10 Steps to Starting a Successful School Composting Operation

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Maine Department of Environmental Protection

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Step 1 **Is composting right for your school? Gauge interest and develop your Composting Team.**

Step 2 **Contact Mark King, Maine DEP for information and assistance:**

Phone: 207-592-0455
Email: Mark.a.king@maine.gov

Step 3 **Hold the first team meeting and invite DEP to attend.**

Step 4 **Conduct a "Characterization Study" of discarded food scraps.**

Step 5 **Choose appropriate food scrap collection system.**

Step 6 **Design and build composting system.**

Step 7 **Develop student-based curriculum and compost activities.**

Step 8 **Initiate compost operations and evaluate and adjust process.**

Step 9 **Collect and report data from composting operations.**

Step 10 **Use soil product and share success with the community!**

Step 1: Getting Started…

What is Composting?

Composting is a biological process in which tiny organisms (microbes) convert organic materials such as food scraps, leaves, grass clippings, and paper) into nutrient- rich, soil-like products. For microbes to breakdown organic materials within a compost pile, there must be suitable amounts of carbon, nitrogen, oxygen and moisture. Compost microorganisms rely on a proper balance of carbon and nitrogen (around 30-40 parts carbon to 1 part nitrogen). Carbon is provided by leaves, paper, sawdust, etc., and serves as the energy source for the microbes. Nitrogen is provided by food scraps, fresh cut grass, horse manure, etc., and is used by the microbes as building blocks to produce more microbes. Nearly anything that was once alive can be composted, popular items including food scraps, grass, plant cuttings, paper, leaves and animal manures.

Is Composting right for my School?

There are many benefits to starting your own compost pile. One of the most compelling reasons involves the eye-opening number of compostable materials that end-up in our landfills each year. In Maine, for example, up to 43% of our waste stream is comprised of organic materials that could be composted, saving valuable landfill space and reducing negative environmental impacts of disposal. Aside from this global value, composting offers many immediate benefits to your school:

- The amount (and weight) of trash your school produces will be reduced.
- Nutrients from composted food scraps are recycled back into your soils.
- Composting can save money and turn any unwanted materials into a useful product.
- Composting offers numerous educational opportunities to promote sustainable environmental practices to your students.

- Student and community awareness is awakened regarding recycling and waste reduction.
- School pride and environmental stewardship is enhanced through positive contributions of conservation efforts.

Getting Started

Once you have decided to compost, you will need to develop your "Composting Team". For this process, you should include as many folks as you can think of, but make sure to include the following groups of individuals:

- **Principal**
- **Food Service Staff**
- **Custodial Staff**
- **Science and Art Teachers**
- **Interested Parents**
- **Local/State Compost Contacts**

All these individuals have much to offer and will need to have a voice at the beginning to ensure their buy-in and continued support of the project as it moves forward.

Step 2: Contacting the Maine DEP…

DEP Compost Resources

Staff from the Division of Sustainability and the Division of Materials Management are ready to assist you with all aspects of starting and operating a compost system at your school. The following contact list will help connect you with the appropriate staff to ensure your compost project is a success:

DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 State House Station 28 Tyson Drive
Augusta, ME 04333-0017
Phone: 207-287-7688 or 1-800-452-1942

Maine DEP—Compost Education and Technical Support

Maine DEP Staff	Region Covered	Phone Number	Email Address
Mark King	Statewide	(207) 592-0455	mark.a.king@maine.gov
Margaret Watson-Pierce	Northern Maine	(207) 242-0383	margaret.watson-pierce@maine.gov
Jim Pollock	Central Maine	(207) 592-8343	james.c.pollock@maine.gov
Sarah Smith	Central Maine	(207) 881-7936	sarah.smith@maine.gov
Edward Stamborski	Eastern Maine	(207) 881-7935	edward.stamborski@maine.gov
John Breedlove	Eastern Maine	(207) 530-6601	john.breedlove@maine.gov
Daniel Chea	Southern Maine	(207) 855-8129	daniel.chea@maine.gov
Stephen Morin	Southern Maine	(207) 252-1851	stephen.morin@maine.gov

