

Predator Control for Sustainable & Organic Livestock Production

LIVESTOCK TECHNICAL NOTE

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Introduction

This publication is intended as a guide to raise producers' awareness of predation, identify potential predator problem areas, and suggest management practices to prevent predation. Because every person and every pasture is different, there is no way that any or all of these predator control practices will achieve perfect predator management, but they can help reduce the number of livestock killed by predators. As Anita O'Brien explains in the Ontario (Canada) Ministry of Agriculture, Food and Rural Affairs publication *Management Practices Can Influence Predation*:

For managing predation, a variety of methods must be available; one method will not be effective for every producer. Most successful predator control programs use an integrated approach—combining good husbandry with effective control methods. Prevention cannot be stressed enough, because after predators kill once they are more than likely to return and kill again. If predators have started killing sheep, it is important to stop the killing as quickly as possible. (1)

The following information is directed mainly toward predator control in sheep and goat production, but it relates to all species of livestock: cattle, goats, sheep, pigs, poultry, and horses as well as other livestock species and even pets. All of these species, particularly the young animals, are potential prey for predators.

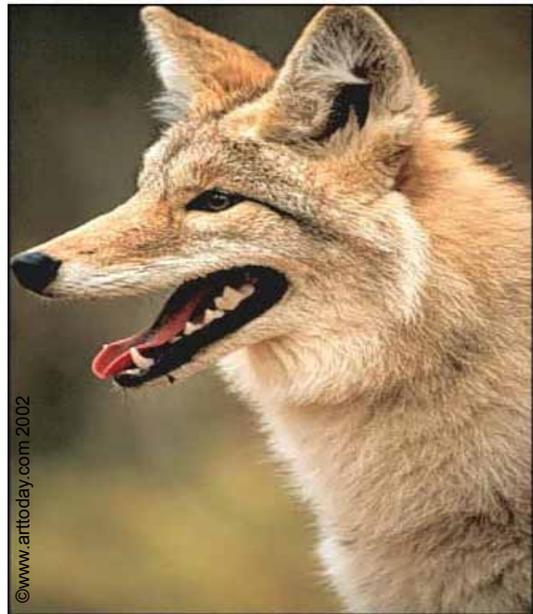


Table of Contents

Introduction	1
Livestock Dead or Missing	2
Is a Predator Responsible?	2
Management Techniques to Minimize Predator Losses	4
Guard Animals	8
References	12
Further Resources	13
Appendix: Disposal of Dead Livestock	16

Livestock Dead or Missing

Livestock deaths and disappearances have many causes, including predators, parasites, bacterial and viral diseases, poisonous plants, suffocation, bloat, exposure, lightning, theft or rustling, and still birth. Evidence of predators feeding on a carcass may not be proof of a predator problem, because most predators will scavenge on dead livestock, even if they didn't kill it (2). Proof of predation will usually be found when a larger animal is killed, but the disappearance of small or newborn animals may also be a sign of a predator problem.

Is a Predator Responsible?

Predators—such as coyotes, dogs, bears, mountain lions, foxes, eagles, hawks, feral hogs, feral cats, wolves, and even ravens—kill sheep and lambs, goats and kids, calves, piglets, foals, and other small livestock and pets throughout the United States (3). The loss of livestock to predators can sometimes make the difference between profit and loss for a livestock producer. According to the National Agricultural Statistics Service (NASS) report *Sheep and Goats Predator Loss*, U.S. sheep and lamb losses from animal predators totaled 273,000 during 1999. The report shows that coyotes and dogs caused more than 75 percent of the losses. This represented more than one-third of the total losses of sheep and lambs from all causes, and resulted in a loss exceeding \$16 million (4).

According to the Ontario Ministry of Agriculture, Food and Rural Affairs publication *Something's Been Killing My Sheep - But What? How to Differentiate Between Coyote and Dog Predation*, predation has risen rapidly over the past 10 to 15 years, causing ever more serious financial losses to sheep operations. Ontario sheep producers reported almost three times more sheep lost in 1995 (3,060) than were lost in 1986 (1,149). The study found that the total would probably be higher, but that losses caused by dogs, domestic and feral, were not included nor were animals killed but not found (5).

Differentiating a predator-caused death from other types of livestock deaths can be a problem, especially if the carcass has begun to decompose or has been scavenged. To differentiate between predator-caused and natural death, the producer will need to examine the general external appearance of the carcass, such as coat condition, the appearance of the eyes and ears, the feces (firm or diarrhea), even the position of the carcass (animals dying of natural causes usually die on their sides or on their chests, with their legs folded under them) (6).

