Part 832	6200 Baxtor Road Cherry Valley Illinois 61016	Cherry Valley	Winnebago	26,453	0	10922.46	Active
Christensen Farms	REN Part 832	12151 W Wilmington Road Peotone, Illinois 60468	Peotone	Will	17,160	0	30,520	Active
Compost Supply Newark	DEOP Part 832	2970 Route 52 Newark Illinois 61360	Newark	LaSalle	34,937	0	21,000	Active
Cottonwood Hills	SM Part 813	10400 Hillstown Road Marissa, Illinois 62257	Marissa	St. Clair	0	0	0	Inactive
Crystal Lake Composting	REN Part 832	410 S Main Street Crystal Lake, Illinois 60014	Crystal Lake	McHenry	903	0	1522.86	Active
Decatur Compost, Inc.	REN Part 832	3680 Bearsdale Road Decatur, Illinois 62526	Decatur	Macon	6,350	0	7000	Active
Decatur Macon Co Composting Facility	REN Part 832	3520 N Bearsdale Road Decatur, Illinois 62526	Decatur	Macon	5,197	0	6924	Active
DeKalb County Landfill	LF Part 813	18370 Somonauk Road DeKalb, Illinois 60115	DeKalb	DeKalb	7,361	400	6,124	Active
Dirksen Compost Facility	PT Part 832	2901 A Dirksen Parkway Springfield, Illinois 62723	Springfield	Sangamon	97.61	0	155.25	Active
DK-Lake Bluff	REN Part 832	640 Rockland Road Lake Bluff, Illinois 60044	Lake Bluff	Lake	1,411	0	4590	Active
Dumoulin Farms		16 N 393 Walker Road Hampshire, Illinois 60140	Hampshire	Kane	166	0	280	Active
Garden Prairie Organics	MOD Part 832	11887 Route 20 Garden Prairie, IL 61038	Garden Prairie	Boone	50,900	0	24,725	Active

Facility Name	Permit Type	Address	City	County	Amount Received (tons)	Food/ Organic Materials (tons)	Compost Generated (Cubic Yards)	Status
Green Organics, Inc.	MOD Part 832	1270 E Beecher Bristol, Illinois 60512	Bristol	Kendall	20,023.50	0	24,732	Active
Harbor View Compost	SM Part 813	2000 E 122nd Street Chicago, Illinois 60633	Chicago	Cook	33,198	7,250	7,268	Active
Hazel Crest Compost	REN Part 832	2600 W 170th Place Hazel Crest, Illinois 60429	Hazel Crest	Cook	1,330	0	1,100	Active
Joyce Farms	REN Part 832	13256 W 3000 N Road Essex, Illinois 60935	Essex	Kankakee	19,268	0	36,436	Active
Knox County Landfill Combined	SUP Part 807	1016 Knox Road 2150 N Oneida, Illinois 61467	Oneida	Knox	2,697.22	0	2,800	Active
Lake Bluff Municipal	DEOP Part 832	640 Rockland Road Lake Bluff, Illinois 60044	Lake Bluff	Lake	1,289	0	4875	Active
Lake Forest Recycling and Compost	REN Part 832	1381 W Kennedy Road Lake Forest, Illinois 60045	Lake Forest	Lake	2,869.45	0	1,300	Active
Land and Lakes #1 & #2	SUP Part 807	1220 E 138th Street Chicago, Illinois 60627	Chicago	Cook	750	0	1,950	Active
Land and Lakes Wheeling	PT Part 807	1300 Milwaukee Avenue Buffalo Grove, Illinois 60089	Deerfield	Lake	0	0	0	Inactive
Mariani Landscape Design Composting	DEOP Part 832	300 Rockland Road Lake Bluff, Illinois 60044	Lake Bluff	Lake	694	0	2,895	Active
Midwest Organics	DEOP Part 832	29353 N Darrell Road McHenry, Illinois 60051	McHenry	Lake	10,202	11,200 c.y. (CR of 1.33/ton)	14,200	Active
Milam RDF Compost	SM Part 813	601 Madison Road East St Louis, Illinois 62201	East St. Louis	St. Clair	26,775.83	0	102,000	Active
Monmouth Municipal Composting	SUP Part 807	836 186th Avenue Monmouth, Illinois 61462	Monmouth	Warren	4,098	0	298	Active
Nashville Compost Facility	SUP Part 807	9384 N Washington Road Nashville, Illinois 62263	Nashville	Washington	277	0	725	Active
New Earth	REN Part 832	11189 Samuel Road Carterville, Illinois 62918	Carterville	Williamson	1,041	0	320	Active
Nu-Earth Organics	MOD Part 832	3055 Apple Avenue Waukegan, Illinois 60085	Waukegan	Lake	2,457	0	902	Active
Pekin Composting Facility	CLCERT Part 832	14379 Illinois Route 29 Pekin, Illinois 61554	Pekin	Tazewell	0	0	0	Inactive

