

**USDA  
NATURAL RESOURCES  
CONSERVATION SERVICE**

**MARYLAND CONSERVATION  
PRACTICE STANDARD**

**ANIMAL MORTALITY  
FACILITY**

**CODE 316  
(Reported by No.)**

**DEFINITION**

An on-farm facility for the treatment or disposal of livestock and poultry carcasses.

**PURPOSE**

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

1. Decrease non-point source pollution of surface and groundwater resources;
2. Reduce the impact of odors that result from improperly handled animal mortality;
3. Decrease the likelihood of the spread of disease or other pathogens that result from the interaction of animal mortality and predators;
4. To provide contingencies for normal and catastrophic mortality events.

**CONDITIONS WHERE PRACTICE  
APPLIES**

This practice applies where animal carcass treatment or disposal must be considered as a component of a waste management system for livestock or poultry operations. It applies where on-farm carcass treatment and disposal are permitted by federal, State, and local laws, rules,

and regulations. It also applies where a waste management system plan as described in the National Engineering Handbook (NEH), Part 651, Agricultural Waste Management Field Handbook (AWMFH) has been developed that accounts for the end use of the product from the mortality facility. This practice includes disposal of both normal and catastrophic animal mortality; however, it does not apply to catastrophic mortality resulting from disease.

**CONSIDERATIONS**

Major considerations in planning animal mortality management are:

1. Available equipment at the operation,
2. The management capabilities of the operator,
3. The degree of pollution control required by state and local agencies,
4. The economics of the available alternatives, and
5. Effect on neighbors.

Consideration should be given to prevailing wind direction and neighbors when siting animal mortality disposal facilities. A minimum of 900 feet should separate the facility from the nearest neighboring residence, and the facility should be 100 feet from a well, spring, or water course.

Runoff from the livestock or poultry facility, or from outside areas should be diverted away from the animal mortality disposal facility.

Composting of poultry mortality will be hindered if the bird carcasses are allowed to freeze. Birds should be kept in a dry, non-freezing environment until added to the compost mix.

Facility sizes for composting large animal carcasses should reflect the longer compost periods required.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the [Natural Resources Conservation Service - Maryland](#) or visit the [electronic Field Office Technical Guide \(eFOTG\)](#).

The following table lists factors that could be used in determining minimum daily weight of animal mortality when sizing incinerators:

Type Animal	Daily Loss Factor (lb/day/animal)
<b>Chicken:</b>	
Broilers (4.2 lbs)	0.0050
Laying hens (4.5 lbs)	0.0014
Roasters (6.5 lbs)	0.0080
Breeding hens (7.5 lbs)	0.0019
Breeder, male (11 lbs)	0.0082
<b>Turkeys:</b>	
Hen	0.0081
Tom, light	0.0193
Tom, feather production	0.0286
<b>Swine:</b>	
Suckling pigs (per sow)	0.0400

Poultry operations often experience higher rates of mortality as the birds reach maturity. The capacity of incinerators should be sized to insure the mortality of the large birds can be handled within the time frame allowed for incineration.

An alternative to prevent bloating of catastrophic mortality die off could include opening animal thoracic and abdominal cavities and viscera prior to placing required cover.

Incineration produces varying quantities of ash that will need to be properly handled.

Vegetative screens and topography can be used to shield the animal disposal facility from public view, and to minimize visual impact.

Items such as burial site location, type and quantity of mortality, burial date, and other pertinent details should be noted at the time of burial.

Operators should maintain a list of current phone numbers for state and local officials to aid in notification if disease-related catastrophic mortality occurs.

Safety devices such as fencing, warning signs, and freezer locks may be necessary at certain sites.

Bio-security concerns should be addressed in all aspects of planning, installation, and operation and maintenance of an Animal Mortality Facility.

Ground disturbing activities such as excavation and site preparation for disposal facilities have the potential to affect significant cultural resources.

### CRITERIA

#### General Criteria Applicable to All Purposes

The facility shall be designed to handle normal mortality and/or catastrophic mortality.

The planning and design of animal mortality facilities or processes must conform to all federal, State and local laws, rules and regulations. This includes provisions for closing and/or removing the facility where required.

All structural components integral to animal mortality management shall meet the structural loads and design criteria as described in NRCS conservation practice standard 313, Waste Storage Facility, unless otherwise designated.