Although the pattern of killing typical of a predator species can sometimes help identify the problem predator, an individual's killing style can overlap the killing style of another species. Other types of evidence, such as tracks and feces, are sometimes necessary to correctly identify the responsible predator species (2).

Table 1. Losses of Sheep and Lambs from Predators: Number of Head and Total Value, United States, 1999.

Predator	Number of Head	% of Total Predators	Total Value
	Number	Percent	1,000 Dollars
Coyotes	165,800	60.7	9,637
Dogs	41,300	15.1	2,982
Mountain Lions, Cougars, or Pumas	15,600	5.7	998
Bears	7,800	2.9	555
Foxes	8,100	3	400
Eagles	10,700	3.9	522
Bobcats	12,700	4.7	650
All Other Animals	11,000	4	758
US	273,000	100	16,502

Reference NASS (4)

The Wildlife Services (WS) section of the USDA/Animal and Plant Health Inspection Service (APHIS) works with farmers and ranchers to protect agricultural resources in a way that is practical, humane, effective, and environmentally sound. They can help identify predators and offer remedies that will minimize their impact on wildlife (7). Each state's Wildlife Service activity report, along with the state WS contact information, is available at <<http://www.aphis.usda.gov/ws/statereportindex.html>>.

An excellent publication, *Procedures for Evaluating Predation on Livestock and Wildlife*, is located at <<http://texnat.tamu.edu/ranchref/predator/b-1429-2.htm>>. It provides details on many of the observations that are needed to determine whether a predator is the cause of the livestock's death. It also provides specific information on the typical killing patterns for most of the predator species.

Prevention and Control of Wildlife Damage – 1994 has separate chapters for more than 90 species of wildlife that may cause damage to crops or livestock. Each of these chapters covers identification, damage prevention, and control methods. The book is available at <<http://deal.unl.edu/icwdm/handbook.shtml>>. The 90 species-chapters are listed alphabetically. The book is also available on CD-ROM or in paper copy. (See **Further Resources**: Books, for ordering information.)

The 36-page Alberta Agriculture, Food and Rural Development publication *Methods of Investigating Predation of Livestock* outlines how to tell whether a predator killed an animal and how to identify the predator. (See **Further Resources**: Books, for ordering information.)

The Maryland Small Ruminant website "Predator and wildlife management" is a rich source of information, with links to many different sites and publications covering all areas of predator-damage control and management. It is located at <<http://www.sheepandgoat.com/predator.html>>.

COYOTES AND DOGS AS PREDATORS

When stock is killed or missing, the predator responsible is most likely either a coyote or a dog. According to the NASS report *Sheep and Goats Predator Loss* (see Table 1), in 1999 coyotes and dogs caused more than 75 percent of all sheep lost to predators, with the losses to coyotes topping 60 percent. Coyotes have become a problem in almost all of the United States, Canada, and Mexico. The state Wildlife Service can verify the legal status of coyotes in your state; contact information is available at <<http://www.aphis.usda.gov/ws/statereportindex.html>>. Most states allow coyotes to be shot or trapped at any time, if they are causing damage, but some states have different regulations or specific hunting seasons only.

In some cases, the producer may have difficulty trying to decide whether a coyote, a neighbor's dog, or their own dog was the killer. The Ontario publication *Something's Been Killing My Sheep – But What? How to Differentiate Between Coyote and Dog Predation* lists ten criteria that can help determine the culprit. They are: time of attack; duration of attack; temperament of flock; extent of attack or kill; location of attack or carcasses; target animals; attacking behavior; feeding behavior; tracks at site; and droppings (5). The publica-



tion is available at <<http://www.gov.on.ca/OMAFR/english/livestock/sheep/facts/coydog2.htm>>.

Some of the criteria to distinguish between coyote and dog predation are:

- Coyotes tend to kill quickly, at night or early dawn, by biting sheep on the throat just behind the jaw and under the ears.
- Coyotes will generally kill only one or two animals, and only close to areas with plenty of cover to allow the coyotes to escape. Coyotes eat their kill by first feeding on the abdominal cavity.