Facility Name	Permit Type	Address	City	County	Amount Received (tons)	Food/ Organic Materials (tons)	Compost Generated (Cubic Yards)	Status
Peoria City County Compost	REN Part 832	11501 W Cottonwood Road Brimfield, Illinois 61517	Brimfield	Peoria	1,206	0	2,010	Active
Perricone Brothers Compost Facility	OP Part 832	31600 Fisher Road Volo, Illinois 60073	Volo	Lake	1,421	0	2,462	Active
Peru Municipal Landfill #2	SUP Part 807	Route 251 & Ben Samek Road Peru, Illinois 61354	Peru	LaSalle	592	0	2,300	Active
Quad Cities LL Phase IV	REN Part 832	13606 Knoxville Road Milan, Illinois 61264	Milan	Rock Island	1,394	0	5,518	Active
Quarry Compost Facility		1371 North Joliet Road Romeoville, Illinois 60446	Romeoville	Will	29,509	10,794	8,117	Active
Rockford Compost	REN Part 832	1800 Meridian Road Rockford, Illinois 61102	Rockford	Winnebago	390	0	5,495	Active
Roxana Landfill Compost Site	REN Part 832	4600 Cahokia Creek Road Roxana, Illinois 62084	Roxana	Madison	7,496.91	0	11,600	Active
Salem Municipal Landfill 2	SUP Part 807	900 East Lake Street Salem, Illinois 62881	Salem	Marion	448	0	1,350	Active
Schmechtig Landscape Co Compost	DE Part 807	20860 W Indian Creek Road Mundelein, IL 60060	Mundelein	Lake	215	0	700	Active
Statesland Improvements	CLCERT Part 832	Koenig Road Ottawa, Illinois 61350	Ottawa	LaSalle	0.00	0	0	Inactive
Thelen Sand and Gravel	DEOP Part 832	28955 W Route 173-B Antioch, Illinois 60002	Antioch	McHenry	83,396	0	35,708	Active
Upper Rock Island County Landfill	SM Part 813	17201 20th Ave N East Moline, Illinois 61244	East Moline	Rock Island	791	0	4,350	Active
Van Zelst Landscape Development	DEOP Part 832	39400 Highway 41 Wadsworth, IL 60083	Wadsworth	Lake	790	0	750	Active
Waukegan Landscape Waste Compost	REN Part 832	825 Pershing Road Waukegan, Illinois 60085	Waukegan	Lake	3,066	0	15,330	Active
Whole Earth Organics	DEOP Part 832	Casimir Pulaski Drive North Chicago, IL 60064	North Chicago	Lake	7,216	0	23,780	Active
Land and Lakes Willow Ranch	SUP Part 807	1371 North Joliet Road Romeoville, Illinois 60446	Romeoville	Will	6,241	0	3,206	Active
Winnetka Municipal	SM Part 813	1390 Willow Road Winnetka, IL 60093	Winnetka	Cook	0	0	0	Inactive
Wood River Compost Facility	SUP Part 807	111 N Wood River Ave Wood River, Illinois 62095	Wood River	Madison	270.00	0	200	Active

Appendix D – Glossary of Terms

Algae bloom: the rapid increase in the population of algae in an aquatic ecosystem as a result of the presence of excess nutrients (particularly phosphorus and nitrogen) in high concentrations in a body of water. The overpopulation of algae in an ecosystem leads to competition for resources and often results in the loss of many other aquatic species due to oxygen loss.

