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# Wildlife Carcass Disposal

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Figure 1. A U.S. Fish and Wildlife Service biologist inspects and removes a dead bird following an oil spill. Proper disposal of animal carcasses can help ensure a safe environment for people and wildlife.

**Quick Links**



## Human-Wildlife Conflicts

Many wildlife management situations require the disposal of animal carcasses. These can include the lethal removal of wildlife to resolve damage or conflicts, as well as clean-up after mortalities caused by vehicle collisions, disease, oil spills (Figure 1) or other natural disasters.

Carcasses must be disposed of properly to protect public sensitivities, the environment, and public health. Improper disposal of carcasses can result in public outrage, site contamination, injury to animals and people, and the attraction of other animals that may lead to wildlife damage issues.

Concern over ground water contamination and disease transmission from improper carcass disposal has resulted in increased regulation. Successful carcass disposal programs are cost-effective, environmentally sound, and protective of public health. In addition, disposal practices must demonstrate sensitivity to public perception while adhering to state and local guidelines.

This publication discusses the range of options available for the responsible disposal of animal carcasses.

## Safe Carcass Handling

Before handling a carcass, ensure that the animal is in fact dead. This can be done by careful visual inspection. Monitor the animal for 30 seconds to ensure it is not breathing. Keep in mind that breathing can be very shallow. The animal's muscle tone should be flaccid. If the animal meets these requirements, then, with a gloved hand, lightly touch the cornea of the animal's eye. Live animals will respond, such as by blinking. If no response, then you can be reasonably assured that the animal is dead.

Dead animals can expose handlers to infectious diseases, ectoparasites, bodily fluids, sharp teeth, and claws. When moved, large and heavy carcasses have the added risk of causing back injuries to the handler.

Handlers can reduce their risk of disease and injury by following basic biosafety and biosecurity practices. First, they should evaluate the situation. The discovery of carcasses from unknown or suspicious origins (e.g., mass mortalities) should be approached cautiously not only to protect personnel, but also to protect evidence for investigations. In rare instances, it may be necessary to section-off and place caution or warning signs near a disposal area to protect the public from unnecessary contact. In the case of the discovery of carcasses of suspicious origin, such as mass mortalities or mortalities involving federally-listed species, immediately contact the state wildlife agency and/or the U.S. Fish and Wildlife Service.

Second, handlers should wear personal protective equipment (PPE). Fresh and intact carcasses minimally require thick gloves, long pants, shoes, and a shirt (Figure 2). Consider additional PPE, such as water-proof shin boots, a Tyvek® suit, thick waterproof gloves (or waterproof gloves under thick gloves), goggles with dust mask, or a face shield when handling putrid or suspicious carcasses. Tools, such as shovels and tongs, can help increase the distance between the handler and the carcass. Properly decontaminate and dispose of used PPE, making sure to thoroughly wash hands between disposal activities. Use of insect repellents will help guard against ectoparasites.


Figure 2. Handlers should wear personnel protective equipment. Fresh carcasses, like this feral swine, require the handler to wear thick gloves, long pants, shoes, and a shirt.

Small carcasses may be placed in a plastic trash bag (industrial strength bags with 3mm thick plastic are recommended) or water-tight barrel for transport to a holding area or final destination. If carcasses are not disposed of that day, it is recommended they be stored in a top-loading chest freezer. Use plastic bags or sheets to keep carcasses from adhering to the freezer walls and to other carcasses.

Carcasses requiring testing for diseases, such as rabies, should be handled in accordance with laboratory instructions.

## Disposal Methods

For many years, carcasses were disposed of through various types of burial or by rendering. Rendering is a process that converts waste animal tissues and other parts into edible and inedible products.

Awareness of prion-based diseases, such as chronic wasting disease (CWD) and Transmissible Spongiform Encephalopathy, have raised concerns regarding the continued use of these traditional methods of disposal. Be sure to check state regulations regarding the transport of carcasses across county and state jurisdictions particularly in areas where prion-based diseases are a concern.

Threats to groundwater from burial practices, especially in areas with shallow water tables, along with allegations of declining air quality and public health risks from incinerator emissions, have led to new procedures and alternative methods whenever possible.

Current disposal methods include the following:

- Aboveground burial (surface disposal),
- composting,
- belowground,
- incineration,
- disposal in a licensed landfill, and
- other disposal options.

