

Guidelines For Urban Community Composting

Part A: Getting Past Odors And Rats

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Introduction

With good practices, urban community composting can thrive at many sites, including school and community gardens, urban farms, parks, and vacant lots. But there are significant challenges, starting with neighbors' and landlords' perception that compost will attract rats and cause odors. This perception is dead wrong as applied to good sites that are run well, but quite correct in some instances where well-intentioned composters started with the wrong site or could not adhere to good protocols. The reality is that room for error is slim in a city, because neighbors are close and rats are already present. What might pass unnoticed in a rural or suburban setting can instead cause uproar in an urban setting, hurting rather than helping the composting movement. Therefore the prime directive is to "do no harm."

Persistent odors and rats at poorly run sites are not just a problem for neighbors. They also discourage your volunteers who may be key to getting the work done. We welcome volunteers to deepen their involvement in, and commitment to, sustainable practices. The two goals of (i) getting the job done, and (ii) cultivating the environmental stewardship of those doing the job, are both compromised if volunteers find themselves dancing around a rat or gagging on odor.

Lastly, there are environmental protection regulations. Each city and state has regulatory agencies tasked with protecting the environment. Those agencies may have rules that apply to community composting. Inquire about those rules during vis-

its with operators at existing composting sites and visits to the agencies' respective websites. The hope is that the high standards set forth in these guidelines will exceed those of your regulatory agencies, because community composters have broader goals relating to building a community. But of course the agency rules trump if they require more.

Most experienced urban composters would agree that the best general advice is to start small. Use the *small* operation to develop expertise, test solutions to problems, and further test commitments others have made to you as part of the plan to run the operation well. Engage interested neighbors, and start with just a couple tumblers/bins or a small "windrow" (described more below). Make sure that the small scale can be successful before taking on more.

These guidelines are not a substitute for training in the science of composting, which can be obtained in several ways, such as an apprenticeship at a successful community composting site and/or a certification program. For example, in training you learn about adequate carbon/nitrogen ratios and the "process to further reduce pathogens." The purpose of these guidelines is to focus on equipping urban community composters with practical tools and tips to succeed. This first installment tackles the two biggest potential challengers standing at the threshold of your important work: odors and rats.

Further, these guidelines assume you will accept the advice to start small, so the composting systems under review do not include aerated static piles (ASP), which require additional training and capi-

tal investment. Rather, the focus is on tumblers, bins (usually at least 27 cubic feet to ensure a good cook), and, where a site allows for maximum rodent control, *small* turned windrows (elongated mounds at least 27 cubic feet to heat up but, to stay small and wieldy, not more than 81 cubic feet).

Section I: Controlling Odors

Odors can be controlled. While it may be possible to even eradicate odors at some community compost sites, a reasonable standard focuses on good practices, not on the occasional odor. But good practices require knowledge and work. Below are the questions to review in advance:

- Will you be able to control the condition of the materials making their way to your site?
- Will you be able to manage the materials soon after arrival?
- Will you be able to conduct **controlled** composting, having enough time and labor to:
 - ◊ *Blend well?*
 - ◊ *Turn on schedule?*
 - ◊ *Manage leachate?*

One piece of compost science is essential to review in advance on the topic of controlling odors: the difference between *aerobic* (with air) and *anaerobic* (without air). At a typical community composting site, operators create compost with controlled *aerobic* decomposition of organic matter like food waste, garden debris, and tree leaves through microbes and other organisms. By keeping enough air in the compost piles, through turning and the use of bulking agents like wood chips that sustain air pockets, you cultivate the aerobic microbes, accelerate the process, and improve the product. Along the way, the piles generate enough heat to reduce pathogens and weed seeds. These practices yield good quality compost sooner for greening your community and open up space more quickly to make more compost. And keeping enough air in the compost piles is one of the most important factors for controlling odors.

Will you be able to control the condition of the materials making their way to your site?

Control of odors starts with the “inputs” — materials like kitchen scraps or coffee grounds that arrive to put into the tumblers or bins or a small windrow. Ideally, you want nitrogen-based inputs like food scraps to be as fresh as possible, because it is easier and more pleasant to manage.