Step 3: Hold your first Team meeting…

The First Team Meeting

Setting the tone during the first Team (group) meeting is an essential step towards building a successful compost campaign. While this is a time for sharing of ideas and brainstorming, it is important to keep everyone focused on the project at hand. Prior to the first meeting, the staff member initiating the meeting (aka, "Compost Coordinator") should conduct sufficient research to be able to discuss the pros and cons of starting a school-based compost operation. Contact with the Maine Department of Environmental Protection should have occurred in **Step 2**, and the staff representative from the Division of Sustainability may have been invited to attend. The goals of the initial meeting should include an understanding of how the group will function, an emphasis on two-way communication and positive reinforcement, a commitment to an educational- based project and clear definition of roles and responsibilities of group members.

As we discussed in **Step 1**, there are essential team members that must present for the process to move forward. We will now take a moment and discuss the roles and responsibilities of each key player and who should assume that role:

- **Compost Coordinator**—The staff member who started the process and will oversee assigning roles of other team members and making sure that assigned tasks are completed in a timely fashion. This role can be assumed by either a teacher or administrator.
- **Compost Monitor**—The staff member who will set up and maintain the compost collection station in the kitchen/cafeteria area, making sure that there is adequate space and clear signage to ensure efficient food scrap collection. This position may delegate collection tasks to teachers, parent volunteers or students, but will be responsible to ensure that collection is well-regulated. This role should be assumed by one of the Kitchen Staff.

- **Sorting Monitor**—This position can be one or several persons that monitor the scraping of plates and emptying of trays to ensure that only food scraps and compostable items are collected. This role can be assumed by a teacher, parent volunteers, custodial staff, or students.
- **Compost Collector**—This position involves managing a group of students as they bring the collected food scraps out to the compost site for inclusion into the compost operation. This position ensures that the food scraps are properly incorporated and that student's take temperatures of compost bins (and record them) prior to adding new materials. The Compost Collector also checks the piles for animal damage, odors, and lack of compost activity. If necessary, students will turn compost piles to restore microbial activity. This role should be undertaken by a science teacher or custodial staff member.
- **Materials Coordinator**—This position is responsible for acquiring all the materials necessary to ensure that the composting operation runs smoothly, including lumber and building supplies, leaves, manure, etc. This person should be resourceful and capable of finding sources of free, donated or cheap supplies. This role can be assumed by a teacher or parent volunteer.
- **Site Monitor**—Even when well-planned and executed, problems may still ensue. This position is responsible for over-all pile monitoring and responds, when necessary, as a back-up failsafe. This role should be assumed by a member of the custodial staff.

Once the Compost Coordinator has assigned roles and responsibilities, it is important to clearly define the scope of the project and set up a timeline of events with defined goals and specific timelines.

Step 4: Conduct a "Characterization Study" …

What is a Characterization Study?

For many school systems, food scrap collection offers a great opportunity to reduce waste streams and save real money. The easiest way to measure this impact is to conduct a system wide characterization study. During this process, all aspects of the food service operations are carefully evaluated to find ways to recover compostables. This includes looking at ways to improve purchasing while eliminating unnecessary packaging and the recovery of food scraps at both the preparation end and the service end. The study is usually conducted for all meal services over the course of one week. At the end of each day, collected food is weighed (pounds) and then a total weight is determined for the week. Often during the study, better ways to purchase items (such as ordering what you need vs. 'what's the best deal') are uncovered. Recently, the US EPA developed a revised Food Recovery Hierarchy to help support ongoing food recovery and recycling efforts. It is called the Wasted Food Scale and lists preferred uses of recovered food scraps in descending order from left to right:

One striking change to the new model is the addition of the "Upcycling" category, which involves using food scraps in a way that creates a new product that is of higher quality and value than the original. Simply put, the overall goal is not producing waste in the first place. This is accomplished by purchasing just enough food items to meet the needs of your clients without exceeding them. The slang term "buying smarter" has been used to describe this category. The waste characterization study is an excellent tool to meet this goal, and its use is becoming increasingly common, especially in school systems.