Sites where disposal methods involve contact between carcasses and native soils should have a soil evaluation. An ideal site would contain moderately well-drained soils that attenuate leachate (i.e., the liquid resulting from water percolating through permeable material) so soil microbes can treat it. These methods include, but are not limited to, composting, incineration using a trench type air curtain burner, and belowground (or burial). Soil evaluations should be conducted by a Certified Soil Scientist, such as a Natural Resources Conservation Service employee, a State Certified Soil Scientist, or other qualified professional.

Disposal sites may be private or registered by the State. Contact local and state authorities for information on current disposal regulations. It is important to evaluate the proposed disposal area using the criteria mentioned above. Specifically, each site should be evaluated to ensure it meets regulations for disposal activities, potential impacts to sensitive areas, such as streams, ponds and wetlands, and, most importantly, the presence of adequate soils for decomposition.

### *Aboveground Burial*

Aboveground or surface burial (“leaving it lie”) is a convenient method of disposal because little to no digging is required. The carcass is placed on the landscape to decompose naturally and for scavenging animals and insects to find. It is gaining popularity as an environmentally responsible way to recycle wildlife into the ecosystem.

Unfortunately, the method is not suitable for all carcasses. To prevent harm to other animals, do not use aboveground burial for animals suspected of diseases. The rabies virus can remain viable in a carcass until putrification.

Do not use aboveground burial for cervids in areas infected with CWD. Recent research shows that crows feeding on a CWD-infected carcass can transmit the prions to new locales through their feces. Likewise, animals treated with toxicants should not be disposed of aboveground.

The method also requires a lot of space to prevent oversaturation of a given site. Every effort should be made to ensure that hikers and pets do not have access to the carcasses.

Another variant of aboveground burial requires the excavation of a 24-inch deep trench lined with a 12-inch base of carbon, such as sawdust or wood shavings to prevent the sideways movement of fluids. The carcass is placed on the bed and covered with the loose soil originally excavated to form the trench. The pile is finally seeded and allowed to sit undisturbed for six months to a year. This method is gaining popularity in areas of the country with shallow water tables or areas were traditional deep pit burial is not feasible.

*Composting*

The most common aboveground disposal practice is composting. Composting is a biological process in which microorganisms consume organic materials (carbon and nitrogen compounds) and produce compost— a nutrient-rich, humus-like end product.

Composting can occur with oxygen (aerobically) or without oxygen (anaerobically). Unlike anaerobic decomposition, aerobic decomposition is rapid, generates heat, and is not as likely to produce noxious odors.

An active compost pile is a community of living microorganisms called microbes. Microbes require suitable amounts of moisture, carbon, nitrogen, and unrestricted airflow in order to survive and multiply within a compost pile. Moisture tends to be the most limiting factor in a compost pile, as moisture provides the medium in which the compost microbes live. Microbes work best at 55 to 60 percent moisture. Additionally, the compost blend should have a carbon-to-nitrogen ratio of approximately 20:1 to 40:1 to ensure adequate nutrients to support composting.

Large animal carcasses are ideally suited for composting, as the carcass provides much of the nitrogen component necessary for the compost mix. Finally, microbes require sufficient oxygen levels (minimum 5%) to ensure aerobic activity. When a pile is properly balanced and operating aerobically, the only outputs are water vapor and carbon dioxide. If the pile becomes unbalanced, it may go anaerobic, resulting in the release of odors and attraction of scavenging animals.

Composting usually occurs in two phases: 1) active, and 2) curing. During the active phase, microbes use oxygen as they feed on the available organic matter, reducing the volume and mass of the original material by as much as 40 percent. During the curing phase, the microbes still feed, but at a slower pace, giving off less heat, water vapor, and carbon dioxide. Left undisturbed, the microbes will feed until all the organic matter has been consumed. The final product, called compost, is highly valued because it is a nutrient rich soil amendment that contains organic matter, enhanced soil structure, drainage and porosity, and water holding capacity.