In addition, you want to avoid fats, meat, fish, and dairy. These items may appear on the list of acceptables for rural or commercial composting sites, but the list for urban community composting is

usually different because we are held to a higher standard regarding odors and rodents. Fats like olive oils in salad dressings interfere with the desired microbial activity, and meat, fish, and dairy have dense proteins. While all those things are indeed compostable, they make decomposition take longer, creating conditions that may foster more odors and rodents. You would never want to experiment with these inputs until you are certain that you have full odor and rodent control. So an initial question is whether your sources for inputs can avoid post-consumer waste (that’s what has already been on the plate for eating, and likely has butter or olive oil in it) as well as meat, fish, and dairy.

For the organic materials you can indeed accept, you may find it has been stored in a sealed container, where over time it can become soupy, anaerobic, and smelly. You’ll have several challenges when you open the container. First, the odor can be overly offensive, not only for neighbors but for volunteers who may feel discouraged from future participation. Second, depending on your ground surface, the liquid may flow over or seep into your surface and spread odor, either in the near term or building up over time. Third, the soupiness is dense and can reduce air in the compost mix, increasing anaerobic conditions. Last, it is harder to cultivate aerobic conditions if you start with anaerobic materials.

Here are some potential solutions. For any source of inputs, explore whether the time between creating compostables and delivering compostables can be reduced to the point of eliminating anaerobic conditions (this depends not just on time but temperature, so you may have to experiment). For example, you might explain to a source that you can only take their materials if they deliver it within one day of it going into the receptacle. If that does not happen consistently, you may have to stop receiving from that source. The same logic applies if you are picking up materials as opposed to awaiting their arrival.

Alternatively, explore whether material can be mixed with browns at the source where compostables are created and capped with browns — wood shavings from non-treated tree lumber (rather than contaminated material like plywood) are popular with this approach. Mixing and capping with browns will help reduce odor.

Lastly, storage in a freezer or refrigerator will help (although keep in mind that in cold winters the frozen material may shut down the heat in a small system like a tumbler or bin). Many households maintain a repurposed plastic bag in the freezer for their scraps.

TIP: a common problem to address with all stakeholders is to avoid chopping material inside buckets, because the choppers slice through the buckets and that creates leaks and smells for the transport vehicle and for the compost site.

Will you be able to manage the materials soon after arrival?

Once organic materials have arrived at your site, your next steps for controlling odors have to do with what happens to those materials upon arrival. The potential problems carry over from the list discussed above regarding materials that have not yet arrived — the inputs may arrive in good shape but then while in storage at your site become anaerobic or attract rodents/insects. There are two choices:

1) Incorporate materials soon after arrival into a compost system like a tumbler so they start composting;

2) Put materials into storage in a way that resists odors while the materials await entry into a controlled compost system.

For the first choice, you can explore whether those delivering the materials can also do the work of incorporating them into a compost system, because then odor control is instantaneous. For example, those bringing their own household scraps could put their inputs directly into a tumbler, mixing with browns and turning. Then the materials could later be transferred to a larger system like a bin or windrow, if you have those systems, but in the meantime it is managed until you or other trained volunteers can further manage it. Alternatively, explore whether delivery times could be scheduled to coincide with your work sessions, if not within a few hours at least within a day. In other words, you can tell sources when to bring their materials, or find out when they can deliver and schedule your work sessions around those delivery times.

For the second choice — odor-resistant storage — the potential solutions similarly break down between what your sources can do and what you can do. Explore whether those delivering the inputs can observe a protocol for blending or layering materials with browns for temporary storage in a bucket/barrel, and capping it off with browns like wood shavings or leaves. Or that may be something you do, which turns on matching up the delivery with your work session.

TIP: Storing material in the shade will help by slowing the breakdown.