- Coyotes are probably responsible if lambs or small animals are missing, because coyotes will take smaller animals back to their den, especially when feeding their pups.
- Dogs will attack at any time of the day or night.
- Dogs are usually poor predators and their attacks last much longer, affecting more of the flock, so the animals are more nervous and confused after the attack.
- Dogs usually attack sheep or other livestock for the chase, not for food. Dog attacks usually cause more slashing and ripping wounds and the mutilation of legs, ears, tails and hindquarters, on both the dead and surviving animals (5).

The 31-page Alberta book *Coyote Predation of Livestock* provides information to help producers prevent or reduce losses from coyotes. (See **Further Resources:** Books, for ordering information.)

If a dog or pack of dogs is the culprit, what can the producer do? The Ontario publication *Family Dogs Attack Sheep* cites an Australian study of 1,400 dogs that attacked livestock. In the study, the authorities used trained tracking dogs to follow the offending dogs home. The authorities found that most of the dog owners would not believe that their dogs had attacked the livestock. Most of the owners believed that their dogs were either too small, young, or friendly to commit such an act. Nonetheless, the publication states:

The researchers caught dogs from 3 months to 12 years of age, intact and sterilized dogs of both sexes, purebred and mongrel; all attacking livestock. Most of these dogs were well fed, friendly, family pets, running at large. Selective breeding has not suppressed the tendency of any breed of dog to attack and kill livestock. Animal behaviorists say it is not possible to predict whether a particular dog will attack sheep or not.

...Owners should understand the reason why a dog attacks sheep – it's all for the love of the game. (8)

Dr. C. V. Ross, in his book *Sheep Production and Management*, suggests that livestock producers need to know their legal rights concerning the control of dogs in their area. He explains that there is a great variation in dog laws. Livestock owners “have the right to protect their property from damage, but there are all kinds of variations in the interpretation of protecting property and therein lies the basis for many bitter and costly lawsuits” (9). Livestock producers have lost cases in court when they have resorted to killing dogs on their property that were not caught in the immediate act of killing livestock.

WOLVES AS PREDATORS

In states such as Minnesota and Wisconsin where wolves have been reintroduced, the producer needs to consider the increased challenge of protecting livestock from these adaptable predators. In most states where wolves have been reintroduced, livestock killed by wolves is compensated for by the state, upon presentation of evidence that it was a wolf kill. The publication *Wolves in Farm Country: A Guide for Minnesota Farmers and Ranchers Living in Wolf Territory* provides information on what to do if a wolf kill is suspected, whom to contact, and how to preserve the evidence. It is available at <<http://www.mda.state.mn.us/AMS/wolf.htm>>. The publication cautions:

Wolves are protected under federal law. It is illegal to harm or kill a wolf, except in defense of human life. Any attempt to frighten away wolves returning to kill other animals or to feed on dead livestock must be done without harming the wolf. (10)

The Canadian Federation of Agriculture publication *Preventing Wolf Predation on Private Land* provides some specific methods to reduce wolf predation, but remember that the wolf is not protected in Canada and that hunting, trapping, and snaring are permitted there. The publication is available at <<http://www.cfa-fca.ca/english/publications/wildlife/wolf.htm>>.

Management Techniques to Minimize Predator Losses

All management techniques have advantages and disadvantages. Some will work for one producer, while others will work for another. Be-

cause every livestock operation is different, not all of these management suggestions are practical for everyone. It is important for producers to combine the management techniques best suited to their operations with the most effective predator control methods for their circumstances.

FENCING

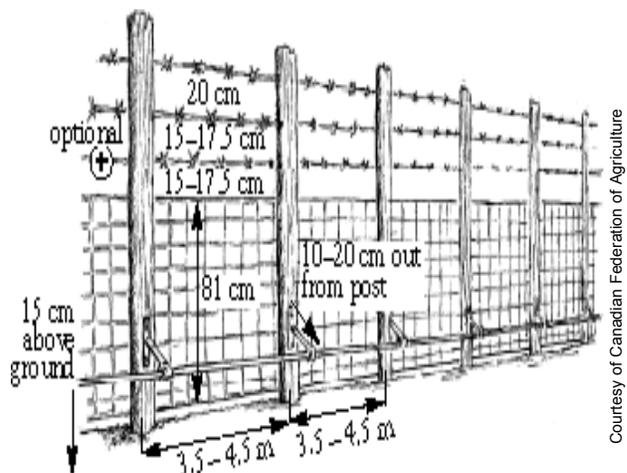
Specially constructed woven (mesh) wire or electric fencing can be a useful tool in a management strategy for deterring predators. The USDA/APHIS publication *A Producers Guide to Preventing Predation of Livestock* states:

