

Cooperative Extension Service  
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## Environmental Implications of Composting

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### Horticulture Facts

Composting facilities are proliferating across the state of Illinois, due in part to the Amended Environmental Protection Act. Prior to July 1, 1990, 17.9 percent of all solid waste deposited in Illinois landfills was yard waste. Composting organic wastes in outdoor windrows or backyard bins is certainly less expensive than using state-of-the-art landfills or waste-to-energy facilities. Most advocates of composting assume that composting is environmentally benign, often without hard evidence to back up that assumption.

Government regulations require a wide range of constraints, including potable waterwell and residence setback distances, dust control measures, surface water

runoff requirements, and minimum static water table depths. Water quality protection is one of the primary aims of current regulatory restrictions on compost facility siting. The Illinois Environmental Protection Agency currently requires a composting facility to be located at least 200 feet from the nearest potable water or residence, out of the ten-year floodplain, and not within five feet of the static water table. It has also been suggested by the

University of Illinois Cooperative Extension Service that surface water runoff be controlled by retention dams or vegetative filter strips.

The following environmental impacts are based on research studies where low to medium composting technology was used for yard wastes. In these studies the yard waste was composted in windrows approximately 12 feet wide and a minimum of 6 feet high. The windrows were turned with a front-end loader or a rotary compost turner either biweekly or monthly as time allowed. Temperatures in the compost piles ranged from 100° F to 140° F. The volume of the yard waste was reduced approximately 70 percent after composting.

Odor, nitrate, nitrite, total nitrogen, heavy metals, deicing salts, phenols, Biological Oxygen Demand, and pH are factors that might be considered environmental hazards related to composting yard wastes.

### Odor

Odor is of primary concern at composting sites that are improperly managed. Odor problems result when compost piles deplete the available oxygen supply and anaerobic conditions develop. This problem can be reduced by turning the pile on a regular schedule. Odor is usually not a problem at sites which exclusively compost leaves. Windrows of leaves will require turning every 30-45 days. During times when a composting facility collects a large volume of grass clippings, the compost windrows will require frequent turnings, two to three times a week, to reduce odor. Another way to reduce odors is to mix high moisture containing landscape wastes, such as grass clippings, with leaves or woodchips in a ratio of two parts uncomposted leaves or woodchips to one part grass clippings. Composting sites that intend to receive large quantities of grass clippings should consider locating on a site where the prevailing winds will not blow toward residential areas.

## **Nitrogen Containing Compounds**

Nitrate, nitrite, and total nitrogen levels at composting facilities remain below environmental standards and in some cases below background levels found on the site prior to composting. This is understandable since landscape waste composting is a nitrogen limited process. Leaf composting, in which decomposition rates are nitrogen limited, does not generate high levels of nitrates or other nitrogen compounds. Compost facilities that use supplemental nitrogen or manage high nitrogen materials such as grass clippings need to insure that excess nitrogen will not escape from the site. Maintaining a carbon to nitrogen ratio above 30:1 in the initial compost substrate is the best way to prevent nitrogen runoff. This can be done by mixing leaves and grass clippings in a ratio of 2:1.

## **Heavy Metals and Deicing Salts**

Soil levels of heavy metals, such as cadmium, lead, copper, nickel, cobalt, and zinc, are not elevated by yard waste composting. Concerns about deicing salts contaminating leaves collected in the winter appear to be unfounded. A study conducted on leaves collected during the winter months and then composted showed the sodium levels of finished compost and the composting site as not being elevated above background levels.

## **Phenols**

Phenols, the natural products of decomposing lignin, may be present at levels above groundwater discharge standards after composting. This condition is common in swamps and marshes where large amounts of organic matter decompose in water. These natural phenols can compromise the taste and odor of drinking water, but are non-toxic. It is important to distinguish them from industrial phenols, some of which are extremely toxic.

## **Biological Oxygen Demand**

Biological Oxygen Demand (BOD) is another parameter often found to be above normally acceptable levels on composting sites. High concentrations of BOD in surface runoff can deplete dissolved oxygen in lakes or streams, and thus have a negative impact on aquatic life.

Both phenols and BOD can be substantially reduced by soil degradation processes so that the levels found on composting sites will not be of sufficient quantities to contaminate groundwater supplies. However, they can threaten nearby lakes or streams if released from composting sites in significant quantities.

Alternatives to surface water discharge include simple technologies such as soil treatment, recirculation, or filter strips. Soil treatment of surface water from composting sites forces the percolation of water through the soil

profile where the organic compounds are adsorbed and degraded. Recirculation involves pumping runoff water back into the compost windrows where the organic components can further degrade and the water can evaporate in the composting process. Vegetative filter strips slow the motion of runoff water so that some particles can settle out of the water, while others are physically filtered and adsorbed onto plants.

## **Pesticide Residues**

Finished composts from yard waste composting sites have been tested for pesticide residues. Finished yard waste compost has been screened for over 200 pesticides, and their concentrations have been below the food tolerance levels set by the U. S. Food and Drug Administration.

Questions have been raised about the presence of chlordane in yard waste compost due to its persistence in the soil. Chlordane was banned from use in the United States in 1988. Prior to 1983 it was used for lawns and gardens, and from 1983 until 1988 it was used almost exclusively for termite control around the foundation of buildings. Chlordane can still be measured in many suburban soils; however, it should be noted research shows that chlordane contamination is not a problem in composted yard waste.

## **pH**

pH is a measure of a soil's acidity or alkalinity. The desired pH for plant growth ranges from 6.0 to 6.6. The pH of finished landscape waste compost ranges from 7.2 to 8.2. This type of compost, when used as a soil amendment, will raise the pH of garden soil slightly. If you already have an alkaline soil, an addition of sulfur to your garden will acidify soil and make it more productive. The addition of sulfur to alkaline soils is a standard agricultural practice and should be based on soil test results.

## **Conclusions**

Municipal composting facilities can be operated in an environmentally benign manner. For leaf compost the primary concerns are BOD and phenol concentrations found in runoff water and percolating water. These concentrations can be reduced through proper facility design and management. For grass clippings the concerns are odors and nitrogen-containing compounds which are best controlled by managing the initial ratio of carbon to nitrogen in the compost substrates and frequent turning of compost piles respectively. Evidence from environmental monitoring programs indicate that communities can be strongly encouraged to compost and recycle organic wastes.

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