After layering/capping, the containers can be sealed. That's especially important with 5-gallon or smaller buckets, because otherwise rodents will invade. But sealing will create anaerobic conditions over time, because the seal keeps out air. If materials may be in storage for a significant time, consider using large 32 or 45 gallon barrels, which are too tall for rats to access. Some brands such as Brute have USDA-approved barrels, which are safer. By putting stakes in the filled barrels, and a tarp over the top, the result looks tent-like (Figure 1). With the tarp in the shape of a tent, you can accomplish two things. First, you allow some air under the tent, which is better to promote aerobic conditions and control odor; second, you keep rain out. Further, if the tarp has an elastic band around the edge then it is much easier to manage because you just hook it over the barrel handles.



TIP: On-line you will find affordable elasticized tarp covers made for all-terrain vehicles (ATVs). Such covers can be stretched across several barrels, or pulled tight by setting two barrels far apart from each other, or pulled tight by tucking under one barrel.

TIP: If your sources fill the barrels, consider having them fill to a certain point in the barrel so it does not get too heavy to manage.

Will you be able to conduct controlled composting?

The opportunity for odors is not limited to the front-end management of inputs. Once those inputs are in your compost systems, they can still host huge “odor events.” Many factors contribute to odor events, including:

- An imbalance of materials (such as too much nitrogen and not enough carbon)
- Not enough porosity to allow room for oxygen (this often happens when untrained workers pack the material down, or do the work while standing on the mound)
- Not enough bulking agent like wood chips to maintain porosity
- Insufficient blending
- Too much moisture (for example when inputs were soupy)
- Insufficient turning
- Unmanaged leachate

Let’s assume you have worked out the recipe based on your previous training and site-specific factors like rainfall levels, ambient temperatures, and what inputs you have. Then the typical problems for community composting boil down to the last three items: insufficient blending, insufficient turning, and unmanaged leachate.

Do you have enough time and labor to blend well?

Controlled aerobic composting is partly about creating the best conditions for the microbes to break down materials. Microbes need both nitrogen and carbon to do their work well. They are microscopic, so their dining platters are also microscopic. That means the nitrogen and carbon has to be blended well enough to get the two elements both on one microscopic dining platter. So for example, layering in browns and greens like lasagna will only prepare the microbes’ dinner plates where the layers touch each other, leaving large bands of nitrogen left to turn anaerobic more quickly.

TIP: Always include some already active compost in a new mound to act like a sourdough starter, much like you would leave behind a bit of starter in a tumbler for the next batch. In addition, you may find it best to run a “continuous feed” bin or windrow. That’s an actively composting mound into which you incorporate new materials. For that method, there may be nearly as many techniques as there are community compost sites, so it’s best to visit a few sites to find your own best choice.

This need for blending is easily met with tumblers, because several spins will suffice. Not so with bins or windrows, which may nonetheless be necessary to handle larger volumes of inputs. Here are a few approaches to consider:

- *Pre-blend:* Blend before you transfer the materials to a bin or windrow—you can make a crater of browns a few feet in width and dump the greens in the middle, cull and chop appropriately, blend with the browns and then transfer to the bin or windrow (for soil-based chopping surfaces, some sites use tubs or cement pans in which to chop and blend, which keeps the soil out of the compost and makes cleanup easier);

- *Blend in place:* Make lasagna layers of browns and green, but for each completed layer use a pitchfork to blend into the layer below (the down side of this approach is that each dump of material pushes air out of the deeper layers below);

- *Post-blend:* Build the entire mound with lasagna layers of browns and greens, but then turn the entire mound to achieve a good blend (for windrows that are sealed with wood chips or finished compost, the post-blend can occur during a subsequent work session, but the longer the wait the greater the risk of an odor event, and labor costs can rise because you wind up sealing the mound twice rather than just once for the same period of active composting).

TIP: If protocols have failed and you are working with anaerobic materials, the “pre-blend” method is likely preferable, because small amounts of material can be quickly smothered with browns. That is harder with lasagna layering, which exposes a large amount of material at one time, especially in a windrow. Wood shavings work best for smothering; sawdust tends to lump together.

TIP: If you are working with new volunteers on large volumes, you’ll likely find that the post-blend method is psychologically challenging for them, because they have just built the mound and now confront tearing it down and building another another mound, either into a windrow or a bin.

