

# A GUIDE TO Composting flood-related animal mortalities



Hurricane Floyd inflicted tremendous damage to North Carolina's agricultural sector. As of September 24, 1999, there were confirmed mortalities of 30,500 hogs, 2.5 million poultry, and 760 cattle (N.C. Department of Emergency Management, SITREP18). Traditional means of disposing of large numbers of disaster-caused mortalities have been incineration or burial.

Composting is a viable method for handling poultry mortalities with less potential environmental impact than incineration or burial. Expenses incurred in composting poultry mortalities may be reimbursable from the Emergency Watershed Protection program of the U.S. Department of Agriculture's Natural Resources Conservation Service (see your local Cooperative Extension Agent for information). Swine and cattle mortality composting is not an approved disposal method in North Carolina.

Composting is defined as the controlled decomposition of organic materials. Decomposition occurs when organic materials go through a "slow cooking" process as microorganisms consume the organics. Rapid decomposition is an aerobic process, requiring oxygen. The process will produce carbon dioxide, water vapor, heat, and compost. The composted material is odorless, fine-textured, and low-moisture. It can be an excellent source of organic matter, nitrogen, and other nutrients. Typical fertilizer values for finished compost are 25 lbs./ton nitrogen, 13 lbs./ton phosphorus (as  $P_2O_5$ ) and 7 lbs./ton potassium (as  $K_2O$ ). It can easily be applied to fields in the spring with a standard manure spreader.

## **Composter Location**

Locate a mortality composting facility in a well-drained area, such as a flat crest of high ground. Keep the facility away from flooded areas, wells, and residences. The site should have all-weather access.



Sites should not be: located in floodplains, within 100 feet of property lines, within 500 feet of residences, or within 100 feet of streams or wells. To the extent possible, sites should be located in areas of deep, well-drained soils, where the seasonal high groundwater table is at least 2' deep. Make sure that rainwater from higher ground is diverted away from the composting site, and make sure that any leachate coming from the composting site can be captured and recycled to the composting mix. If possible, fence off the composting area to discourage scavengers.

### Composting Ingredients

The composting process requires a balance between carbon, nitrogen, water, and oxygen. Carbon is obtained from bulking agents. Nitrogen is obtained from the mortalities and litter. The preferred Carbon-to-Nitrogen Ratio is between 20:1 and 35:1. This ratio requires approximately 100 cubic feet (3.7 cubic yards) of bulking agent for every 1,000 pounds of mortalities.

The ideal bulking agent is sawdust, because of its high carbon content, particle size and ability to absorb moisture. Odors from composting are greatly reduced when using adequate amounts of sawdust. For sources of sawdust, please consult the Directory of Markets for Recyclable Materials (Web page address: <http://www.p2pays.org/DMRM/dmrm.asp>). Other bulking

agents can be straw, hay, silage, bedding, and litter. These other bulking agents may be too wet, or may require grinding to be used effectively.

Water may need to be added to the compost mix to ensure a 40 - 60% moisture content (about the feeling of a damp sponge). Water may be added at the rate of 1- 1.5 gallons for every 100 cubic feet of sawdust.

Good pH control is also important to the composting process. The preferred pH range is 6.5 - 7.2. Lime or granular ferrous sulfate can be used to adjust pH if needed.

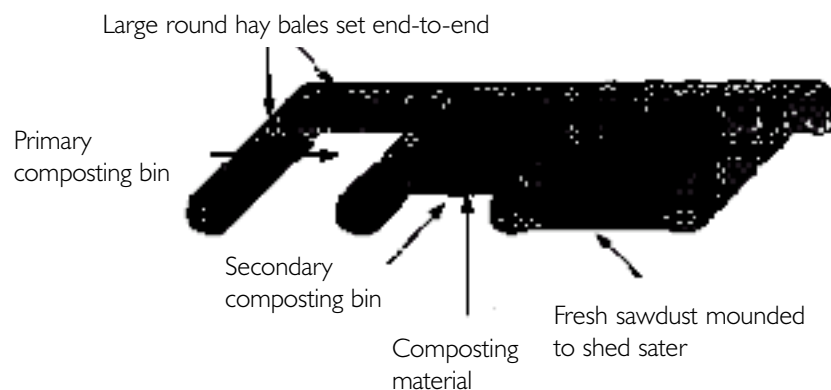
### Composter Requirements

The composting process consists of two stages: a primary, high-temperature active composting stage in which pathogens and disease organisms are killed; and a secondary, lower-temperature curing or stabilization stage. How long a composting mix stays in each stage depends on how the compost is made.

Compost can be made in bins (or in portions of hen houses) or it can be made in windrows. Bins can be constructed of wood or of round hay bales laid end to end. Figure 1 shows a hay bale bin system.

Bins should be sized to provide 2 cubic feet of

### LARGE ROUND BALE COMPOSTER



composting space per pound of mortality for poultry. Each bin should be between 100 – 200 square feet in area, and filled to a depth of 5’ – 6’. For example, a farm with capacity of 40,000 four-pound birds needs 420 cubic feet of available space for each phase of composting (four bins 5’ x 5’ x 8’).