Anaerobic digestion: a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen.

Biofuel: a mixture of volatile hydrocarbons derived from biological raw materials, specifically plant material or animal waste, used as fuel. Biogas is one of the many types of biofuels.

Biogas: the gaseous emissions from anaroebic degradation of organic matter. Biogas technology recovers this gas for use as fuel for direct heating, mechanical power, electrical generation and other uses.

Carbon sequestration: an artificial or natural (occurring in the form of carbon sinks such as oceans, forests, or soils) process by which carbon dioxide is removed from the atmosphere and stored in solid or liquid form.

Carbon sink: an artificial or natural reservoir (oceans, forests, soils) that absorbs carbon from the atmosphere, effectively offsetting greenhouse gas emissions.

Compost: a mixture of various decaying organic waste substances, such as food scraps, dead leaves, or manure, used as soil fertilizer.

Effluent: a liquid (such as sewage or industrial chemicals) that is released as waste.

Erosion: the act in which rock and sediment is worn away, often by water, wind, or other natural agents.

Food recovery: the collection of wholesome food that would otherwise go to waste from retail stores, foodservice establishments, or other venues, to be distributed to the poor and hungry. Collection includes the rescue of prepared, non-perishable, and perishable food.

Food scrap composting: the process of decomposition and recycling of organic matter derived from food waste, to be turned into a high quality soil amendment.

GIS: an abbreviation for the term "geographic information services," which refers to the data management system used to capture, store, manage, retrieve, analyze, and display spatial information.

Humus: the dark organic material in soils, produced by the decomposition of vegetable or animal matter and essential to the fertility of the earth.

Leaching: the loss of water-soluble material or plant nutrients from a substance, such as soil or rock, through the percolation of water.

Life-cycle materials management: the process of managing the entire lifecycle of a product from inception, through engineering design and manufacture, to service and disposal of manufactured products.

Materials recovery: a method of resource recovery in which emphasis is on separating and processing waste products to reclaim or recycle usable material for marketing to end-use manufacturers.

Municipal solid waste (MSW): a subset of solid waste which includes unsorted garbage, refuse, and similar solid waste material discarded from residential, commercial, institutional, and industrial sources and community activities, including residue after recyclables have been separated.

Non-point source pollution: a type of pollution that cannot be defined as originating from a discrete location, but rather originates from multiple diffuse sources and generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification.

Polyethylene: a tough, light, flexible synthetic resin made by polymerizing ethylene, chiefly used in plastics manufacturing, especially in the creation of plastic bags, food containers, and other packaging.

Pre-consumer food scraps: food waste generated during the manufacturing and production of food prior to the item being sold in shops or served to consumers that can result from overproduction, spoilage, faults in food preparation, or products not meeting the demands of food retailers (due to size and aesthetics).

Processed food scraps: a source separated organic material that is generated by a food processing facility and may include sludge from food processing water treatment plants, culls, and manure, not intended for animal or human consumption.

Recycling: the process of transforming or remanufacturing waste materials into usable or marketable materials for use other than landfill disposal or incineration.

Silt fences: a temporary sediment barrier of permeable fabric that acts as a perimeter control and is typically used in combination with sediment basins and sediment traps, as well as erosion controls, designed to retain sediment in disturbed areas.

Solid waste management: the systematic control of the generation, collection, storage, transport, source separation, processing, treatment, recovery, and disposal of solid waste.