An ideal composting site should:

- Be located such that the prevailing wind directions do not travel to nearby residences and uninfected farms and communities (whenever possible);
- Be located at the top of the slope of the field, on

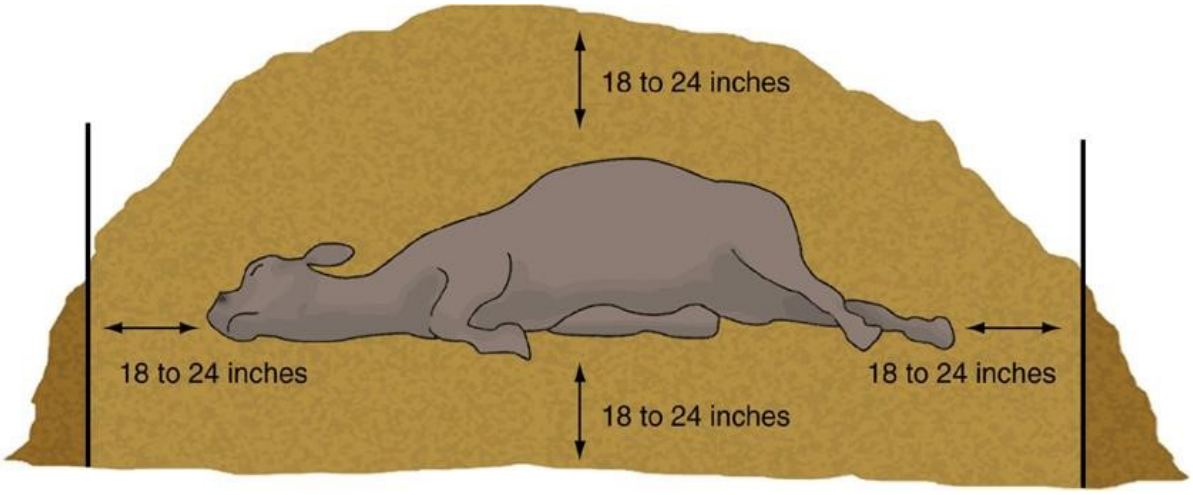


Figure 3. Illustration of carcass location in compost pile.

moderately-well to well drained soils (usually land that is used for crop production);

- Have a gentle 2% to 4% slope to encourage on-site drainage;
- Contain on-site soil depths or be modified (i.e., create a thicker base layer) to be at least 24-inches from seasonal high-water tables;
- Contain on-site soil depths in excess of 36-inches from bedrock;
- Not be located on a flood plain;
- Have (or construct) diversion ditches, terraces, or berms to direct surface water flows and storm water away from active compost piles. (Note that if piles are located between production houses, then roof and surface drainage should be directed away from the compost area); and
- Meet state-specific setback requirements, which should be no less than:
  - 200-feet from a water supply well used for drinking;
  - 200-feet from water bodies, including: ponds, lakes, streams, rivers;
  - 200-feet from a nearby residence (not owned by the premises);
  - 50-feet from a drainage swale that leads to a water body; and
  - 25-feet from a drainage swale that does not lead to a water body.
- Meet Federal Aviation Administration (FAA) regulations concerning setback locations from airports. FAA may require a site evaluation from USDA Wildlife Services particularly when starting a new composting site at a landfill or transfer site near an airport.

Carcass Composting

Carcass composting (Figure 3) is a variation of the basic composting process whereby the carcass itself provides nutrients and moisture to the composting pile. The goal of carcass composting is the rapid reduction of a carcass to material that is non-hazardous and may be used as soil enrichment without generating odors or leachate.

Carcass composting often requires removing several acres of land from production. Whenever possible, try and choose isolated locations to reduce encounters with pets and people, and do not overuse a location. Sites should be 100 yards from surface water, and at least 100 yards from a water supply well.

Ideal locations are far removed from neighbors who may be annoyed with the resulting noxious odors. In field situations, where appropriate space and equipment is available, composting is an excellent alternative to disposal in landfills. Poisoned and diseased animals (or those suspected of being diseased) should not be composted.

The process for carcass composting includes the following steps:

1) Lay down a bed of carbonaceous materials, usually 18 to 24 inches in depth, and large enough to surround the entire carcass. This initial layer serves as a barrier to help absorb any liquids that are released by the carcass as it decomposes.

2) Place the carcass on the center of the bed, making certain that none of the carcass extends beyond the edge of the bed. In many cases, carcass legs may be tied together to help keep the carcass covered as it expands during decomposition.

3) Vent the carcass in numerous locations to release trapped gasses and allow abdominal contents an opportunity to mix with compost ingredients.

4) Carcasses should be covered with an additional 18 to 24 inches of carbonaceous material to form a natural biofilter that minimizes odors and prevents the attraction of scavenging animals.

5) The finished pile should be conical in shape with steep sides to help prevent saturation and accumulation of rain and snow (Figure 4).

Figure 4. Compost pile (notice steam caused by the heat being generated).

