Composting

By Brenda Platt, Composting Makes $en$e Project
Institute for Local Self-Reliance
and
Susan Eisendrath, Montgomery County Master Gardener

Guest Lecturers
Our Vision:

A healthier world through environmental stewardship.

Our Mission:

To support the University of Maryland Extension mission by educating residents about safe, effective & sustainable horticultural practices that build healthy gardens, landscapes, & communities.
Our Mission:

To provide innovative strategies, working models and timely information to support environmentally sound and equitable community development. To this end, ILSR works with citizens, activists, policymakers and entrepreneurs to design systems, policies and enterprises that meet local or regional needs; to maximize human, material, natural and financial resources; and to ensure that the benefits of these systems and resources accrue to all local citizens.

Programs:

✓ Waste to Wealth
✓ Community Banking
✓ Community Owned Broadband
✓ Decentralized Energy
✓ Independent Business
✓ Biomaterials
✓ The Public Good Blog
Objectives

- Define compost and composting
- Understand the main composting systems and methods
- Identify the benefits of composting
- Learn about regional activities
- Understand the barriers to composting more
- Understand the compost ecosystem
- Describe how to compost and identify optimum conditions
- Understand how to troubleshoot composting problems
- Understand the uses for compost
- Apply knowledge gained to promote composting
FAQs

- Can I compost my kitchen waste?
- Do I need to turn my compost?
- Can I put weeds in my compost?
- How can I make sure I have enough browns and greens?
- Do barrel composters work?
- What about worm composting?
- What about rats? Will they be a problem?
- Are foodservice products labeled as “compostable” home compostable?
What is compost and composting? Who has experience composting? Give examples
What is compost and composting?

**Compost:** A dark, crumbly, earthy-smelling material produced by the natural decomposition of organic materials.

**Composting:** The aerobic, or oxygen-requiring, decomposition of organic materials by microorganisms, under controlled conditions.

During composting, the microorganisms consume oxygen. Active composting generates heat, carbon dioxide, and water vapor.

Composting reduces the volume and mass of the raw materials while transforming them into a valuable soil conditioner.

Organic materials

- Leaves
- Yard trimmings
- Brush and branches
- Food scraps
- Compostable packaging & paper
- Compostable plastics
Howard Co., MD: new residential collection

Recycle Food Scraps!

Accepted:
- Fruit and vegetable scraps
- Egg shells
- Bread, pasta, rice, grains, cereal
- Cakes, pies, cookies, baked goods
- Nuts, beans, seeds
- Corn cobs and husks
- Coffee grounds, filters, tea bags (no foil or foil-backed products)
- Paper towels and napkins
- Uncoated paper plates
- Pizza boxes (remove non-food items)
- Ice cream containers
- Paper egg cartons and paper bags
- House plants
- Cut flowers
- Small quantities of:
  - Grass and leaves

Not Accepted:
- Meat or fish (including bones)
- Dairy (cheese, butter, ice cream, etc.)
- Fats, oils, grease
- Facial tissues
- Styrofoam
- Diapers
- Pet waste
- Plastic-coated paper plates or bowls
- Plastics of any kind, including bio-degradable plastics
- Milk cartons: Recycle in your blue bin/cart
- Waxed paper or waxed cardboard, aluminum foil, or plastic wrap
  Please recycle cardboard and clean aluminum foil in your blue bin or cart.

www.HowardCountyRecycles.org   410-313-6444
Composting, lots of models
Regardless of System Size, 6 Important & Related Factors

1. The microorganisms that digest organic matter
2. Air or oxygen they require
3. Water or moisture they require
4. Food they require (need to balance carbon to nitrogen ratio = “green” and “brown” ingredients, watch Ph)
5. The size of the food particles (ingredients)
6. The volume of the pile

Common steps Include:
• Mix
• Monitor temperature
• Cure
• Screen
3-Bin Composting System
Composting Systems

Windrow

Passive aerated windrow

Covered composting bins/shed

Rectangular agitated bed

Aerated static pile

Equipment

- Moving materials
- Aerating/turning
- Grinders
- Mixing
- Watering
- Screening
Equipment Best Friends for Small-Scale Sites
What are the benefits of composting and compost? Why do we need to compost?
Benefits of Composting & Compost