For poultry, start with a 1’ layer of sawdust, then alternate layers of mortalities and sawdust until the bin is nearly full, then cover the entire bin with a 1’ – 1.5’ layer of sawdust. The material should be left in place for three months, then turned by moving it to another bin for a second three-month period. At the end of that time, the compost can be stored (out of the weather).

Windrows are long triangular-shaped rows of composting material. Windrows should be about 10’ – 12’ wide, 5’ – 6’ tall, and as long as needed. A windrow 12’ wide by 6’ high will hold approximately 300 pounds of mortality per foot of length. Thus, 10,000 birds at 3 pounds each would require a windrow 30’ long and 3,000 cubic feet (110 cubic yards) of bulking agent (sawdust, straw, litter, etc.). Start by making a bed layer of bulking agent one foot thick, and alternate 8” layers of mortalities with 6” layers of bulking agent. Figure 2 shows a cross-section through a poultry mortality windrow.

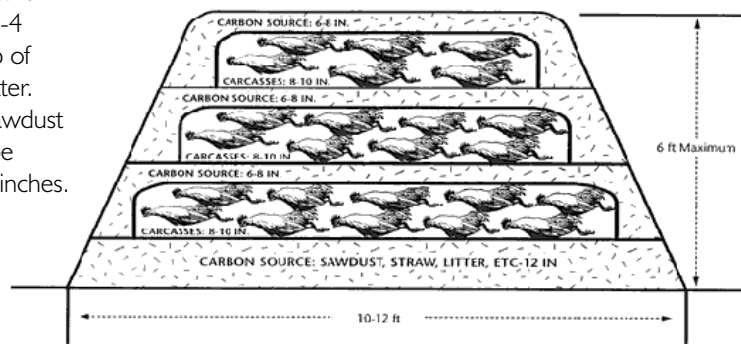
The primary phase of composting will take 2 – 3 months, and the secondary phase another 2 – 3 months. The composting mix should be turned (with a front-end loader) five times during the first month (while temperatures are above 130°F), and biweekly after that until the end of the primary phase. During the stabilization phase, the windrow should be turned monthly. Recover the windrow with clean bulking agent as needed to cover mortalities exposed by the turning operation and to discourage scavengers.

### Compost Monitoring

The important information to monitor in composting is temperature. Monitor temperature with a long-stemmed stainless steel thermometer (one source is Reotemp Instrument Corporation, (619) 481-7737, <http://www.reotemp.com/reotemp>). Check temperatures at several points in the composting mix. Temperatures should increase and reach 135°F to 145°F in a week, hold at that level for about a month, then decline slowly. Monitor temperatures daily for the first four weeks, and twice weekly thereafter until the primary composting phase is complete.

Water content should be checked periodically. If sawdust is used as a bulking agent, it will need rewetting if it dries. This is needed to keep the composting process active and to minimize spontaneous combustion risks

Note: If straw is used, place 3-4 inches on top of sawdust or litter. Amount of sawdust or litter can be reduced 4-6 inches.



**CARCASS COMPOSTING WINDROW X- SECTION**

in dry sawdust. When a bin or a windrow is turned, additional water may be needed to keep composting mix's moisture content at the "damp sponge" level.

## For More Information

For more information and technical assistance with animal mortality composting, please contact:

- Local County Cooperative Extension Agents
- Craig Coker, Composting Technical Specialist, N.C. Division of Pollution Prevention and Environmental Assistance, at (919) 715-6524 or [craig\\_coker@p2pays.org](mailto:craig_coker@p2pays.org)
- Ted Lyon, Supervisor, Composting and Land Application Branch, N.C. Division of Waste Management at (919) 733-0692, ext. 253, or [Ted.Lyon@ncmail.net](mailto:Ted.Lyon@ncmail.net)
- Dr. Jim Barker or Ron Sheffield at N.C. State University Dept. of Biological and Agricultural

Engineering at (919) 515-6793 or (919) 515-6784

- Mike Hinton, Emergency Watershed Protection Program Manager, USDA/NRCS, at (919) 873-2134
- Dr. Jo Anna Quinn, Director, Diagnostic Labs, NCDA and CS at (919) 733-3986
- Dr. Andy Mixson, State Veterinarian, NCDA and CS at (919) 733-3986

## Acknowledgements

The information presented in this document was compiled from previous publications from: University of Missouri Cooperative Extension, Alberta Agriculture, Food and Rural Development, University of Maryland Cooperative Extension, Ontario Ministry of Agriculture, Food and Rural Affairs, University of Nebraska Cooperative Extension, North Carolina State Cooperative Extension, and the University of Georgia Cooperative Extension.

This is a publication by the North Carolina Department of Environment and Natural Resources' Division of Pollution Prevention and Environmental Assistance. Information contained in this publication is believed to be accurate and reliable. However, the application of this information is at the readers' risk. Mention of products, services, or vendors in this publication does not constitute an endorsement by the State of North Carolina. Information contained in this publication may be cited freely.

DPPEA-99-16. 100 copies of this public document were printed on recycled paper at a cost of \$16 or \$0.16 per copy.

Changes:

Craig Coker was replaced by Brian Rosa

Composting and Land Application Banch changed its telephone number to 919-508-8505

State veterinarian phone number is 919-733-7601