STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT
DIVISION OF PLANNING AND STANDARDS
860-424-3365

Best Management Practices for Grass Clipping Management

Published May 21, 1999

Printed on recycled paper

Best Management Practices for Grass Clippings Management

Background Information

The Department has developed this guidance document to help municipalities and private compost site operators understand some of the choices available to them for grass clipping management. Information on grasscycling, home composting and agricultural practices are included as well as key research findings, siting and operational criteria for addition of grass clippings to large scale leaf composting facilities.

As a result of Connecticut legislation banning grass clippings from disposal as of October 1, 1998, the Department has received inquiries regarding the process of adding grass clippings to leaf composting facilities and the approvals necessary for such an operation. Compared with leaf composting, grass composting demands a more scientific approach with added emphasis on proper site selection, management and operational controls. Although the Department recognizes the benefits of grass composting, there are potential air and water quality problems which may result from improperly designed or poorly operated grass-composting facilities. In some cases, grass composting may be a viable method of organics recycling. However, the Department first recommends source reduction of grass by educating the public about the benefits of leaving grass clippings on the lawn after mowing and home composting. These are the best alternatives to grass clippings management and should be implemented before considering centralized composting.

Reducing Grass Clippings in the Waste Stream

Grasscycling

Source reduction of grass by leaving grass clippings on the lawn after mowing is the best alternative for grass clippings management and should be implemented before considering collection and centralized composting. This method eliminates the cost and labor associated with municipal collection and composting while at the same time improving the health of lawns by returning nutrients directly back to the soil. A report entitled *Organic Materials Management Strategies* prepared by Tellus Institute for the U.S. EPA clearly shows that grasscycling is a very cost effective strategy ($1.21 per ton diverted) when compared to centralized compost facilities ($91.10 per ton diverted). Municipalities should set an example for their residents by practicing Agrasscycling@ at public areas such as parks, schools, town office buildings and other municipal facilities.

The DEP Recycling Program has developed a public education program called ADon=t Trash Grass!@ designed to teach residents how and why they should Agrasscycle@. A copy of all the education materials was sent to the recycling coordinator of each Connecticut municipality in the spring of 1993 and again in 1996. These materials included a 12-minute video program, color brochure, community action handbook, and advertising slicks and logos. The video was also placed in public libraries and on the public service shelves of Blockbuster video stores statewide and has been aired on several local access cable TV stations. It may still be purchased from the CT DEP Recycling Program for $10.00.

Home Composting

Grass clippings can also be added to home compost piles, again eliminating expensive collection, labor and large-scale composting costs. A*Home Composting...Turning Your Spoils to Soil*@ is another how-to video produced by the CT DEP Recycling Program which has been distributed and aired statewide. It too may still be purchased for $10.00. A brochure by the same name is free. The DEP has also enlisted the help of 15 local nature centers which have agreed to establish and maintain a home composting demonstration area and conduct workshops on home composting, vermicomposting and grasscycling. In addition, the University of Connecticut Cooperative Extension System has written materials and may offer composting information through their master gardener program.

Grass Clippings in Agriculture

Agricultural Waste Management Plan

Forging relationships with farmers may be a viable alternative for municipal recycling of grass clippings, especially for those towns which are not eligible for centralized grass and leaf composting. By following guidance provided in the A*Best Management Practices for Agriculture*@, farmers may now manage grass clippings as an agricultural waste through direct cropland application, incorporation into an agricultural composting operation, or by incorporation into an agricultural waste storage facility. An agricultural waste management plan designed specifically for the farm will need to be approved by the DEP Water Management Bureau to implement these practices.

Composting Grass Clippings with Leaves

Key Research Findings

The observations listed below are the results of a study[1] conducted for the purpose of developing guidance for composting grass collected in large quantities by municipalities. The study was a three-year project which examined the effects of composting grass in terms of odors, impacts on soils, and groundwater. Currently, this study is the best available information and the Department has based these guidelines on the following findings:

- For safe and practical handling of grass, the most important single factor is the proper mix ratio. In general, a maximum of 1 part grass to 3 parts leaves by volume is the recommended mix. A good mixing technique is important to attain this ratio.

- The addition of grass to leaf windrows accelerates the breakdown time of leaves, and shortens overall composting time.