- Reduces waste
- Improves soil
  - Creates a rich nutrient-filled material, humus
  - Increases the nutrient content in soils
  - Improves soil tilth, aeration, and water-holding capacity
  - Reduces or eliminate the need for chemical fertilizers
  - Suppresses soil-borne plant diseases and pests
  - Promotes higher yields of agricultural crops
  - Helps regenerate poor soils
  - Has the ability to cleanup (remediate) contaminated soil
- Saves gardeners the money used to buy alternatives such as peat moss, fertilizer, or vermiculite
- Reduces stormwater run-off & soil erosion
- Cuts emissions from landfills & burning
- Creates jobs & supports local economies

U.S. Municipal Waste Disposed (after recycling)

Source: US EPA, 2010 data
(http://www.epa.gov/epaoswer/non-hw/muncpl/msw99.htm)
Compost: Foundation of healthy soil and green infrastructure

- Stormwater management (low-impact development)
- Water conservation (the cheapest “new supply” of water)
- Sustainable landscapes
- Sustainable local/regional agriculture

*Added benefit of cost-effective waste diversion*

*Source: David McDonald, Seattle Public Utilities & Washington Organic Recycling Council, Soils for Salmon Project.*

*Above photos courtesy: Filtrexx*
Composting: Climate Protection

- Prevents landfill methane emissions
- Stores carbon
- Improves soil’s ability to store carbon
- Substitutes for energy-intensive fertilizers, pesticides, fungicides
- Improves plant growth, and thus carbon sequestration
- Reduces energy use for irrigation
Composting = Local JOBS

- Organics do not ship well
- Composting is small-scale
- Jobs are local
- Compost products are used locally
- Dollars circulate within local economies
- Local = good for local economies
- Composting linked to urban food production
- Composting diversifies farm products and saves money

On a per-ton basis, composting sustains 4 x more jobs than landfills or trash incinerators

Institute for Local Self-Reliance
How well does our area compost? How do we compare to others?
Residential Yard Trim Composting Programs Well Developed
Food Scrap Composting Growing

Univ. of Maryland

Peninsula Compost

Whole Foods

Chesapeake Compost
San Francisco: Aiming for Zero Waste
Composting & Recycling Collection System Designed for High Diversion

- Recycled Paper 21%
- Glass and Plastic Bottles 5%
- Aluminum and Steel Cans 5%
- Construction and Demolition Waste 25%
- Food Scraps 20%
- Yard Trimmings 5%
- Compostable Paper 10%
- Other 15%

Courtesy of City of San Francisco
Easy to Understand Program

1. Recycle
   - Place all bottles, cans, and paper and cardboard in the blue cart - MAKING RECYCLING EASIER!

2. Compost
   - Place all of your food scraps, food-soiled paper, and yard trimmings in the green cart.

3. Garbage
   - Place what is left over - non-recyclables into the black cart.
     - Food waste
     - Paper bag
     - Paper napkins
     - Paper milk cartons
     - Deli meat containers

Questions?
Call 415-330-1300 or visit www.sunsetsavenger.com

Composting Collection

All Food
- Fruits, vegetables, meat, bones, pizza boxes, bread, cake, cookies, fruits, vegetables, coffee grounds

Food-soiled Paper
- Paper plates, paper napkins, paper towels

Plants
- Brown leaves, grass trimmings, tree leaves, fresh flowers, flowers, grass clippings, tree leaves, miscellaneous

Questions?
Call 330-1300

Courtesy of City of San Francisco
Designed for Easy Participation

Kitchen Pail

Labeled Lids

Wheeled Cart

Courtesy of City of San Francisco
Seattle: Compostable Food Service Ware
Hierarchy of Food Scrap Recovery

- Source reduction
- Edible food rescue
- Food to animal feed
- Residential backyard composting (via subsidized distribution of compost units and intensive training for residents)
- On-site, small-scale, decentralized composting systems for gardens, institutions and businesses
- Centralized composting of food residuals through curbside collection programs

Source: US EPA

Montgomery County

- Grasscycling with mulching mowers
- Backyard bin give aways
Derwood Community Garden
Urban Farm Composting – Eco City, Edmonston, MD
What are the barriers to composting?
Barriers to home composting