During composting activities, it is important to periodically check the pile to ensure that cracks have not formed in the bulking material (e.g., wood chips, leaves, saw dust) as the carcass continues to breakdown. These cracks become sources for odors and may attract scavenging animals. This is especially true during the first week when carcasses discharge large amounts of fluid, causing the body of the carcass to collapse and fissures to form along the top edges of the compost pile. Any and all cracks may be repaired simply by using a hand rake or other tool to smooth over the disturbed areas. In rare cases, additional bulking material may be needed to effectively close openings. With the exception of occasional pile maintenance, carcass composting is a relatively simple alternative to conventional disposal practices.

### *Belowground, Individual Grave*

Belowground disposal conceals the sights and smells of decomposition from people and scavengers. The digging of graves, however, can become quite laborious or require access to large digging equipment, such as backhoes or bulldozers.

For areas inhabited by large carnivores, such as grizzly bears, an electric fence around the grave site may be necessary to prevent their access to carcasses.

To ensure proper belowground disposal for individual animals, the following conditions must be met:

1) Cover the carcass with at least 12 to 24 inches of soil within 24 hours after burial.

2) Do not allow the carcass to come into contact with surface or groundwater.

3) Locate the grave at least 200 feet from any groundwater well that is used to supply potable drinking water.

4) Do not exceed 100 individual graves per acre.

### *Belowground, Common Grave*

To ensure proper belowground disposal for multiple animals, the following conditions must be met:

1) Cover the carcasses with at least 12 inches of soil within 24 hours after burial.

2) Do not allow the carcasses to come into contact with surface or groundwater. Carcasses cannot be disposed of in a 100-year floodplain or wetland area as defined by the Solid Waste Management Act.

3) The number of carcasses should not exceed 250.

4) Common graves should not remain open for more than 30 days.

5) Common graves should have at least 4 feet of soil as final cover.

6) Common graves must be located at least 200 feet from any groundwater well that is used to supply potable drinking water.

7) Do not exceed 5 common graves per acre.

Figure 5. Gray wolves feed on a donated deer carcass at the International Wolf Center in Minnesota.

*Incineration*

Incineration refers to the complete destruction of a carcass through combustion resulting in ash. There are five basic technologies used to incinerate carcasses: standard in-vessel systems, pyres, air curtain burners, gasification (Pyrolysis units), and plasma arc gasification systems. All of these incinerators must be approved by state and local authorities to burn animal carcasses, due to the toxic emissions that may occur.

With the exception of pyres, incineration methods generally require purchasing expensive equipment that may be cost prohibitive. In fact, incineration can cost more than $0.50 per pound, making it a relatively expensive disposal option.

Incineration has been scrutinized for its high energy use and contribution to greenhouse gasses and cannot be used for carcasses that have died from certain toxicants.

*Licensed Landfill*

Carcass disposal at an authorized landfill may be the most cost-effective option. Prior approval from the landfill owner/operator is often required. Secure carcasses in 3mm thick plastic trash bags or other suitable airtight containers to prevent noxious odors. Carcasses must be disposed at permitted landfills capable of handling solid waste.

One downside of disposing carcasses at landfills is that the nutrients from the carcasses are not recycled back into the natural environment.

*Other Disposal Options*

Some wildlife rehabilitators accept carcasses to provide as food to raptors, carnivores (Figure 5), and carrion feeders.

## Conclusion

Proper disposal of carcasses protects the sensitivities of the public, reduces the potential for the spread of zoonotic diseases, prevents nutrient losses to surrounding soils and ultimately, groundwater, and reduces human-wildlife conflicts. Failure to dispose of carcasses appropriately can cause unwanted media attention and public outrage.

The overall goal of any animal carcass management plan is to ensure clean, safe disposal of all materials in a manner that protects human, animal, and environmental health.

## Acknowledgements

Figure 1. Photo by Ashley Spratt, U.S. Fish and Wildlife Service
Figure 2. Photo by USDA Wildlife Services
Figure 3. Illustration by Josh Payne, USDA
Figure 4. Photo by Josh Payne, USDA
Figure 5. Photo by Wikimedia Commons

## Glossary

**Carcass:** The dead body of an animal.

**Compost:** A mixture of decayed or decaying organic matter used to fertilize soil.

**Personal Protective Equipment (PPE):** Equipment worn to minimize exposure to hazards that cause serious injuries and illnesses.