Conducting a Characterization Study

As stated above, the characterization study is useful in giving schools a sense of the amount of food scraps that they routinely discard. This value will also be used to determine the type and size of compost system that will be eventually used.
The characterization process is very straightforward and consists of the following steps:

1. Several days before initiation of characterization study…
    - An announcement is made to all staff, teachers and administrators several days prior to initiation of the study.
    - Necessary materials are gathered (scale, pen and paper, calculator, heavy duty non-latex gloves, 5 or 6 five-gallon pails (with lids, if possible), hand sanitizer, aprons, and tarps to cover collection areas.
    - A location for sorting and collection is determined, and appropriate signage is designed to orient students during the collection period.
    - Compost Monitor meets with Sorting Monitors and describes process that will be used to ensure that only compostable items are collected.

2. Initiation of Characterization Study
    - An initial survey of food items in storage is conducted, focusing on expiration dates and quantities.
    - Sorting begins, with weights recorded separately for each meal.

- Collected weights are totaled for each day during the five-day collection period, with a final total determined at the end of the week.

3. Evaluation Phase
    - Discussions regarding the collection process, efficiency of collection, lessons learned and thoughts for the future are generated.
    - Results of tabulated weights and comments generated above are used to determine the collection system (**Step 5)** and compost system (**Step 6**) that will be used by the Team.

Step 5: Choosing a Food Scrap Collection System…

Setting up the Collection System

The hallmark of a good food scrap recovery program is an efficient collection system that is easy to use. No matter how the collection area is set up, it should be clearly marked with appropriate signage, ensuring that students know where they should place food scraps; also, having 'Sorting Monitors' at the collection area helps to ensure that students do not forget. Since long-term consistency is the objective, there also needs to be a positive feedback loop to help encourage desired behaviors.

What Kind of Container Should I use?

Containers for collection of compostables vary based on size, cost, and overall ease of use. The "key" is to try and match the container to the needs of your school system. Schools with less than 200 students may be able to collect in five- gallon buckets or small storage tubs, whereas a school system of 650 students may prefer a wheeled cart (holding between 20 and 48 gallons). Another consideration is the weight of collected organics. Most food scraps generally weigh about three to six pounds per gallon. If young children are going to be handling the containers, then smaller buckets or wheeled containers filled half- way may be necessary. Additionally, to ease the need for cleaning up between

uses, you may consider using plastic liners in the container. Compostable liners may be used, depending upon the composting system selected. Certified compostable liners have been found to breakdown within 180 days if placed into an active compost system.

How much time should I budget for Collection?

The collection process can be broken into two periods of activity:

daily tasks and weekly tasks.

Daily tasks take about 30-45 minutes and include the following:

- Sort and collect food scraps.
- Weigh collected food scraps.
- Take food scraps to compost site.
- Take compost temperatures.
- Mix food scraps into compost pile.
- Add bulking materials (carbon) as cover, and clean-up.

Weekly tasks take a little longer, about 1 to 1 ½ hours and include:

- Maintenance of the compost bins.
- Physical turning of compost pile contents.
- Trouble-shooting compost pile problems.
- Bringing in new bulking material sources.

Running the Collection

Once you have designated a sorting area and procured the appropriate containers, it is time to initiate the collection/recovery operation. Many school systems find that a stepwise approach works best. This is usually accomplished by using separate containers in the kitchen area to catch preparation discards, followed by additional containers in the sorting area to capture plate discards. At the end of each meal (breakfast and lunch), captured food scraps are then combined and a total weight collected for that service. This is repeated daily for a five-day school week and then a total weight for the entire week is determined.

This data is then used to project future savings potential from avoided disposal costs and to determine what size compost system may be required.