- lack of knowledge, awareness of benefits, and experience,
- residential zoning and code restrictions (i.e., food scraps),
- rodent control,
- availability of materials (supply + quality),
- different systems (e.g., hot vs cold and shred vs no shred),
- expense of compost containers, and
- phytotoxicity and nitrogen stealing.
Barriers to comprehensive composting

- Lack of policies prioritizing composting and a decentralized infrastructure;
- Cheap landfill disposal fees;
- Landfill and incinerator industry vested interests;
- Lack of composting facilities;
- Poorly operated compost facilities that ultimately give a bad name to composting;
- Unlimited set-out of residential trash allowed free of charge;
- Lack of training programs for onsite composting; and
- Perception that starting composting is too costly.
Needs: Some ideas

- Local and state policies to support decentralized infrastructure
- Technical assistance and tools for on-site systems (schools, restaurant districts, supermarkets, malls)
- Development of model small-scale systems
- National Master Composting Training Program clearinghouse and advocacy program
- Network of training locations to provide hands-on training for local compost production and its use in growing local food.
- Standards and specifications for compost use in green roof media, stormwater manuals
Compost Basics

### Composting

#### Learning Objectives
- What compost is;
- At least three benefits of composting;
- The composting process, including the four essential components;
- How you go about starting a compost system;
- How you troubleshoot composting problems; and
- The characteristics of finished compost and uses of finished compost.

#### Introduction to Composting

**What is Compost?**

Compost is a dark, crumbly, earthy-smelling material produced by the natural decomposition of leaves, grass clippings, and many other organic materials. It is much like the organic matter existing on top of and in all soil and can be made by just about every gardener or homeowner. Compost "happens" without human intervention, since microbes and soil animals are on the job 24 hours a day, decomposing plant and animal remains. Composting allows you to expedite this natural process to produce a regular supply of compost (aka "black gold") for your landscape. Finished compost contains an assortment of major and minor elements and other nutrients necessary for plant growth and also improves soil structure.

**Why Make Compost?**

There are some very compelling reasons to compost:

- It reduces the amount of material going to landfills. Municipal waste is composed of 33% yard waste, 12% food waste, and 34% paper, most of which can be composted (U.S. EPA, Office of Solid Waste 2005). Depositing of yard waste in landfills is expensive and environmentally unsound. Burning organic materials uses up fossil fuels and releases pollutants. Furthermore, some Maryland jurisdictions impose special taxes on homeowners for yard waste disposal.
- Compost is a valuable and free soil amendment that saves gardeners the money used to buy alternatives, such as peat moss, fertilizers, or vermiculite. Compost improves soil health, aeration, and water-holding capacity and contains a wide range of plant nutrients.
- All soils benefit from regular additions of compost.
- Compost suppresses some soil-borne diseases. Populations of some microbes in compost may out-compete pathogens for food and habitat while others attack or repel plant pathogens.
- It’s good for the environment, flat, educational, and an activity the whole family can help with.

**How is Compost Made?**

Composting is the controlled, biological and chemical decomposition of organic matter. Decay takes place naturally, but composting speeds up the process. Composting can be done in open piles or within an enclosure. The term “compost pile” is often used generically in this chapter to mean any type of composting system, simple or complex.

There are six important factors involved in effective composting:

- The microorganisms that digest organic matter (1);
- The air, water, and food they require (2,3,4);
- The size of the food particles (ingredients) (5); and
- The volume of the pile (6).
Compost Ecosystem

- Compost is a living soil amendment.
- Bacteria, fungi, and microbes feed on organic matter.
- Microbes use carbon and nitrogen to grow and reproduce.
- Several cycles of organisms are needed for decomposition.
Composting Process

#1 – Layers of:
BROWN/Carbon material, like leaves and GREEN/Nitrogen material, like yard trimmings or grass clippings. You need more brown than green material, for example: 3 buckets of browns to 1 bucket of greens.
Composting Process

#2 – Moisture: Enough water so that the compost feels like a damp sponge.