Do you have enough time and labor to turn on schedule?

As compost mounds sit, the material inside will settle and compact and drive the air out, all the more so with significant rainfall. Again, well-con-

structed tumblers are easiest because the spinning introduces air, and good ones have adequate drainage. Not so easy with bins and windrows.

Ideally, you have a compost temperature gauge and can monitor whether your mounds reach the coveted 131°F for 72 hours, as part of what you learned in your training about the “process to further reduce pathogens” (and weed seeds), or “PFRP.” You would turn the materials multiple times, moving the inside materials to the outside and outside materials to the inside to ensure every bit gets exposed to the right temperature for the right amount of time, and otherwise to maintain high air levels and process the material as quickly as possible. Some sites can manage to turn every 3 or 4 days, and the results can be truly impressive — zero odors, quick to curing phase, and nice quality.

But most sites cannot sustain such a vigorous turning schedule. The variables include volume/type of material, type of system, ambient conditions (rain, temperature, sun/shade), type of pad — concrete or wood chips, and most especially the reliability of labor. Types of labor vary, including individuals, nonprofit staff, volunteer groups, nonprofit community service groups, corporate service groups, and members of a community garden. In developing a schedule, don’t forget to factor in holidays, sickness, vacations, bad weather, all of which suggest that it’s a good idea to pad the work teams with an extra body or two.

Success requires endurance. Part of your success will shine when your sources build into their own schedules the consistent practice of separating organics from their landfill garbage to give to you. Congratulations! But that means they are creating a consistent flow of organics and need your schedule for pickup/receipt to be just as consistent. It’s very exciting to talk about the recovery of organics all over the community, but it’s radically different to get it done. That’s another reason to start small, so you can keep the promises you make to your sources, and not cause them to get frustrated and pull out of organics recovery altogether.

Your goal is to find the turning schedule that reliably manages the scale of composting you’ve chosen, because it only takes one significant odor event to turn a few neighbors into a mob that makes phone calls and shuts you down. Start small, and initially turn more often than you might have to, scaling back slowly until you detect you’ve reached the anaerobic trigger point, although do not scale back so far as to neglect reduction of pathogens and weed seeds. Use that trigger point to develop your long-term turning schedule and avoid odor events. One rule of

thumb is that no *active* compost mound should go unturned for more than 14 days — it may be less given the particular variables at your site. Turning once every 7 days is a good target. Once a mound passes the active phase and enters the curing phase, less turning is necessary.

TIP: Get to know your surface as it appears after a rainfall, because you won’t want a pile sitting on an area where rainwater pools.

Do you have enough time and labor to manage leachate?

Leachate is the fluid that may escape from your compost mound if the mound is too wet, taking some valuable microbes and nutrients with it and often creating offensive odor. If this occurs, it typically does so in the early phase of composting, more often of course when the feedstock is high in moisture, as with food scraps. Ideally, your recipe and good practices minimize leachate, so you retain all of the nutrients and control odor. But renegade leachate can appear at times, and you have to be ready to control it.

If your compost systems rest on concrete or a similar hard surface, controlling leachate is simpler, because the fluid runs with the pitch of the surface and is easily spotted and captured. The best medium for capturing leachate is unsifted finished compost, placed in a small row or mound to soak up the leachate. That material is then treated as fresh feedstock for a new compost mound, because it may have pathogens from the leachate.

If your compost systems rest on a permeable surface, like wood chips or soil, leachate is a bigger problem. It is more challenging to monitor leachate when it can seep into the platform — you won’t see it. Over time it may build to the point of causing odor. In such instances, you may have to occasionally excavate the platform to dig out the odor — that is easier if you have been careful to maintain a minimum 12-inch bed of wood chips, because then you are just shoveling up wood chips. For urban sites with no concrete base, you would want to maintain a thick platform of wood chips anyway to keep any toxins in the soil out of your compost as you turn.