Sustainable materials management (SMM): an approach to serving human needs by using and reusing resources most efficiently and sustainably throughout their life cycles, from the point of resource extraction through material disposal. This approach seeks to minimize the amount of materials involved and the associated environmental impacts of production, use, and disposal, as well as account for economic efficiency and social considerations.

Take-back: an approach that aims to require manufacturers and retailers to share responsibility for reducing the environmental impact of certain products by mandating that each collect and recover said products after consumers are done with it.

Topsoil: the fertile, uppermost layer of soil (usually the top 2 to 8 inches) that has the highest concentration of organic matter and microorganisms and is the site of most of earth's biological soil activity.

Vermicomposting: a controlled and managed process of composting in which live worms convert organic residues into dark, fertile, granular excrement.

Waste characterization study: a type of study used to better understand the quantity and characteristics of waste generated in a specific region that details the size, sources, and composition of the regional waste stream. Data collected from such a study is often used to develop plans and policies for current and future waste reduction efforts.

Water-based adhesive: a non-toxic type of adhesive typically formulated from natural polymers, including those derived from vegetable sources (such as dextrin and starch), protein sources (such as casein, soybean, milk), and animal hides or bones.

Appendix E – References

[1] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[2] USEPA report Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012

[3] September 18, 2009 Memo from Mathy Stanislaw, to ECOS Waste Committee on the 2020 Vision Report: Sustainable Materials Management: The Road Ahead (June 2009)

[4] USEPA Report - Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012

[5] USEPA Report - Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012

[6] USEPA MSW Report 2006

[7] *The Southern* article: http://thesouthern.com/news/local/landfills-in-illinois-have-a--year-life-expectancy/article_38b078f6-061e-5f5f-9ac0-a1fd9dd01a4a.html

[8] *Public Act 85-1430 banned landscape waste (grass, leaves and brush) from being landfilled: https://www2.illinois.gov/gov/green/Documents/Summary%20of%20Illinois%20Recycling%20Legislation%20(4-18-2013).pdf*

[9] 2013 Illinois Environmental Protection Agency Permitted Landscape Waste Compost Facilities annual reports submitted in 2014

[10] 2013 Illinois Environmental Protection Agency Permitted Landscape Waste Compost Facilities Annual Reports

[11] Miller, J.J., B.W. Beasley. C.F. Dury, F.J. Larney and X. Has. 2015. Influence of long term composted and stockpiled feedlot manure application on selected soil physical properties of a clay loam soil in Southern Alberta. Compost Sci and Util. 23 (1)

[12] Vo. M.H and C. H. Wang. 2015. Effects of manure composts and their combination with inorganic fertilizer on acid soil properties and the growth of muskmelons. Compost Sci and Util. 23 (2) 117-127.

[13] Warwick, J.D. and K.Y. Chan. 2014. Soil properties and nutrient export of a duplex hard-setting soil amended with compost. Compost Sci. and Util. 22 (1).

[14] Kelly, W.R., P.M. Walker, K.D. Smiciklas and T.R. Kelley. 2009. Field application of processed manure upon water quality and crop productivity. J. Agronomy 8 (2) : 49-59

[15] Walker, P.M., K.D. Smiciklas and T.R. Kelley. 2008. Evaluation of compost for use as a soil amendment in corn and soybean production. Compost Sci and Util. 6 (2): 183-191.

[16] Smiciklas, K.D., P.M. Walker and T.R. Kelley. 2005. Utilizing compost or processed manure as a soil amendment for corn and soybean production. Abst. ASA – CSSA – SSSA Annual Mting.

[17] Smiciklas, K.D., P.M. Walker and T.R. Kelley. 1997. Utilization of compost (food, paper, landscape and manure) in row crop production. Abst. Amer. Soc. Agron., Crop Sci Amer., Soil Sci Amer. 114.

[18] Maynard, A.A. 2013. Nitrate leaching from compost-amended soils. Compost Sci. and Util. 2 (1). 72-79.