Where an animal mortality facility can be damaged by surface runoff, the runoff shall be diverted away from the facility.

**Location** - The location shall minimize the impact of the facility on odor and other air quality issues affecting neighboring residences, as well as minimizing the impact of the facility on surface and ground water resources.

In addition, the facility, where practical, shall be generally down gradient from a spring or well. Locate facilities at least 100 feet from wells. When practical, locate facilities at least 100 feet from springs, wetlands, drainage ditches, streams, and ponds.

Locate the composting facility outside the 100-year, 24-hour floodplain when possible. If the only practical alternative is to locate the facility within the 100-year floodplain, design the facility to protect from inundation and damage from the 25-year, 24-hour flood event. Divert runoff

from outside drainage areas and maintain positive drainage away from the facility.

Construction activity within the 100-year floodplain requires permits or authorizations from the Maryland Department of the Environment and/or the U.S. Army Corps of Engineers. Obtain all applicable permits and authorizations prior to start of construction.

The area surrounding the mortality facility will be subject to a high traffic load during loading, mixing, and unloading. Design these areas to meet the requirements of the Maryland conservation practice standard for Heavy Use Area Protection, Code 561.

Contaminated runoff from any mortality facility without a roof must be controlled. This may be accomplished with distribution over a Wastewater Treatment Strip (Maryland conservation practice standard, Code 635) or transfer to a storage facility or other approved treatment method.

Leachate should not occur from any composting facility. If leachate does occur, this means the mix is too wet. Make adjustments to the composting mix by adding dry matter to eliminate leachate. Address this issue in the operation and maintenance plan.

Locate the facility a minimum 2 feet above the high water table. Soils that have a rapid permeability (>6.0 inches/hour) in the upper 40 inches of the soil profile require a concrete pad, clay, or synthetic liner. The compost area and access must be kept free of standing water and rutting.

Where seepage from mortality facilities will create a potential water quality problem and it is deemed necessary to reduce seepage, use AWMFH, Appendix 10D, for clay liner design criteria, or other acceptable liner technology.

**Federal, State, and Local Laws** - Adhere to all federal, state, and local laws, rules and regulations for composting and utilization of the compost. It is the responsibility of the producer to secure any permits necessary to install structures and for properly managing the facility on a daily basis.

**Safety** - Incorporate safety and personal protection features and practices into the facility design and operation as appropriate, to minimize the occurrence of hazards during the composting process. These features may include warning signs, fences, ladders, ropes, bars, rails, and other safety devices to protect humans and livestock.

**Control of Scavenging Animals** - The cover requirements of composting are important to discourage animals from scavenging in the compost piles, and to prevent the spread of disease. For dead animal composters, two feet of bulking agent cover over dead carcasses is required for static pile and windrow composting. Bin composting requires one foot of cover over the carcasses.

If scavenging animals become a problem, use additional measures such as fencing or bin composting to control scavenger access. This is to be addressed in the Operation and Maintenance Plan.

**Biosecurity** - It is very important for anyone working on or about poultry or animal farms to follow biosecurity techniques to prevent the spread of diseases. Follow biosecurity measures when working in or around poultry or animal buildings and where animal, manure, debris, and poultry litter exists. If possible, avoid entry into poultry houses or animal facilities. However, if entry is necessary, obtain the farm operator's permission.

**Criteria Applicable to All Purposes – Normal Mortality**

The facility shall be located as close to the source of mortality as practical, considering biosecurity issues and the need to keep the facility out of sight of the general public.

**Composters**

**Type** - Select the type of facility and composting method based on the availability of raw materials, the desired quality of the final compost, available equipment, manpower, management time, and available land.

The following additional requirements apply to all dead bird composters:

1. A roof to provide year round operation and to control rain water and percolation. Design the roof for applicable wind and dead loads for agricultural buildings;
2. A concrete floor designed for the anticipated loads;
3. Pressure treated lumber for all posts and planks and treated metals to prevent rust for the roof, nails, and other metal appurtenances.
4. Dimension all structures to accommodate the equipment used for loading and unloading. Determine the minimum bin width by adding 1 foot to the maximum width of the equipment used. However, 2 feet is generally recommended.

**Size and Design** - Size all composting facilities in accordance with the Agricultural Waste Management Field Handbook, Part 651 Chapter 10, appropriate NRCS Design Worksheet(s), Extension Fact Sheet(s), or other methods as approved.