Step 6: Designing a Compost System…

Picking the Right Compost System Design

Once you have decided to compost, you will need to get a few things in order. First, choose a suitable site that is dry, partially shady to shady, flat and contains well-drained soils. Next, you will need to choose a system for composting. The two most popular systems are enclosed or walled bins and open heaps (piles). Bin designs vary from single-bin systems up to two or three bin designs, and can be built using an array of available materials including: lumber, wire mesh, recycled pallets, cinder blocks, snow fencing, waste containers, etc. Single bins are generally filled with alternating layers of carbon amendment and food scraps until full. In multi-bin systems, such as the three bin system, compost materials are systematically added to the first bin until it is full, and then transferred to the second bin as the first is filled again. This 'turning" process provides aeration as well as thorough mixing of the compost ingredients. The turning process is then repeated until the compost materials have cycled through each of the three bins.

In a pile system, compost materials are mixed and formed into a pile. This system is ideal for large quantities of material and tends to produce compost more quickly, as piles are turned on a weekly basis using a frontend loader tractor with

an attached bucket. However, it is important to note that pile systems require more space for tractor maneuverability and for storage of additional amendment materials. Finally, if you do not have a tractor handy, the size of pile you build is greatly limited, since turning by hand can be quite cumbersome.

Once you have decided on the right system, it is time to build it. Many school systems reach out to community members for construction assistance and possible donations of building materials. This time serves as an excellent opportunity to invite community buy-in and help develop relationships that will continue to prosper as the composting operation grows. No matter which system you eventually choose, there are many plans available through the Department's Sustainability Division staff to help you design the ideal one for your school.

Step 7: Developing Student Based Curriculum Materials…

Introduction

There are numerous educational opportunities for educators to develop lesson plans and activities to promote learning while developing and operating a school-based compost project. In short, composting is a valuable teaching tool at any grade level. For example, pre-k and kindergarten students can enjoy learning about the various critters involved in composting and then draw and paint pictures of them as an art project. First, second and third graders greatly enjoy digging into the compost piles to see how they work. As you progress through the grade levels, you can begin to add more science-based learning to your curriculum. Having students track weights of recovered food scraps and compost pile temperatures, allows them to analyze data and generate reports. These reports are also valuable to administrative staff when budget time comes.

Over the years, staff from the Division of Sustainability have worked with numerous school systems in Maine and have developed a list of internet sites that offer free resources for educators wishing to add compost to their curriculum.

Compost Curriculum Links (suggested, to help you get started)

The following links provide curriculum ideas and fun activities for all ages:

- "Do the Rot Thing, A Teacher's Guide to Compost Activities"—Central Vermont Solid Waste Management District:

  http://www.cvswmd.org/uploads/6/1/2/6/6126179/do_the_rot_thing_cvswmd1.pdf

- “Composting Across the Curriculum, A Teachers Guide to Composting”—Marin County Office of Waste Management:

  http://www.marincounty.org/depts/pw/divisions/mcstoppp/~/media/Files/Departments/PW/mcstoppp/education/nov%202012/Composting%20Curriculum%20out%20of%20print.pdf

- **“**Composting Education for Schools and Communities”—Cornell Waste Management Institute:

  http://cwmi.css.cornell.edu/solidwastecurriculum.htm

  “Backyard Magic, The Composting Handbook, Be Eco Friendly”—New Brunswick:
  http://compostingcouncil.org/admin/wp-content/uploads/2013/01/CompostingHandbook.pdf

- “Agriculture in the Classroom”—Cornell University, the NYS Department of Agriculture and Markets, the NYS Education Department, and the New York Farm Bureau, NY AITC:

  http://www.agclassroom.org/

- “Composting in Schools”—Cornell Composting

  http://compost.css.cornell.edu/schools.html

Step 8: Beginning Compost Operations…

Material Preparation and Mixing

Before you can begin operations, there several key steps to you need to accomplish to ensure start off on the right foot. The first step is to determine what amendments (carbon sources) are available locally, and what ratios they should be blended with your food scraps. The easiest way to accomplish this is to develop a compost recipe. As a rule, for leaf and yard trimmings, a recipe of three parts leaves to one part grass clippings will yield satisfactory results. If manure is added to the mixture, at least two additional parts leaves should be added for each part manure. Once the compost recipe has been determined, you should consider preparing the feedstocks for the mixing process. One way involves material sizing through grinding. A small lawn chipper can grind feedstocks prior to mixing, thereby increasing available surface area for microbial contact, while also providing for a better mixture among ingredients and faster decomposition. Although this is not a necessary requirement, it can go a long way to making the process work smoother.