[19]Sikora, L.J. and M.I. Azad. 2013. Effect of compost-fertilizer combinations on wheat fields. Compost Sci. and Util. 1 (2). 93-96.

[20] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[21]United Nations News Centre; www.un.org/apps/news/story.asp?NewsID=48342#.VL1WNkdQM88.

[22]*State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[23] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[24] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[25] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[26] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[27] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[28] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[29] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[30]NOAA: Gulf of Mexico 'dead zone' predictions feature uncertainty". National Oceanic and Atmospheric Administration (NOAA). June 21, 2012

[31]*State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[32] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[33] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[34]*Building Healthy Soils with Compost to Protect Watersheds*; by Bobby Bell and Brenda Platt; May 2013

[35] http://www.epa.gov/climatechange/ghgemissions/gases.html

[36] IPCC Report and The Energy Collective-More Bad News For Fracking: IPCC Warns Methane Traps More Heat October 7, 2013

[37] Intergovernmental Panel on Climate Change - WORKING GROUP I CONTRIBUTION TO THE IPCC FIFTH ASSESSMENT REPORT CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS

[38] Memorandum to Brian Guzzone, U.S. EPA, from Chad Leatherwood, Eastern Research Group, Inc., November 18, 2002, re: "Review of Available Data and Industry Contacts Regarding Landfill Gas Collection Efficiency"

[39] U.S. EPA, Anthropogenic Methane Emissions in the United States, (EPA 430-R-003), 4–11; U.S. EPA, "U.S. Methane Emissions 1990–2020: Inventories, Projections, and Opportunities for Reductions." (EPA 430-R-99-013)

[40] S. Brown, "Putting the Landfill Energy Myth to Rest," *BioCycle Magazine* (May 2010): 33 [35%]; European Commission, *A Study on the Economic Valuation of Environmental Externalities from Landfill Disposal and Incineration of Waste – Final Appendix Report* (October 2000), 144 [40%]; Ofira Ayalon, et al., "Solid Waste Treatment as a High-Priority and Low Cost Alternative for Greenhouse Gas Mitigation," 27 *Environmental Management* 5 (May 2001), 699 [50%]; Riitta Pipatti and Margareta Wihersaari, "Cost-Effectiveness of Alternative Strategies in Mitigating the Greenhouse Impact of Waste Management in Three Communities of Different Sizes," *Mitigation and Adaptation Strategies for Global Change*, 344 (1998) [40%]; Nickolas Themelis and Priscilla Ulloa, "Methane generation in landfills," *ScienceDirect-Renewable Energy* (April 2006), 8 [34%].

[41] http://www.epa.gov/lmop/projects-candidates/index.html#map-area

[42] J. Bogner, et al., "Waste Management", *Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, 600.

[43] Peter Anderson, "Some Essential Facts About Landfill Gas Emissions," *MSW Management* (February 2011). Anderson notes that the 20 per cent value is a "global average" only as it applies to developed countries "because most landfills in the underdeveloped world are shallow, frequently burned, open dumps [that] do not create… anaerobic conditions…Methane from garbage is, ironically, largely an unintended consequence of the liners used in the developed world to reduce groundwater contamination."

[44]*State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[45] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014; Marin Carbon Project, www.marincarbonproject.org

[46] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[47] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[48] University of Exeter. "Carbon stored in world's soils more vulnerable to climate change than expected." ScienceDaily, 3 September 2014.

[49] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[50] Local Food, Farms & Jobs: Growing the Illinois Economy; 2009

[51] *Mayors Call For Immediate Action To Keep Drinking Water Safe In The Great Lakes And St. Lawrence River*; Mayor's Press Office, City of Chicago; September 24, 2014

[52] The Delta Institute, *Waste Management: Unrealized Environmental & Economic Benefits for Chicagoland*, October 2014

[53] Diane Duva, Assistant Director, Waste Engineering and Enforcement Division, CT Department of Energy and Environmental Protection, Hartford, Connecticut

[54] APWA Reporter, March 2012

[55] Institute for Local Self Reliance, Connecticut Organics Recycling Mandate, July 2014

[56] *Massachusetts To Ban Solid Food Waste from Landfills From Large Foodservice Operations*; Green Restaurant Association; December 18, 2012.