For dead animal and bird composting, establish the size of the composting units on the basis of known or published normal mortality rates. Dead animal or bird facilities require a minimum of 2 primary stages and 1 secondary stage, except for mini-composters used for small animals or during periods of less than normal mortality rates. The volume of the second stage is site specific but generally greater than or equal to the first stage.

To decrease the chances of fire, bin walls may be no higher than 5 feet, and static piles or windrows may be no higher than 7 feet at the peak.

**Materials** - Conform to the requirements of Maryland conservation practice standard for Waste Storage Structure, Code 313, for materials and structural design of composting facilities. On a case by case basis, the designer may determine material requirements not covered in that conservation practice standard.

**Compost Mix** - Develop a compost mix that encourages aerobic microbial decomposition and minimizes nuisance odors.

**Carbon-Nitrogen Ratio** – Microorganisms use Carbon for energy and growth, and Nitrogen for protein and reproduction. In general, biological organisms need 25 times more Carbon than Nitrogen. The ratio of Carbon to Nitrogen is referred to as the C:N ratio. For short composting periods (7 to 28 days), the initial compost mix should result in a (C:N) ratio between 25:1 and 40:1. The “mix” for this system must be managed closely for the C:N ratio, moisture, and temperature.

Dead animal composting is usually an inconsistent mix with a large mass of material (the animal) having a low C:N ratio, a high moisture content, and nearly zero porosity surrounded by a material (the carbon source) with a high C:N ratio, low moisture levels, and good porosity. This is a bio-filter system, or possibly better described as an above ground burial in a biomass filter with pathogen kill by high temperature. Bio-filter systems require less management time and skills than typical composting systems using C:N ratios of 25:1 to 40:1.

**Carbon Source** - Choose a carbon source compatible with the organic by-product being composted. A good carbon source will mix well with the organic matter, provide air space for aerobic decomposition, and enhance aeration. Therefore, a good carbon source also acts as a good bulking agent.

Most carbon sources will work well in a mix to compost manure. Dead animals or birds require a friable material such as chicken litter or sawdust because contact with the animal or bird and absorption of decomposing matter encourages microbial decomposition and avoids nuisance odors.

**Bulking Agents** - Bulking agents are ingredients used to improve the structure and porosity of a mix. Bulking agents are typically dry and vary in particle size (e.g., straw and sawdust), but could be old finished compost.

Add bulking agents to the mix as necessary to enhance aeration. The bulking material may be the carbon source used in the mix or a non-

biodegradable material. If a non-biodegradable bulking material is used, provisions must be made for its salvage at the end of the composting period.

**Moisture Content** - The moisture range during the composting period should range from 40 to 60 percent. Moisture contents above 70 percent invite fly production, anaerobic decomposition, and objectionable odors. For dead animal or bird composting, the carbon source should be as dry as practical. Water should be added during the mixing process of most composting materials. When water is needed add water directly to birds, dead animals, or other organic matter to be composted.

Maintain moisture levels such that materials are thoroughly wetted without being waterlogged or dripping excessive water. In general, material is too wet if water can be squeezed out and too dry if the mix doesn't feel moist to the touch.

**Temperature Control** - Design the facility and compost mix to reach and maintain the internal temperature for the duration of the composting process to meet the management goals.

For reduction of pathogens, the compost temperature must be maintained for a minimum of 5 cumulative days at or above 130°F during the composting process. Monitoring internal temperatures is a good indicator of pathogen kill. A temperature log of the temperature profiles should be maintained.

**Turning/Aeration** - Mix or agitate the compost material to improve aeration to attain the desired amount of moisture removal and temperature control. Turning and aeration are functions of the composting process chosen and should follow the requirements of that system.

**Pile Configuration** - Windrows and static piles should be triangular to parabolic in cross-section and rounded on top to shed rainfall. Align windrows and static piles to avoid accumulation of precipitation. Maintain positive drainage parallel to the windrows.

**Use of Finished Compost** - Follow the requirements of the Maryland conservation practice standards for Nutrient Management, Code 590,

and Waste Utilization, Code 633, for land application.

### **Freezers**

**General** - Freezer units shall be of the chest type with a construction compatible with the mechanism to be used to empty the freezer. Provisions for protecting the freezer unit from precipitation and direct sun shall be made as deemed appropriate.