MacKissic Inc.

The next consideration is moisture management. Ideally, a feedstock should contain approximately 50% to 60% water. Adding water to a dry feedstock will help optimize conditions for microbial colonization, whereas adding dry material to a saturated pile helps to create additional air spaces for pile oxygenation. Next to recipe development, proper mixing is the single most important step determining success or failure of the compost operation. Obtaining a thorough, homogeneous mixture at the onset of the compost process, will ensure intimate contact between the carbon, nitrogen and moisture components of the pile, thereby reducing the potential for the formation of "dead spots". In addition, proper mixing allows for even air distribution throughout the pile, helping to promote aerobic composting.

Pile Formation

Once you have created your mix, it is time to fill the compost bins or build the compost pile. The objective here is to create a mass large enough to sustain the "self-heating". As a rule, bins should be built to hold at least one cubic yard, and piles should be constructed at least five to six feet high by eight to 15 feet in diameter. In areas experiencing long winter seasons, pile dimensions may need to be increased to 10 feet high by 15 to 18 feet in diameter. The size and shape of the compost pile will ultimately be determined by the type of compost system that you choose and the volume of material you will be handling in each season. In addition to adequate mass, the pile must also contain enough porosity (air spaces) to allow natural movement of air throughout the pile. Creating piles that are too high (more than 10 feet) risks compression of the inner core contents due to the excessive weight of the overlying materials.

Turning

Turning is the physical process by which compost pile ingredients are blended and re-mixed throughout the active compost phase to help sustain thermophilic temperatures. During the turning process, compacted, settled materials are "fluffed-up", creating air spaces. The act of turning accomplishes several things at

once, including re-mixing of pile ingredients, further physical breakdown of resistant ingredients, and redistribution of air spaces within the pile to help promote passive air flow. In addition, the turning process can be used as a moisture management tool. Piles that are too wet can be turned more often to facilitate drying, whereas piles that are too dry may be turned immediately following precipitation events to help capture and retain moisture. In addition, flattening the top of a pile prior to an anticipated rain event increases the amount of surface area available to absorb moisture. The frequency of turning depends upon the individual needs of each compost pile.

Evaluating Compost Performance

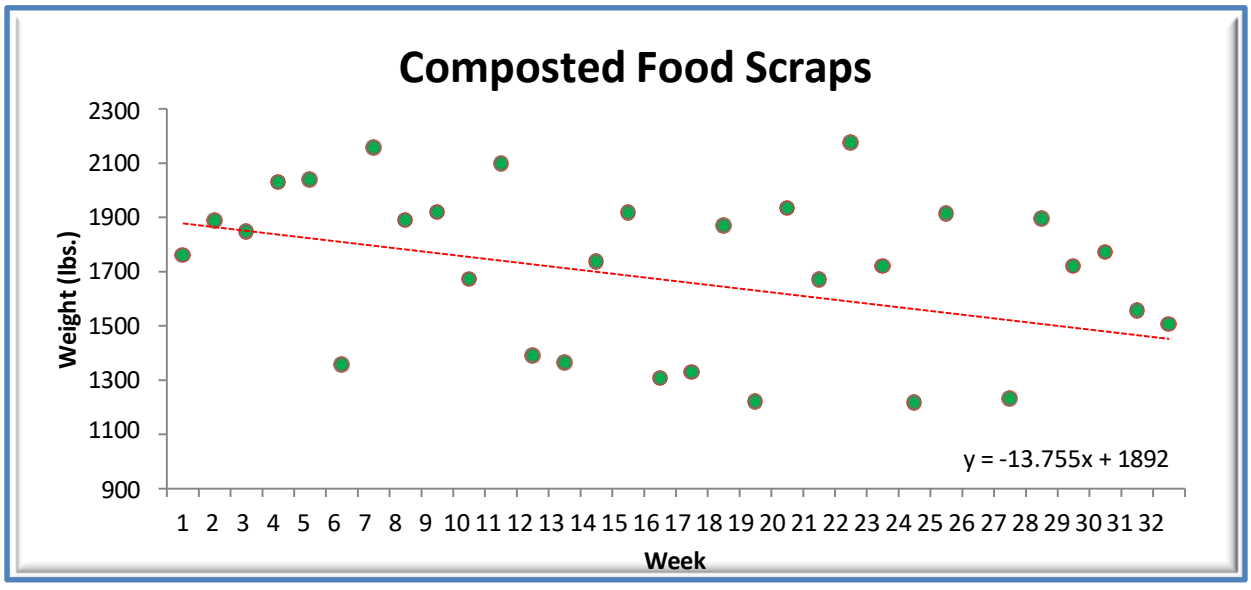
No matter how well a compost process operates, there are invariably going to be nuisance problems from time to time. Most problems are due to a breakdown in the process, and are interrelated and as a result, addressing one usually solves the others. The key to overcoming nuisance problems is to identify the root cause and correcting it. Often optimizing the existing compost recipe (creating a homogeneous compost mixture that is 40-60% moisture, 6.5-7.5 pH, 20:1 to 30:1 C:N, and has adequate "air spaces" within the piles) will do the trick. Extra layers of amendment may be added to help control stinky piles or you may wish to give the compost a good mixing. If problems do persist, the Department's Sustainability Division is only a phone call away.