- Pesticides were found in low concentrations in raw materials, but none were detected in the finished compost sampled from the same material. Pesticides that are properly applied to lawns and gardens have been shown to degrade in the composting process.

- Excess nitrogen can result in the formation of nitrates. Nitrogen is contained in higher concentrations in grass than in leaves and is converted to nitrate, a soluble form, by the aerobic composting and curing process. Nitrate is a valuable plant nutrient which can also be a pollutant in sufficient quantities. Potential nitrate leaching can be prevented through proper site design and compost process management.

1. "The Environmental Impact of Composting Grass Clippings and Other Yard Wastes" Report to the Massachusetts DEP, Division of Solid Waste, March 26, 1992. Yarmouth, MA. Bruce R Fulford, William F. Brinton, Ralpf DeGregorio.

- Higher levels of nitrates are formed during the mesophilic (low temperature) and curing stages than during the thermophilic (high temperature) stage of active composting. Proper management of curing piles mitigates potential leaching of nutrients.

- If composting on sandy soils, especially where there is a relatively high water table, it is important **not** to compost at a higher ratio of grass to leaves than 1 to 3. Leaching of nitrate and nutrients could potentially affect the soil or water table. Soils rich in organic matter can, to some extent, buffer nutrients from leaching into groundwater. On sensitive sites, it is advisable **not** to compost grass on the same portion of the site continually because nitrate loading is cumulative and could impact the subsoil or groundwater over long periods of time. Shift windrow positions every two or three years.

- Odors can be kept at a minimum on both small and large sites with good management practices.

Addition of Grass Clippings to Large-Scale Leaf Composting Facilities

Approval Process

The DEP has developed a A*General Permit for the Addition of Grass Clippings at Registered Leaf Composting Facilities*@. In order to obtain this permit, an application form and supplemental documents must be submitted to DEP and approved by the Commissioner. Once approved, the applicant must adhere to all of the siting, operating, monitoring and reporting requirements set forth in the general permit or be subject to enforcement action. The applicant should be aware that the general permit has some basic requirements which may preclude some registered leaf composting facilities from accepting grass clippings. These include, but are not limited to:

1. *Grass clippings shall be accepted for composting only at a leaf composting facility registered under Section 22a-208i(a)-1 of the Regulations of Connecticut State Agencies (RCSA).*

   Meaning, that only registered leaf-composting facilities may accept grass clippings.

2. *Delivery, handling, and composting of grass clippings shall take place at least 1000 feet away from any occupied building, other than owner occupied building, on the property at which the facility is located.*

3. *Delivery, handling, and composting of grass clippings shall take place at least 250 feet away from any surface water.*

The applicant should become familiar with ***all*** of the conditions of the general permit before applying as they may otherwise restrict the acceptance of grass clippings and impact operating procedures at the leaf composting facility.

Practical Guidance

Handling Incoming Grass

Composting grass clippings with leaves demands a more scientific approach to composting with added emphasis on proper site selection, maintenance and operational controls. The amount of grass received and the method used to handle the grass will impact the labor and equipment time required. Plan in advance and require people delivering grass to comply with the rules. This will make your job much easier. **It is essential that grass be handled properly (sufficient blending and turning) and in a timely fashion to avoid odor and nitrate leaching problems.**

As with leaves, grass should be monitored for physical contaminants such as cans and bottles upon arrival. Drop-off areas should be monitored and improper materials removed, since contaminants left at the site may encourage others to do the same. Landscapers and residents should be informed of the procedure for delivering grass to the site. They should be instructed to deliver grass and leaves only with no brush or trash mixed in.

Bagged Delivery

- Collection in plastic bags is discouraged given the additional labor requirements involved in de-bagging. However, if grass is collected in plastic bags, it must be de-bagged immediately upon arrival. If grass is allowed to remain in bags for more than two days (either at the curb or at the compost site), the grass will become anaerobic and generate strong odors when the bags are opened. This creates an unpleasant job for the de-baggers and could cause an odor release to the immediate area.