With tumblers on a permeable surface, you have the option of capturing any leachate with a receptacle, perhaps a cement mixing pan or the underliners used to catch excess water for large potted plants. But it is still best to line the receptacle with a bit of finished compost to soak up the leachate and reduce odor.

For bins on a permeable surface, it is advisable to dig out the soil beneath and prepare a pit filled with sand or gravel or some similar material. This is necessary anyway to adequately control rats, discussed in Section II. But the added advantage is that such a pit can serve as a ground drain, so small amounts of leachate will rinse clear with rainfall in most locations.

Section II: Controlling Rats

Many rodents can challenge you in a city, including raccoons, opossum, mice, and rats. Of those, rats are by far the most intelligent and difficult to manage. For most sites, controlling rats means you control other rodents. Thus these guidelines focus on rats.

Below are the questions to review in advance:

- *Will you be able to deny rats' access to your site?*
- *Will you be able to deny rats' access to food?*
- *Will you be able to deny rats' access to habitat?*
- *Will you be able to deny rats' access to security?*

Will you be able to deny rats' access to your site?

If rats cannot get to your site in the first place, they are controlled. For most sites, that is too much to ask. But even if access cannot be totally blocked, it helps to limit access with effective barriers like lumber or hardware cloth. That forces rats toward certain paths that expose them better to other forms of control. And the more exposed they are, the deeper their sense of insecurity and the greater their incentive to go elsewhere. The more exposed they are, the more vulnerable they are to predators like cats or hawks, and trapping.

Will you be able to deny rats' access to food?

This is the single most important rule for controlling rats: no exposed or accessible food, and that includes bits in a bucket or on the ground. One bitty bit of food can feed one rat for a day. This rule is not only absolutely necessary to control rats, but also to control pests like biting flies. This rule means that if inputs are stored, they are sealed with lids or made inaccessible (as with large barrels). It means if food is chopped on the ground, every bit has to be shoveled or swept or scooped up, and each storage unit has to be rinsed or cleansed clear. Every bit. It means when storage units are rinsed/cleansed, the bits are not left on the ground but managed (swept and/or shoveled up for storage, incorporation into a fresh mound, or landfill). Every bit.

Your choice of compost systems also has a dramatic impact on rats' search for food and habitat. The choices include tumblers, bins, and windrows.

Tumblers

Tumblers can be the most rodent proof of all compost systems because they are lifted above the ground and thus provide no access to food and no source of warmth for a habitat. In that regard, they contrast sharply with systems like the tall plastic boxes that sit directly on the ground. Without modification, these boxes allow rodents access from the bottom, or when rats chew through the plastic (one operation received so many offers from frustrated composters to donate these boxes that it maintains one, with a hole chewed through one side, as an example of what not to buy). The cost of modifications, along with the extra tools necessary for working the material in the boxes, brings expense in line with that for tumblers. For tumblers, two things must be kept in mind:

- Ignore exaggerated manufacturer claims about how little time it takes to make compost and focus instead on the real advantages;
- Visit a variety of tumblers at existing sites to get familiar with features, and avoid those that can get so heavy they cannot be emptied, *or* instead maintain a schedule that avoids those tumblers getting that heavy in the first place.

With those points in mind, tumblers are a good option.

Bins

A typical individual bin, usually a wood frame at least 3-feet by 3-feet by 3-feet, can handle more material than a typical individual tumbler. But rats chew through wood. So in the absence of other controls, you need to outfit bins with half or less hardware cloth covering every square inch, with tight seams. You will find a variety of designs on-line. Even the top lid must be covered with hardware cloth and a tight seal, because rats will scale the sides of 4-foot high bins to get to the top.

Good practices require that no food can be accessed through openings in the bins, such as through hardware cloth. Even at one-quarter inch, the openings in hardware cloth allow rats to pluck out food, even if they have to climb for it. Thus a good practice is to ensure that the mound in the bin is wrapped in browns inside the mesh, with no food exposed through any openings, even the small openings in hardware cloth. The technique to support that good practice is to create a lining of browns prior to adding each layer of the mound to the bin. So if you plan to add 6 inches of material, you first line the perimeter with a thick band of browns 6 inches high.