The freezer unit design, construction, power source, and unit installation shall be in accordance with manufacturer's recommendations. Freezers shall be constructed of durable material with a life expectancy compatible with other aspects of the waste management system. The freezer container shall be leak proof to minimize odor and leachate pollution.

Where needed, the freezer will be placed on a pad of suitable strength to withstand loads imposed with vehicular traffic consistent with equipment used to load or remove the box or tray.

**Temperature** - The freezers shall be self-contained units designed to freeze animal carcasses before decomposition occurs. For best results, the temperature of the carcasses shall be maintained between 22<sup>o</sup> and 26<sup>o</sup> F.

**Capacity** - Freezer units shall be sized to accommodate the normal maximum volume of mortality to be expected in the interval between emptying. Volume calculations shall include the expected mortality rate of the animal, the period of time between emptying where mortality is given on a per day basis, the average weight of the animal between emptying, and a conversion factor for weight to volume. For broiler operations use a weight to volume conversion of a minimum of 45 pounds per cubic foot. Capacity calculations shall be supported by a removal schedule supplied by an integrator or approved vendor.

**Power Source** - An alternative source of power, where available, shall be used to maintain the integrity of the freezing process during power

outages. Where an alternative power source will not be available, the operation and maintenance plan shall contain contingencies for disposal of the poultry mortality.

### **Disposal Pit**

**General** - Disposal pits shall not be located on sites with:

1. highly permeable soils or over fractured or cavernous bedrock within two feet of the bottom of the pit unless an approved liner is used, or
2. soils with a seasonal high water table less than two feet from the bottom of the pit.

**Size and Capacity** - Pits shall be sized to accommodate the normal mortality in accordance with criteria acceptable to state and local regulatory agencies. The disposal pit shall be a minimum of 4 feet wide and 4 feet long. No minimum depth is required, but the selected depth shall accommodate 2 feet of cover over the mortality. Multiple pits shall be separated by a minimum of three feet of undisturbed or compacted soil.

**Structural Loading and Design** - Vehicular traffic shall not be allowed within four feet of the pit structure. Fences or other barriers shall be used to exclude vehicles where necessary.

The disposal pit shall be cased with masonry blocks, treated timber, or a pre-cast concrete septic tank conforming to American Society of Testing Materials (ASTM) C1227-00b Standard Specification for Pre-cast Septic Tanks. In all cases, the bottom of the pit shall remain exposed to the soil. If the pre-cast septic tank is used, it shall be fabricated with three 6-inch openings in each end, and five six inch openings in each side. When masonry block are used, every fourth block in each course shall be laid sideways (openings toward the outside) except the top and bottom courses. The bottom course shall be on a reinforced concrete footing of at least one foot wide and six inches thick. When treated timbers are used for walls, a one-inch spacing shall be left between timbers.

For pits that are four to five feet deep, a step or bench 18 inches wide and one-foot deep shall be dug around the perimeter of the main pit so the remaining vertical wall shall not exceed four feet. For pits greater than five feet deep, the earthen wall shall be sloped back at 1 1/2 horizontal and 1 vertical or flatter.

The top of a disposal pit shall be covered with a slab constructed of reinforced concrete or treated timber having an appropriately sized hole for a drop chute. A pit over eight feet long shall have drop chutes every five feet and a minimum of two drop chutes. The drop chutes shall be appropriately covered and made of drainage tile, or concrete, clay, or polyvinyl chloride (PVC) pipe. A ten-inch opening is recommended for chickens, and a twelve-inch opening for turkeys and suckling pigs.

### **Incinerators**

**General** - Incinerators shall be dual burning Type 4 (human and animal remains) approved for use within the state.

**Capacity** - Minimum incinerator capacity shall be based on the average daily weight of animal mortality and the length of time the incinerator will be operated each day.

**Location** - The incinerator shall be located a minimum of 20 feet from any structure. The incinerator shall be placed on a concrete pad with the fuel source as distant as practical. If the incinerator is covered with a roof, at least six inches are required between the incinerator chimney and any combustible roof parts.

### **Criteria Applicable to All Purposes – Catastrophic Mortality**

**General** - Processes addressed by this standard shall be limited to burial and composting. Catastrophic mortality shall be collected as soon as practical and moved away from the production facility.