- Because the addition of grass clippings constitutes a modification in the procedures or processes at a leaf composting facility, the owner or operator must re-register such facility with the Commissioner of DEP in accordance with Section 22a-208i(a)-1(c)(4) of the RCSA prior to accepting grass. Paper bags filled with grass should also be shredded or broken open upon arrival and before composting. If grass remains in the bag, anaerobic pockets will form, which will result in odors. Shredding, slashing, and manipulating with a front end loader or windrow turner are methods for releasing the grass from paper bags. If using a front end loader, the bags may need to be wet down to break the tensile strength of the bag, thereby making it easier to rip open. Once removed, the grass should be well blended with the leaves. Paper bags take longer to decompose than leaves. Therefore, they should be dispersed sparingly throughout the windrow.

- Sites located in and sites processing large quantities of grass should take extra care while de-bagging. Bagged grass that is more than several days old should not be de-bagged all at once but rather opened a few bags at a time. The more that are opened at one time, the stronger the odor will be. Requiring residents to de-bag their own grass when using a drop-off site may help alleviate some of this concern.

- A possible danger from grass collected in paper bags is spontaneous combustion. This condition requires a moisture level of less than 40% and temperatures in excess of 450EF. If the windrow has dry pockets, fire is a possibility. To avoid this, split bags and distribute grass, making sure the interior of the windrow is of high enough moisture content (45-50%).

Bulk Delivery

- Grass collected at a drop-off site or in bulk by landscapers or municipal employees should be mixed in with leaves as quickly after arrival as possible. Grass left in a large heap will begin to decompose anaerobically very quickly, creating a slimy mass. It will emit strong odors, especially when disturbed, and will be difficult to blend with leaves.

- To control labor costs and encourage source reduction, consider limiting the residents drop-off period to one or two days a week and charging a tip fee for landscapers during the week.

Mixing Ratio of Grass to Leaves

To avoid odors and potential leaching of nitrates from grass, keep mix ratios of grass to leaves low (i.e., use more leaves than grass). Mix grass to leaves in a ratio of 1 part grass to not less than 3 parts leaves (1:3) by volume. The higher the proportion of leaves to grass, the lower the potential for problems.

- If the site has the potential to impact adjacent land uses, groundwater, surface water or wetlands, the ratio of grass to leaves should preferably be less than 1:3 (i.e., one part grass to four, five or more parts leaves).

- Keep the windrow size small to reduce potential for odor and for ease of handling. A good manageable size is 6' high and 14' wide at the base. Typically, a windrow this size will have approximately 2 cubic yards of material per linear foot of windrow.

Mixing Procedures

- Blend grass with leaves as thoroughly as possible in the initial mixing. It is important to make sure that grass is not mixed in with the leaves in large clumps. If grass is not properly blended, there may be pockets of anaerobic grass breaking down which will cause odor and potential nitrate leaching problems.

  Factors to consider when adding grass to an existing windrow:

  - If the interior of the windrow is dry, thoroughly mix in the grass. The high moisture content of grass will provide needed moisture to the windrow;

  - If the windrow is at the correct moisture or is on the wet side, spread the new grass thinly on top of the windrow and let the sun dry it out. Then mix the dry grass in with the leaves.

  - If the windrows are located on sandy soil, it is advisable not to compost grass on the same portion of the site continually. Nitrate loading is cumulative and could impact the subsoil or groundwater over extended periods of time. Shift the location of windrows containing grass every two or three years.

  Methods of measuring out the proper mix ratio:

  - Build a new windrow as grass comes to the site. Take three bucket scoops of leaves and spread them on the ground in a new location next to the existing windrow. Take one bucket scoop of grass and mix well with the leaves, and re-pile into a new windrow.

  - Another method is to spread the grass in a 3-4" layer on the surface of an existing leaf windrow and let it dry in the sun. Then mix it in. Calculate the approximate volume of leaves, and keep records of the amount of grass added to the windrow. In this way, you may keep adding grass to the same windrow until you reach the 1:3 parts grass to leaves (by volume). Typically, a leaf windrow with a height of 6' and base width of 14' will have approximately 2 cubic yards per linear foot of windrow.

Odor Control

- If the compost site is close to houses, schools, and other public locations, or if the site has received complaints in the past, it may not be prudent to accept grass for composting there, given the potential odor conditions that can occur.

The following are the recommended odor management procedures.