Windrows

Windrows are elongated mounds of materials open to the air. They must be sealed with several inches of wood chips or finished compost to help repel rats. Prior to the seal, all renegade food waste must be pushed into the windrow. Every bit. Often that means sweeping from a perimeter 15 feet beyond the windrow, as renegade food waste often rolls or otherwise travels on volunteers' tools. In addition, windrows should sit where there are several feet of space on all sides, exposing rats to predators and generally making them less comfortable. It takes a lot of work to seal a windrow, and a lot of space to have sufficient clearance on all sides, so the choice of windrows must be thoughtful. And windrowed material is not protected as it is in tumblers or hardware-clothed bins, so the site may have to also allow for near total denial of site access or perhaps have a population of feral cats nearby — those may be determinative favorable factors in choosing the windrow for your compost system.

Will you be able to deny rats' access to habitat?

Again, the tumblers excel — there can be no habitat in a vessel that is sealed and lifted off the ground.

For rat-proofed bins clothed in metal mesh, there still can be warmth next to the ground that encourages rats to burrow for a habitat. That has caused a few composting sites to fail, despite a well sealed set of bins, because rats still flourished in the habitat below. To address that issue, it is necessary on a soil base to dig down and use sand or gravel or similar material to destroy potential habitat. As mentioned above, you would do this anyway to promote adequate drainage. And it is advisable to place the bins so there is plenty of space all around to allow for monitoring of habitat formation.

TIP: It's worth repeating that by the time you spend the money to outfit the tall plastic boxes properly, with hardware cloth fastened to the base to prevent access and sand/gravel underneath to block habitat, and a corkscrew auger to turn the materials, you've come close to or surpassed what you would spend on a tumbler, which requires none of that extra outfitting. Tumblers do have a tainted reputation partly because manufacturers have often exaggerated claims regarding how little time it takes to finish compost. But ignore those dodgy claims, and focus instead on the real advantages.

Warm windrows also become attractive habitats for rodents, especially in cold winters, so there is an additional reason to turn the materials on schedule: disrupting habitat.

In addition to the features of your particular compost system, other elements of a composting operation affect habitat as well. For example, any long-term storage of inputs can present opportunities for habitats to develop, and bagged or fenced in leaves are of particular interest. Unlike wood chips, leaves mat together and can hold a burrow in place better.

The goal for stored materials is disruption, because the more things move the less attractive they are as habitat. The inventory principle of "first in / first out" is not only good for operational reasons, but also helps prevent formation of habitats because material sits in one place for less time. In addition, it may be necessary to occasionally move items in storage from one place to another even before they may be needed as inputs. And strategic placement of storage units can also allow for better monitoring/disruption. For example, consider putting tree leaves in chain link silos with enough space all around to allow you to spot trails of leaf bits that signal a burrow has formed. Root out the discovered burrow with a long stick, and the rats either have to start all over again or give up and move elsewhere.

Will you be able to deny rats' access to security?

Rats would rather avoid open space, and instead run along the safety of a wall or fence or some other structure that makes it harder for predators like cats or hawks or stone-throwing humans to get them. Even if there are no cats or hawks, rats still feel less comfortable in open space as a matter of instinct, and the more uncomfortable they are the more likely they will go elsewhere.

This is why bins and windrows should have plenty of space all around. In fact in community gardens, the best location for bins may be toward the very middle of the garden, creating maximum exposure and insecurity for rats.

Good practices have ensured rodent-free community composting sites. But when all else fails, the ultimate denial of security is a trap. Of course traps are effective only to the extent that food is otherwise utterly unavailable at the site — if rats don't need the bait, they won't go for it. One favorite bait: a kernel of dog food on a bit of peanut butter.

Conclusion

Your choice to create a community composting site is of great value to future generations, because

the tighter we close the loop on organics the more sustainable our lives will be. As with most choices of what's right, it presents more challenges than the other choice. At the threshold are odors and rats. These guidelines can equip you to meet those challenges and play a meaningful role in greening your community and protecting the environment.

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