#3 – Air: Turn the compost weekly for about three weeks or more. (One option is to put sticks or straw at the bottom of the pile to let air in.)
Compost Process

#4 – Heat:

High temperatures break down the ingredients faster and help microbes decompose the material.

Make the compost pile at least 3 ft x 3 ft x 3 ft to hold heat in and no bigger than 5 x 5 x 5 ft so it can be turned.
## Recommended Conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Recommended Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial C:N</td>
<td>25:1 to 40:1</td>
</tr>
<tr>
<td>Moisture content</td>
<td>50% to 60%</td>
</tr>
<tr>
<td>Oxygen concentration</td>
<td>&gt;&gt;5%</td>
</tr>
<tr>
<td>Temperature</td>
<td>131-149 deg F</td>
</tr>
<tr>
<td>Initial bulk density</td>
<td>&lt;1,100 lbs/cubic yard</td>
</tr>
<tr>
<td>Particle size</td>
<td>1/8 to 2 inches</td>
</tr>
<tr>
<td>pH</td>
<td>5.5 to 8.0</td>
</tr>
</tbody>
</table>

Source: Greg Evanylo, Dept. of Crop and Environmental Science, Virginia Tech, Better Composting School 2010.
DO COMPOST:
GREEN/Nitrogen Material
Coffee grounds, Fruit & Vegetable waste, Grass clippings and Yard trimmings and Fresh hay (without pesticides & herbicides), Manure: cow, horse, poultry, sheep, rabbit.
Compost Materials

**BROWN/Carbon Material:**
Leaves, Straw & Hay (without pesticides & herbicides),
Sawdust & Wood chips, Woody yard trimmings.

**AVOID COMPOSTING:**
Cat and Dog manure, Dairy and Meat, Weeds with seeds, Diseased plants, Wood ashes.
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost has bad odor</td>
<td>Too much nitrogen or not enough air</td>
<td>Add high carbon material and turn pile</td>
</tr>
<tr>
<td>Center of pile is dry</td>
<td>Not enough water</td>
<td>Moisten and turn pile</td>
</tr>
<tr>
<td>Pile is damp and warm only in middle</td>
<td>Pile is too small</td>
<td>Collect more material and mix into new pile</td>
</tr>
<tr>
<td>Pile is damp but will still not heat up</td>
<td>Lack of nitrogen</td>
<td>Mix in nitrogen source like grass clippings</td>
</tr>
</tbody>
</table>
Managing the compost process

- Good management can make or break the operation
- Minimize odors and other environmental impacts
- Make best use of materials, equipment, and labor available
- Good operator who understands the compost process and knows how to troubleshoot
- Temperature is the primary yardstick of the composting process
- Pathogens/aspergillus fumigatas

How is compost used?
Compost Applications

- landscape and nursery
- agricultural and horticultural
- vegetable and flower gardens
- tree and shrub planting
- sod production and roadside projects
- wetlands creation
- soil remediation and land reclamation
- sports fields and golf courses
- sediment and erosion control
How can we promote composting?
Promotion Strategies

- Create and use compost demonstration sites
- Provide information tables and displays at events
- Conduct and report on composting experiments
- Hold competitions and give away composting containers and thermometers
- Use social networking
- Sign-up for Master Composter training
- Advocate for supportive composting policies
Signage Is Important

Derwood Signage
FAQs

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Master composter action plan

1. Do you compost in your garden currently? 
   - Yes, I do 
   - No

2. If you do, do you plan to compost in your garden this year? 
   - Yes, I will 
   - No

   Describe how you plan to set up your composting below:

3. If you do, do you plan to change or improve how you compost based upon what you learned today? 
   - Yes, I will 
   - No

   Describe how you plan to change or improve your composting below:

4. Since composting is an important foundation of building healthy soils, how do you plan to promote it through the volunteer work that you would like to do as a Master Gardener? 
   - Through education at special events 
   - Through education at homeowner classes 
   - Through speaking opportunities 
   - Through working at demonstration gardens
   - Through school projects

5. Would you like to receive more training on composting and become a Master Composter? 
   - Yes 
   - No

6. Fill in the blank with your contact information:
   Name: __________________________
   Phone: __________________________
   E-mail address: __________________________

Thank you!
Contacts

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