[57] John Fischer, Mass DEP, Massachusetts Organics Ban: http://www.slidesearchengine.com/slide/massachusetts-commercial-organic-waste-ban-massdep

[58] Vermont Agency of Natural Resources: http://www.ilsr.org/rule/food-scrap-ban/vermont-organics-recovery

[59] http://www.ilsr.org/rule/food-scrap-ban/vermont-organics-recovery

[60] Institute for Local Self Reliance *New York City, NY – Organics Recycling Mandate*; 7-14-14
[61] *Municipal Curbside Compostables Collection*- Department of Urban Studies and Planning - Massachusetts Institute of Technology

[62] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington)

[63] www.biocycle.net/2014/07/16/state-of-composting-in-the-u-s

[64] *Municipal Curbside Compostables Collection*- Department of Urban Studies and Planning - Massachusetts Institute of Technology

[65] BioCycle June 2007, Vol. 48, No. 6, p. 33 - *Florida Embarks On Composting Regulations Update*

[66] Institute for Local Self Reliance, Washington-Composting Rules, July 30, 2012

[67] Institute for Local Self Reliance, Iowa-Composting Rules, July 30, 2012

[68] Institute for Local Self Reliance; *Summary of Select State Composting Regulations*; April 2010

[69] Freeman and Skumatz of the Ecoconservation Institute, "Best Management Practices in Food Waste Programs"; prepared for USEPA Region V

[70] Batllevell, Marta and Kenneth Hanf. "The fairness of PAYT systems: Some guidelines for decision-makers." Waste Management 28 (2008): 2793-2800

[71] Kelleher, Maria, et al. "Taking out the Trash: How to Allocate the Costs Fairly." C.D. Howe Institute Commentary 213 (2005): 1-22

[72] Freeman and Skumatz of the Ecoconservation Institute, "Best Management Practices in Food Waste Programs"; prepared for USEPA Region V

[73] Recycling Incentives: Part One; LISA SKUMATZ, DAVID JURI FREEMAN, DANA D'SOUZA AND DAWN BEMENT

[74] USEPA PAYT Fact Sheet and MIT USA Compost Assessment

[75] Danielle Niles, WBZ-TV; 'Pay *As You Throw' Trash Programs Becoming More Popular In Mass.*; October 17, 2014

[76] Global Warming Solutions Group of Central Illinois; *Pay As You Throw*, Kassy Killy, July 10, 2009

[77] Rhodes Yepsen, BioCycle - http://www.biocycle.net/2013/03/19/residential-food-waste-collection-in-the-u-s-biocycle-nationwide-survey

[78] *Municipal Curbside Compostables Collection*-Department of Urban Studies and Planning - Massachusetts Institute of Technology

[79] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington)

[80] Freeman and Skumatz of the Ecoconservation Institute, "Best Management Practices in Food Waste Programs"; prepared for USEPA Region V

[81] *Municipal Curbside Compostables Collection*- Department of Urban Studies and Planning - Massachusetts Institute of Technology

[82] "Utility District Ramps Up Food Waste To Energy Program," November 2011

[83] "Zero Waste On San Francisco's Horizon," July 2011

[84] www.calrecycle.ca.gov/LGCentral/Library/innovations/curbside/CaseStudy.htm#Table6

[85] Rhodes Yepsen, BioCycle Nationwide Survey: Residential Food Waste Collection In The U.S.; BioCycle January 2015, Vol. 56, No. 1, p. 53

[86] Rhodes Yepsen, BioCycle - http://www.biocycle.net/2013/03/19/residential-food-waste-collection-in-the-u-s-biocycle-nationwide-survey