## Key Words

Carcass, Composting, Personal Protective Equipment

## Disclaimer

Wildlife can threaten the health and safety of you and others in the area. Use of damage prevention and control methods also may pose risks to humans, pets, livestock, other non-target animals, and the environment. Be aware of the risks and take steps to reduce or eliminate those risks.

Some methods mentioned in this document may not be legal, permitted, or appropriate in your area. Read and follow all pesticide label recommendations and local requirements. Check with personnel from your state wildlife agency and local officials to determine if methods are acceptable and allowed.

Mention of any products, trademarks, or brand names does not constitute endorsement, nor does omission constitute criticism.

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## Resources

Bonhotal, J. Cornell's natural rendering method. Paper presented at the Symposium on Composting Mortalities and Slaughterhouse Residuals, S. Portland, Maine, May 24-25, 2004.

Carr, L.E. 2004. Composting: A treatment alternative for dairy cattle mortalities. Maryland Dairy Talk. 7(1): 2 pp.

Flory, G.A., R.W. Peer, R.A. Clark, M.N. Baccar, T. Le, A.B Mbarek and S. Farsi. 2017. Above ground burial for managing catastrophic losses of livestock. International journal of One Health, 3:50.

Glanville, T. 1995 .Composting dead livestock: A new solution to an old problem. SA-8. Ames, IA.: Iowa State University Extension.

Glanville, T.D. and D.W. Trampel. 1997. Composting alternatives for animal carcass disposal. Journal of American Veterinary Medical Association, 210 (8):1116-1120.

Jennelle, C.S., M.D. Samuel, C.A. Nolden, and E.A. Berkley. 2009. Deer Carcass Decomposition and Potential Scavenger Exposure to Chronic Wasting Disease. The Journal of Wildlife Management 73(5): 655-662.

Keener, H.M., D.L. Elwell, and M.J. Monnin. 2000. Procedures and equations for sizing of structures and windrows for composting animal mortalities. Applied Eng, Agric., 16(6):681-692.

King, M.A., B. Seekins, M. Hutchinson, and G. MacDonald. 2009. Active biosolids compost as poultry carcass amendment. Biocycle 50(5): 35-38.

King, M.A., B. Seekins, M. Hutchinson, and G. MacDonald. 2005. Observations of static pile composting of large animal carcasses using different media. Presented at the "Symposium on Composting Animal Mortalities and Slaughterhouse Residuals", in South Portland, Maine, May 24-25, 2005.

Langston, J., D. Carman, K. Vandevender, and J.C. Boles, Jr. 1997. Disposal of swine carcasses in Arkansas. MP 392. University of Arkansas Extension.

Looper, M. 2001. Whole animal composting of dairy cattle.

Maine Department of Agriculture. 2012. 01-001 Chapter 211, "Rules for the disposal of animal carcasses, rules and regulations relating to disease control of domestic animals and poultry". Maine Department of Agriculture, Food and Rural Resources-Division of Agricultural Resource Development, 28 State House Station, Augusta, Maine 04333-0028. 56 pp.

Miller, L.P., A. Buckendahl, G. A. Flory, R.W. Peer, M. L. Hutchinson, M. A. King, J. B. Payne, E. Malek, J. Bonhotal, K. Powell, D. Ross and T. Le. 2017. Composting Livestock 2017, Livestock Mortality Composting Protocol. USDA. 34 pp.

Rynk, R., M. van de Kamp, G.B. Wilson, M.E. Singley, T.L. Richard, J.J. Kolega, F.R. Gouin, L. Laliberty, Jr., D. Kay, D.W. Murphy, H.A.J. Hoitink, and W.F. Brinton. 1992. On farm composting. Northeast Regional Agric. Eng. Service, Ithaca, NY.

Schaefer, J.M. 1983. The viability of rabies in carrion. W.F. Andelt (Ed). Sixth Great Plains Wildlife Damage Control Workshop Proceedings. Wichita, KS. 112.

Sheffield, S.R., Sullivan, J.P., and E.F. Hill. 2005. Identifying and handling contaminant-related wildlife mortality/morbidity. Techniques for wildlife investigations and management, 213-238.

VerCauteren, K.C., J.L. Pilion, P.B. Nash, G.E. Phillips, and J.W. Fischer. 2012. Prion remains infectious after passage through digestive system of American crows (*Corvus brachyrhynchos*). PLoS ONE 7(10): e45774. doi:10.1371/journal.pone.0045774.