**Location** - The facility shall be located as far away from neighboring dwellings and the poultry or livestock operation as site conditions per-

mit. Locate on sites with restricted percolation and a minimum of two feet between the bottom of the facility and the seasonal high water table unless special design features are incorporated that address seepage rates and non-encroachment of contaminants into the water table. Use AWMFH Appendix 10D for selection of sites where seepage will be restricted with normal construction techniques.

### **Burial Pit**

**General** - Catastrophic mortality resulting from natural conditions such as temperature extremes shall be buried on-site or as otherwise directed by state and local regulatory agencies. Burial of catastrophic mortality shall be timed to minimize the effects of mortality expansion during early stages of the decay process. Where possible and permitted by state law, mortality shall remain uncovered or lightly covered until bloating has occurred, or methods employed to reduce or eliminate bloating. Topsoil shall be retained to re-grade the disposal site after the ground has settled as the decay process is completed. Stockpiled soil shall be no closer than 20 feet from the edge of the burial pit.

**Size and Capacity** - Pits shall be sized to accommodate catastrophic mortality using appropriate weight to volume conversions. Capacity shall be in accordance with criteria acceptable to state and local regulatory agencies. The burial pit shall be a minimum of 4 feet wide with length necessary to accommodate mortality. Depth shall accommodate a minimum of 2 feet of cover over the mortality. Pit bottoms shall be relatively level. Lengths may be limited by soil suitability and slope. If more than one pit is required, they shall be separated by a minimum of three feet of undisturbed or compacted soil. The burial site shall be of sufficient volume to contain the mortality with a minimum of two feet of soil cover. The burial site shall be finish graded to slightly above natural ground elevation to accommodate settling.

**Structural Loading and Design** - Vehicular traffic shall not be allowed within four feet of the pit edge.

For pits that are four to five feet deep, a step or bench 18 inches wide and one foot deep will be dug around the perimeter of the main pit so the remaining vertical wall will not exceed four feet. For pits greater than five feet deep, the earthen wall shall be sloped back at 1 1/2 horizontal and 1 vertical or flatter.

### **Composting**

**General** - Catastrophic mortality composting shall be in either passive piles or windrows as described in National Engineering Handbook Part 637, Chapter 2 – Composting (NEH 637.0210 and NEH 637.0211).

Composting mortality shall be protected from precipitation as necessary, or provisions made for collecting contaminated runoff. Static piles or windrows covered with sawdust, finished compost, or other benign material will not need further protection

### **SPECIFICATIONS**

Plans and specifications for the composting facility shall be in keeping with this standard and describe the requirements for applying the practice to achieve its intended purpose.

All phases of construction shall comply with the appropriate standards and specifications for the work items including, but not restricted to:

The contractor should furnish a certification statement that he has constructed/assembled any non-NRCS designed structure in accordance with the requirements/specifications of the designer/manufacturer.

### **OPERATION AND MAINTENANCE**

An operation and maintenance plan applicable to this practice that includes, but is not limited to, the items listed below will be developed with the operator, and will become a part of the overall waste management system plan. The requirements in the individual operation and maintenance plan shall be consistent with the practice purposes, intended life, and design criteria. Safety considerations shall be prominently displayed in the plan.

**Normal Mortality** - Animal mortality facilities will normally be operated or used on a daily basis. At each operation or use, the facility shall be inspected to note any maintenance needs or indicators of operation problems.

Develop an operation and maintenance plan prior to design approval that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for its operation. The plan must include but is not limited to the following:

1. Objective of the landowner or operator and the operation requirements;
2. The mix proportions, moisture requirements, and materials used;
3. The sizing requirements;

4. The timing of the disposal/utilization process including loading, unloading, and turning or aeration of the material;
5. Temperature monitoring requirements, including a temperature log;
6. What must be done to prevent scavenging animals and leachate problems;
7. Bio-security requirements;

If available, frequently encountered mistakes if composting and brief “fix it” scenarios or a reference to; references of sources of information or a reference to where they can be found.

The operation and maintenance plan may be part of the Comprehensive Nutrient Management Plan (CNMP) or a Waste Management Plan which will include locations, times, rates, and volumes of application on the land. Waste handling equipment shall be available to remove waste materials from the composting facilities.

**Catastrophic Mortality** - Possible locations for catastrophic animal mortality facilities shall be located during the planning process to be operated as needed.