The success of various types of fencing in excluding predators ranges from zero to 100 percent. Density and behavior of coyotes, terrain and vegetative conditions, availability of prey, size of pastures, season of the year, design of the fence, quality of construction, maintenance, and other factors interplay in determining how effective a fence will be. Fencing is most likely to be cost effective when the potential for predation is high, where there is a potential for a high stocking rate, or where existing fences can be electrified. Fencing is more effective when incorporated with other means of predator control. (11)

Fencing is most successful if it is strung before the predator has established a pattern of movement. If coyotes have been feeding on livestock in a pasture, the construction of a fence will probably not deter them, since they already recognize the livestock as a food source. The USDA/APHIS publication comments that “because predator exclusion fences may restrict movement of other wild species, especially large

game animals, Federal or State regulations may prohibit construction of effective fences in some areas” (11).

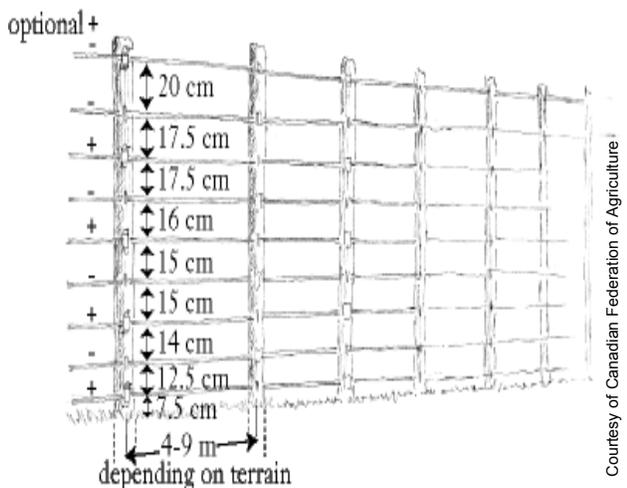
Building a new mesh or woven wire fence for predator management can be expensive. A properly constructed 5½- to 6-foot mesh wire fence should have horizontal spacing of less than 6 inches and vertical spacing of 2 to 3 inches. It should have barbed wire at ground level and barbed wire, electric wire, or wire overhangs on top to help deter predators that will climb or dig under fences.



Courtesy of Canadian Federation of Agriculture

The construction cost for multiple strands of single-wire electric fencing can be lower than the cost of new mesh fencing. Seven or nine strands of high-tensile smooth wire, with alternating charged and grounded wires (beginning with a charged bottom wire) can help reduce predation. A Canadian predation study in the mid 1970s showed a 90 percent reduction in sheep lost to predation in pastures with electrified fences (12). Electric fences require maintenance to ensure proper livestock protection, and snow and frozen ground can greatly reduce the effectiveness of electric fencing (12).

Adding electric wires at the top and electric trip wires to the bottom and middle of a mesh fence that is in good condition can help make it an effective predator barrier and is probably more cost effective than replacement. An electric trip wire placed about 6 inches off the ground and 8 inches outside the woven wire fence will help prevent predators from digging under it. Electric wires added to the top and at various intervals along the woven wire fence will discourage predators from climbing or jumping the fence.



Courtesy of Canadian Federation of Agriculture

Detailed information on building fences is available from the following sources:

- The Alberta publication *Protecting Livestock from Predation with Electric Fencing* is available at <<http://www.agric.gov.ab.ca/agdex/600/684-7.html>>
- The 47-page book *Fencing with Electricity*, published by Alberta Agriculture, Food and Rural Development Publication Office, is intended to help producers choose and build the right electric fence for their operation. (See **Further Resources**: Books, for ordering information.)
- The book *...May Safely Graze: Protecting Livestock Against Predators* by Eugene Fytche has a chapter on predator control fencing. (See **Further Resources**: Books, for ordering information.)
- The article “Sheep In, Coyotes Out: High Tensile Electric Fencing” is available at <http://www.suitee101.com/print_article.cfm/9948/63040>.
- The chapter entitled “Fencing Against Predators” from the *Sheep Production Handbook* is online at <<http://sheepusa.org/resource/handbook/chpredtr.htm>>.
- The 1983 Oregon State University publication *Building an Electric Antipredator Fence* is online at <<http://eesc.orst.edu/agcomwebfile/edmat/PNW225.pdf>>.
- The Maryland Small Ruminant Webpage is an excellent source of fencing information. It also links to many publications on fencing, as well as many fencing vendors. Go to <<http://www.sheepandgoat.com/fencing.html>>.