- Do not let bags or piles of fresh grass accumulate at the site; de-bag and thoroughly mix grass with leaves as it arrives;

- If you are de-bagging anaerobic, decomposed grass, do a little at a time to reduce the concentration of strong odors.

- De-bag on rainy days or when the wind is blowing away from sensitive areas;

- A complete initial mixing and blending is critical;

- Frequent turning will facilitate mixing and rapid decomposition, and will help neutralize odor producing compounds;

- Other processing methods, such as forced aerated static pile or in-vessel systems, may be appropriate in some circumstances.

Monitoring

- When composting grass with leaves, greater care should be taken to monitor windrow temperatures and oxygen consumption. Grass is high in nitrogen and generates higher temperatures than leaves as it decomposes. This could raise the temperature high enough to kill the microbial population in the windrow. A longer composting time will be needed because it will take a period of time for the microbes to repopulate the windrow and continue their work. Oxygen may be depleted quickly due to the wet, heavy nature of grass, making it even more important to aerate the windrow frequently.

- If the composting windrow temperature reaches above 150EF, or if the oxygen level falls below 5%, the windrow should be turned and aerated. Turning will cool it down and supply oxygen. Specific field instruments (temperature probes and oxygen meters) have been developed to measure temperature and oxygen levels in composting windrows.

- Moisture should be monitored (such as by the hand squeeze test) and maintained at roughly 50%-60%. Dry windrows will severely limit decomposition, and excessive moisture will inhibit decomposition and generate odors. There are instruments for this measurement as well.

Compost Stabilization

- Stabilization follows the rapid initial stage of decomposition and is characterized by a slowing in the metabolic process, lower heat production, and the formation of humus. Compost stability is indicated when the material looks like soil rather than leaves and grass, and when it is turned and does not reheat (even with adequate moisture). Another test is to take a sample of compost, wet it, put it in a sealed plastic bag, and place it in the sun for one or two days. If a strong odor is given off when the bag is opened and the compost is hot (reheated), it is an indication that the material is not yet stable. Field instruments, such as the Dewar Flask, are also available to measure stability based on reheating.

Curing

- Curing the material after composting facilitates the completion of the decomposition of leaves and grass into a stable nutrient-rich soil amendment. During curing, nitrogen in the immature compost is converted into nitrate, the form that is most readily available to plants as a nutrient.

- Curing piles should not be placed in an area with a high groundwater table and sandy soils. If this type of area is unavoidable, consider curing on a paved surface or on top of plastic or some other impervious material with proper run-off controls.

- In any area, a good precaution is to cover the curing pile so that heavy precipitation will not cause leaching. Covering will also prevent weed seeds from being blown into the pile. New felt-like materials specifically designed for composting operations have recently been introduced to the market. These materials let the pile Abreath@, but prevent excessive moisture from entering the pile.

- If you are analyzing your compost product, be sure to test for Nitrogen (N), Phosphorus (P), & Potassium (K). The finished product will generally have a higher nutrient value than compost made from only leaves.

Testing

- Nutrient testing of compost is available through the Connecticut Agricultural Experiment Station Soil Testing Laboratory located at 123 Huntington Street, P.O. Box 1106, New Haven, CT 06504, Phone: 203-974-8521. A typical soil analysis usually includes soil texture, organic matter content, pH, nitrate nitrogen, ammonium nitrogen (high levels indicate lack of compost maturity), phosphorus, potassium, calcium and magnesium. You should add soluble salts to this list, as levels over 4 or 5 mmhos/cm can harm plants. The analysis is free to municipalities; all others should call for pricing.

- Compost maturity test kits are available under the name ASolvita@ and can be ordered through the developer and manufacturer, Woods End Research Laboratory, Inc., P.O. Box 297, Mt Vernon, ME 04352; Phone: 1-800-451-0337; Fax: 207-293-2488; web site: www.woodsend.org
  e-mail: solvita@woodsend.org The test was designed for field use by site managers and gives results in about four hours. Test kits are $88/six tests and refills are available for $72/six refills plus shipping and handling. Contact Wood=s End for current pricing and Solvita literature.

Technical Assistance

For technical assistance, please contact the CT DEP Recycling Program at 79 Elm Street, Hartford, CT 06106-5127. Phone 860-424-3365.