Burial of catastrophic mortality shall be timed to minimize the effects of mortality expansion during early stages of the decay process. Where possible and permitted by state law, mortality shall remain uncovered or lightly covered until bloating has occurred. Some topsoil shall be retained to re-grade the disposal site after the ground has settled as the decay process is largely completed.

Where composting is used for catastrophic mortality disposal, the operation and maintenance plan shall identify the most likely compost medium, possible compost recipes, operational information, and equipment that will need to be readily available.

**SUPPORTING DATA AND DOCUMENTATION**

**Field Data and Survey Notes**

The following is a list of the minimum data needed:

1. System plan sketch;
2. Topographic survey of the site showing building locations, elevations at structure location and location of dwellings, wells, floodplains, etc.;
3. Soils investigation showing seasonal high water table;
4. Operator data used to size the facility and documentation of the landowners decisions.

**Design Data**

Record on appropriate engineering paper. For guidance on the preparation of engineering plans see chapter 5 of the EFH, Part 650. The following is a list of the minimum required design data:

1. Comprehensive Nutrient Management Plan or Waste Management Plan including the Operation and Maintenance Plan;
2. Plan view including, location map, all system components, material and construction specifications;
3. Construction drawings, and component details;
4. Structure sizing computations;
5. Structure and component design and details;
6. Area grading plan;
7. Quantities estimate;
8. Job Class on plan;
9. Details of foundation drainage, when required;

10. Planting plan. This must meet the criteria, specifications, and documentation requirements of the Maryland conservation practice standard, Critical Area Planting, Code 342.

**Construction Check Data/As-built**

Record on survey notepaper, SCS-ENG-28, or other appropriate engineering paper. Survey data will be plotted on plans in red. The following is a list of minimum data needed for As-Built:

1. Documentation of site visits on CPA-6. Include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed, and decisions made and by whom;
2. Actual dimensions of installed structure;
3. Verification of adequate foundation preparation;
4. Documentation of installation of foundation drainage;
5. Documentation of reinforcing steel and proper concrete installation, if applicable;
6. Condition of precast panels, if applicable;
7. Certification statement from the contractor(s) that they have constructed/assembled the structure in accordance with the plans and specifications.
8. Statement on seeding and fencing;
9. Final quantities and documentation for quantity changes, and materials certification;
10. Sign and date check notes and plans by someone with appropriate approval authority. Include statement that practice meets or exceeds plans and NRCS practice standards.

**REFERENCES**

1. Arkansas Cooperative Extension Service. *Basic Operating Procedures*. University of Arkansas, 2201 Brookwood Drive, P.O. Box 391, Little Rock, Arkansas 72203. (501) 671-2000.
2. Arkansas Cooperative Extension Service. *Recommended Operating Procedures (for) Swine Composting (Recipe)*. University of Arkansas, 2201 Brookwood Drive, P.O. Box 391, Little Rock, Arkansas 72203. (501) 671-2000.
3. Arkansas Cooperative Extension Service. *Suggested Composter Size*. University of Arkansas, 2201 Brookwood Drive, P.O. Box 391, Little Rock, Arkansas 72203. (501) 671-2000.
4. Delaware Cooperative Extension Service, Delaware *Two-Stage Composter*; Construction Details, 1988.
5. Fulhage, C., Water Quality Publication # 225, *Composting Dead Swine*, Extension Publications, University of Missouri-Columbia, 2800 Maguire, Columbia, MO 65211.
6. Maryland Cooperative Extension Service, 1988. Maryland Free-Standing 2-Stage Composter; Isometric Poultry Composting Shed.
7. Murphy, D.W, (unpublished). *Composting of Dead Birds*. University of Maryland, Cooperative Extension Service; Handout.
8. Murphy, D.W. *Composting Poultry Mortality* (video). University of Maryland, Video Resource Center, 0120 Symons Hall, College Park, Maryland. 20742.
9. Murphy, D.W. and L.E. Carr. *Composting Dead Birds, Fact Sheet 537*. Cooperative Extension Service, University of Maryland System.
10. Murphy, D.W. and T.S. Handwerker, April, 1988. *Preliminary Investigation of Composting as a Method of Dead Bird Disposal*. Proc. National Poultry Waste Mgt. Symp., Columbus, Ohio.
11. USDA, Natural Resources Conservation Service. *Animal Waste Management Field Handbook*, Chapter 10, pages 58 - 62.
12. USDA, Natural Resources Conservation Service. *National Handbook of Conservation Practices*.