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Abstract: Wildlife damage managers regularly are faced with decisions that include whether and how animals will be killed. Euthanasia refers to death without pain or distress, i.e., a humane death. The American Veterinary Medical Association has developed guidelines for euthanasia (Andrews et al. 1993). These guidelines affect many of the methods and technologies involved in wildlife damage management. Carbon dioxide, carbon monoxide, barbiturates, and gunshots are appropriate methods of euthanizing wildlife when necessary and when applied in the prescribed manner.

Pages 109-110 in R.E. Masters and J.G. Huggins, eds. Twelfth Great Plains Wildl. Damage Control Workshop Proc., Published by Noble Foundation, Ardmore, Okla.

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Animal death, and the process of killing animals, has long been a traditional part of modern wildlife management (Leopold 1933). Hunting and trapping, for example, depend upon animal death as an endpoint to meet cultural definitions of success, whether hunting or trapping is done for recreation or subsistence. However, wildlife management has focused very little on the issue of death (Schmidt 1981, 1989a). Wildlife management textbooks do not discuss death other than mentioning that there are segments of society against hunting and trapping, or sensitive to issues involving potential animal suffering. Training manuals and education courses for hunting and trapping focus on death only in the context of retrieval, "fair chase," or wastage. Wildlife damage management also is involved in technologies and materials that result in death of animals (Schmidt 1989b, 1994a, 1994b).

Euthanasia focuses on real and perceived pain and suffering in death. It refers to death with no pain or distress, or a humane death. In theory, euthanasia occurs in an animal when rapid unconsciousness is followed by cardiac or respiratory arrest, leading to loss of brain function (death). This, in addition to minimized stress and discomfort prior to the animal becoming unconscious, is euthanasia — a painless death.

The American Veterinary Medical Association (AVMA) in its "1993 Report of the AVMA Panel on Euthanasia" developed guidelines to assist those involved in killing animals in choosing methods and procedures for minimizing pain and suffering (Andrews et al. 1993). The primary focus of the report was on animals used in research, as well as animal care and control facilities. However, the report also commented on euthanasia of wildlife (including amphibians, reptiles, and fish) and animals raised for fur production.

What were the AVMA's evaluation criteria for euthanasia? How do they apply to the procedures and techniques used by many wildlife damage managers? The AVMA panel used 11 primary criteria for determining whether a procedure induces death without pain and distress (Schmidt 1994b). These 11 criteria are listed below.

1. Does the procedure induce loss of consciousness, followed by death, without causing pain, distress, anxiety, or apprehension? Euthanasia techniques should result in rapid unconsciousness followed by cardiac or respiratory arrest and, ultimately, loss of brain function. Decompression chambers that result in gases trapped in body cavities expanding and causing pain and distress are not considered acceptable.

2. How long does the procedure take to induce unconsciousness? A 30 second procedure is better than a 5 minute one.

3. Is the procedure 100% reliable? Does the technique or process work every time?

4. Is the procedure safe for the personnel using it? Is there a risk that the user can be harmed? For example, carbon monoxide is odorless and colorless, and safeguards must be used to prevent exposure to personnel.

5. Is the procedure irreversible? Do "dead" animals stay dead? Animals should not "wake up" after they are buried or while they are being incinerated.

6. Is the method of death compatible with the purpose of the animal's death? For example, a gunshot to the brain is an acceptable method of death, but if the purpose of killing the animal is to take the intact brain tissue to a laboratory for rabies testing, a gunshot to the head is not a compatible method.

7. Does the procedure cause a strong, negative effect on observers or personnel? Although these considerations should not outweigh the primary responsibility of using the most rapid and painless technique, negative reactions by observers or project personnel can cause a technique to be used improperly.

8. Is the procedure compatible with subsequent evaluation, examination, or use of tissue? In most wildlife damage management applications this criteria is not important. If, however, you are involved in a research project, the technique you choose may be dictated by the samples you need to collect. If you need tissue samples without drug residues, then you must use a technique that does not leave drug residues in the tissue.

9. Does the procedure have the potential for human abuse? Controlled substances may be very effective, but they might also lead to abuse by personnel. In addition, these chemicals usually require strict accounting, which may be difficult under some field conditions.

10. Can the procedure be utilized over a broad range of ages and species, or is it highly specialized for one species or a specific age class of one species?

11. Finally, does the procedure require complex maintenance to keep it in good working order? The more difficult and complex a procedure is, the higher the risk of something going wrong, resulting in increased pain and distress.

How do these criteria apply to techniques used in wildlife damage management (Schmidt 1994b)? A number of techniques exist that are appropriate to kill an animal in a humane manner. However, they should be used as prescribed.

Carbon dioxide, from a compressed cylinder or from dry ice, is acceptable. When using dry ice, it is important to keep the animal from coming into physical contact with the ice. Carbon dioxide from a fire extinguisher is not acceptable.

Carbon monoxide is also acceptable. It induces unconsciousness without pain and with minimal discomfort. However, only commercially compressed carbon monoxide is recommended. Exhaust fumes from internal combustion engines are not considered acceptable because of criteria 1, 2, 4, and 11 above. With a combustion engine, other gases besides carbon monoxide are produced, the concentration of carbon monoxide cannot be controlled, the cooling of the gases is difficult, and the equipment must be in good working order.

Barbiturates, when available, are recommended euthanasia agents. However, training is essential, and there is strict accounting required of all regulated barbiturates.

Gunshots are considered acceptable when other methods cannot be used. Personnel should be trained, and the recommended target area should be the brain. The firearm and the ammunition should be appropriate for the species.

The AVMA Panel on Euthanasia (Andrews et al. 1993:243) noted that "Kill traps are practical and effective for animal collection when used in a manner that minimizes the potential for attraction and collection of non-target species. Traps should be checked at least once daily. In those instances when an animal is wounded or captured but not dead, the animal must be killed quickly and humanely."

Finally, the AVMA panel outlined unacceptable agents and methods. These included decompression, rapid freezing, use of an air embolism, drowning, strychnine, chloroform, cyanide, and stunning. Stunning is acceptable to render an animal unconscious, but must be followed by an acceptable killing technique.

Whether you agree with the AVMA Panel findings or not, it is important to understand the rationale behind them in

order to better assess procedures that you use, and so you can explain and defend techniques used as part of your operation. There are an increasing number of technical articles on injuries and time to death associated with a variety of commercial traps, and there is currently an international effort to develop "humane" standards for many trapping devices (Jotham and Phillips 1994). Additional information on euthanasia and animal pain can be found in Universities Federation for Animal Welfare (1972), Committee on Pain and Distress in Laboratory Animals (1992), Longair et al. (1991), and Fowler (1995). Reprints of the AVMA report are available for \$1.50 from: the American Veterinary Medical Association, 1931 N. Meacham Road, Suite 100, Schaumburg, IL 60173-4360.

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