[87] Rhodes Yepsen, BioCycle Nationwide Survey: Residential Food Waste Collection In The U.S.; BioCycle January 2015, Vol. 56, No. 1

[88] http://www.oak-park.us/village-services/refuse-recycling/compostable-program

[89] Rhodes Yepsen, BioCycle - http://www.biocycle.net/2013/03/19/residential-food-waste-collection-in-the-u-s-biocycle-nationwide-survey

[90] Rhodes Yepsen, BioCycle Nationwide Survey: Residential Food Waste Collection In The U.S.; BioCycle January 2015, Vol. 56, No. 1

[91] *Municipal Curbside Compostables Collection*- Department of Urban Studies and Planning - Massachusetts Institute of Technology

[92] Rhodes Yepsen, BioCycle Nationwide Survey: Residential Food Waste Collection In The U.S.; BioCycle January 2015, Vol. 56, No. 1

[93] Rhodes Yepsen, BioCycle Nationwide Survey: Residential Food Waste Collection In The U.S.; BioCycle January 2015, Vol. 56, No. 1

[94] "Composter Brings On Residential Food Scraps Stream," Nora Goldstein, BioCycle, December 2014

[95] Rhodes Yepsen, BioCycle Nationwide Survey: Residential Food Waste Collection In The U.S.; BioCycle January 2015, Vol. 56, No. 1

[96] *Municipal Curbside Compostables Collection*- Department of Urban Studies and Planning - Massachusetts Institute of Technology

[97] *"Best Management Practices in Food Waste Programs";* Freeman and Skumatz of the Ecoconservation Institute; prepared for USEPA Region V.

[98] *Municipal Curbside Compostables Collection*- Department of Urban Studies and Planning - Massachusetts Institute of Technology

[99] Charleston County Resource: http://www.charlestoncounty.org/departments/environmental-management/compost-commercial-info.php

[100] Austin-American Statesman, *Austin restaurants must compost food scraps starting in 2016*; April 26, 2013

[101] Composting Roundup; BioCycle August 2013, Vol. 54, No. 8, p. 12

[102] Emory College Campus News, Hospitals turn food waste into compost; April 19, 2010

[103] *Building Healthy Soils with Compost to Protect Watersheds;* Bobby Bell and Brenda Platt, Institute for Local Self Reliance,; May 2013

[104] *Building Healthy Soils with Compost to Protect Watersheds;* Bobby Bell and Brenda Platt, Institute for Local Self Reliance,; May 2013

[105] *Building Healthy Soils with Compost to Protect Watersheds;* Bobby Bell and Brenda Platt, Institute for Local Self Reliance,; May 2013

[106] *Building Healthy Soils with Compost to Protect Watersheds;* Bobby Bell and Brenda Platt, Institute for Local Self Reliance,; May 2013

[107] *"Best Management Practices in Food Waste Programs";* Freeman and Skumatz of the Ecoconservation Institute; prepared for USEPA Region V.

[108] *"Best Management Practices in Food Waste Programs";* Freeman and Skumatz of the Ecoconservation Institute; prepared for USEPA Region V.

[109] ILSR http://www.ilsr.org/rule/on-farm-composting/ohio

[110] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[111] *State of Composting in the US: What, Where, Why and How;* by Brenda Platt (ILSR), Nora Goldstein (BioCycle), and Craig Coker (Coker Composting and Consulting) with contributions from Sally Brown (University of Washington); July, 2014.