Step 9: Collecting and Reporting Data…

Using Data to Support Compost Efforts

Once you are up and running and have worked the kinks out, you will want to start tracking data to help support ongoing operations during budget season. The two most valuable data sets are total weights of collected food scraps and daily temperature recordings of compost pile temperatures. These values are important for different reasons: the weights of diverted food scraps help to show how much material has been pulled from the waste stream, whereas the daily pile temperatures help to demonstrate that the piles are doing what they should or not. Whenever possible, you should have students track as much information as possible. In that way, students learn while information is gathered and presented to administration.

One interesting study is to have students track the weight of recovered food scraps over the course of the school year. This is best accomplished by recording data in a spreadsheet such as Excel®. The spreadsheet contents may then be represented graphically to provide a vivid image to help generate discussion.



Other initiatives include plotting money saved from avoided disposal costs by month, revenue earned from compost sales, and plots of compost temperatures (by day or month) to help track pile performance and demonstrate success of program.

Step 10: Using the Finished Product…

Compost Uses

There are many uses for a finished compost product. Although it is technically not a fertilizer, it still contains small amounts of three important plant nutrients: nitrogen, phosphorus, and potassium. The true value of compost, however, is as a "soil conditioner". Compost provides large quantities of organic matter which in turn help improve soil by increasing water holding capacity, increasing infiltration, reducing erosion, decreasing soil compaction, and by introducing new biological activity to the soil.

Compost Testing

When finished, compost will often appear dark in color and have no noticeable odor except for a slight "earthy" smell. But this alone does not mean that the compost is ready for the garden. Partially composted may damage sensitive garden plant materials, especially if they contain, high salts, high pH, or unstable amounts of ammonia nitrogen. The safe bet is to collect a sample of your compost and send it to a lab for analysis. There are many labs capable of testing compost, but it is important to ask first.

At the University of Maine Soil Testing Laboratory in Orono, they conduct a "Compost Analysis" test that includes all the pertinent information necessary to ensure the correct usage of your finished compost. This relatively inexpensive test costs under $60.00 and only needs to be done once annually.

Copies of the test results may be given directly to consumers, or you may wish to provide a few more facts about your product, including suggested application rates, in the form of an informative "Fact sheet".

Compost Sales

At end of each season, you may find that your school is producing more compost than it can use. A natural extension of the process is to offer the excess for sale to the surrounding community. A further extension might be the inclusion of

community members into compost process and perhaps the establishment of a community garden on site. Other school systems have an adjacent green house where plants are grown for spring sale events.