[112] *Municipal Curbside Compostables Collection*- Department of Urban Studies and Planning - Massachusetts Institute of Technology

[113] Campbell, K. (2012, February 9). 4 Takeaways From Seattle's Composting Experience. *OPB.org.* Retrieved July 11, 2014, from http://www.opb.org/news/article/urban-composting-programs-take-root-in-the-northwe/

[114] Campbell, K. (2012, February 9). 4 Takeaways From Seattle's Composting Experience. *OPB.org*. Retrieved July 11, 2014, from http://www.opb.org/news/article/urban-composting-programs-take-root-in-the-northwe/

[115] Estabrook, R. (2011, November 29). A Dissolving Fruit Sticker That Claims Soap Superpowers. *NPR.org*. Retrieved July 1, 2014, from http://www.npr.org/blogs/thesalt/2011/11/29/142895565/a-dissolving-fruit-sticker-that-claims-super-soap-powers

[116] McLaughlin, B. (2013, August 30). Former Lakeland resident invents a clean, green alternative to sticky fruit labels. *ABCActionNews.com*. Retrieved July 1, 2014, from http://www.abcactionnews.com/money/business-news/former-lakeland-resident-invents-a-clean-green-alternative-to-sticky-fruit-labels

[117] Erbentraut, J. (2014, April 30). Chicago Approves Ban on Plastic Shopping Bags. *HuffingtonPost.com*. Retrieved October 1, 2014, from http://www.huffingtonpost.com/2014/04/30/chicago-bans-plastic-bags_n_5241854.html

[118] Nirappil, F. (2014, September 30). California Becomes the First State to Ban Single-Use plastic bags. *HuffingtonPost.com*. Retrieved October 1, 2014, from http://www.huffingtonpost.com/2014/09/30/california-plastic-bag-ban_n_5904766.html

[119] Brinton, W., Dietz, C., & Matsch, D. (2011, January 1). Microplastics in Compost: What we found and what you need to know. Retrieved August 1, 2014, from http://www.ecocycle.org/microplasticsincompost/faqs

[120] Brinton, W., Dietz, C., & Matsch, D. (2011, January 1). Microplastics in Compost: What we found and what you need to know. Retrieved August 1, 2014, from http://www.ecocycle.org/microplasticsincompost/faqs

[121] Waste Management. (n.d.). Illinois Environmental Protection Agency. Retrieved December 11, 2014, from http://www.epa.state.il.us/land/hazardous-waste/household-haz-waste/hhw-disposal.html

[122] Glanville, T., Richard, T., & Persyn, R. (n.d.). Using Compost for a Safer Environment. *Iowa State University Agricultural and Biosystems Engineering*. Retrieved December 10, 2014, from http://www.eng.iastate.edu/compost/index.html

[123] USCC Position: Persistent Herbicides. (2013, January 1). *CompostingCouncil.org*. Retrieved September 1, 2014, from http://compostingcouncil.org/admin/wp-content/uploads/2013/04/USCC-Position-Statement-on-Persistent-Herbicides-FINAL.pdf

[124] USCC Position: Persistent Herbicides. (2013, January 1). *CompostingCouncil.org*. Retrieved September 1, 2014, from http://compostingcouncil.org/admin/wp-content/uploads/2013/04/USCC-Position-Statement-on-Persistent-Herbicides-FINAL.pdf

[125] USCC Position: Persistent Herbicides. (2013, January 1). *CompostingCouncil.org*. Retrieved September 1, 2014, from http://compostingcouncil.org/admin/wp-content/uploads/2013/04/USCC-Position-Statement-on-Persistent-Herbicides-FINAL.pdf

[126] Bell, B., & Platt, B. (2013, May). Building Healthy Soils with Compost to Protect Watersheds. *ILSR.org*. Retrieved November 1, 2014, from http://www.ilsr.org/wp-content/uploads/2013/05/Compost-Builds-Healthy-Soils-ILSR-5-08-13-2.pdf

[127] Bell, B., & Platt, B. (2013, May). Building Healthy Soils with Compost to Protect Watersheds. *ILSR.org*. Retrieved November 1, 2014, from http://www.ilsr.org/wp-content/uploads/2013/05/Compost-Builds-Healthy-Soils-ILSR-5-08-13-2.pdf

[128] Duffy, D. (2005). Landfill Economics. *MSWManagement.com*. Retrieved December 15, 2014

[129] USEPA 2012 MSW Generation, Recycling and Disposal in the US: Facts and Figures