RECORD KEEPING

Accurate records provide a ready way to know when livestock is missing from a pasture. Knowing quickly that a loss has occurred helps speed the response to a predator problem. In addition, knowing the exact number and loca-

tion of the losses can help establish the predation pattern and identify problem areas on the farm or ranch (1).

NIGHT CONFINEMENT CLOSE TO RESIDENCES

Because many predators, including the coyote, are usually active between dusk and dawn, penning livestock in predator-proof pens at night should reduce losses. In addition, some predators are reluctant to approach any place where humans are present. Livestock will learn to come to the secure pens when they are regularly penned at night. Additional labor and maintenance of facilities may be required (13).

LAMBING IN SHEDS OR SECURE LOTS

Lambing in sheds or secure lots can reduce losses to predators. Shed lambing allows the producer greater access to the sheep to assist with lambing and will also provide the opportunity for lambing earlier in the season. The main disadvantages of shed lambing are the initial cost of the shed and the additional labor needed. The costs will vary depending on the accessibility of lambing facilities and feed, plus the availability of additional labor (14).

PROMPT REMOVAL OF ALL DEAD LIVESTOCK

Dead animals attract coyotes and other scavenging predators. Unless the dead animals are removed, the predators will become accustomed to the taste of livestock. Coyotes may depend on dead animals to remain in livestock-raising areas (13). One Canadian study indicates that on farms that promptly removed dead livestock, predator losses were lower than on farms where dead livestock were not removed (14). See the **Appendix** for information on various livestock disposal methods.

USING LARGER LIVESTOCK IN ROUGHER PASTURES WITH HISTORY OF PREDATOR PROBLEMS

Pastures with a history of predator problems should be avoided—especially during lambing. Pastures with rough terrain or dense vegetation provide good cover for predators. Placing only larger animals in these pastures will usually reduce the incidence of predation (11).

NOISE, LIGHT, AND VISUAL DEVICES

Predators can display uncanny abilities to outwit the producer's attempts to protect livestock. Producers may need to use two or more practices concurrently, and probably will need to vary the practices occasionally. Most predators are wary of any changes in their territory and will shy away from anything different until they become familiar with it. There are several devices that help discourage predators.

Electronic Guard

Developed by the USDA/APHIS/Wildlife Service, the Electronic Guard is a light-sensing device that is activated at dusk and de-activated at dawn. It combines a strobe light and a siren going off in random order. This random arrangement helps prevent predators from becoming accustomed to it. According to William Paul and Philip Gipson, authors of "Wolves," in *Prevention and Control of Wildlife Damage – 1994*, the Electronic Guard may be useful for up to four months in reducing livestock predation. They say that it is most effective in small open pastures, around penned livestock (15). Specific information on the use of the Electronic Guard is available at <<http://www.aphis.usda.gov/oa/pubs/eguard.html>>. Producers can contact their state Wildlife Service to see whether there is an Electronic Guard to rent; contact information for state Wildlife Services is available at <<http://www.aphis.usda.gov/ws/statereportindex.html>>. The Electronic Guard costs about \$270, not including the battery. An Electronic Guard can be ordered by writing the WS Pocatello Supply Depot, 238 E. Dillon St., Pocatello, ID 83201 or by calling (208) 236-6920.

Night Lighting

Lighting corrals at night may serve to frighten some predators away, but may also attract roaming dogs to the stock. Lights will allow the producer to see any predators that are in the pen. Lighting doesn't usually affect the livestock and they adapt quickly (11). In a 1977 Kansas study involving 100 Kansas sheep producers, lighting corrals at night had the clearest effect on losses from predators. Of the 79 sheep killed by coyotes in corrals, only 3 were lost in corrals with lights (16).

Propane Exploder

Propane exploders produce loud explosions at random intervals. They work best when the

interval is fairly short and the location is changed every couple of days. The Predator Defense Institute website publication *Controlling Coyote Damage to Livestock* says that the exploders are effective only temporarily, because coyotes become accustomed to the noise (13).

Bells

Producers have put bells on sheep for years to discourage predators; however, no data establishes the usefulness of this practice. Bells help to locate the sheep or to alert the producer to predator trouble in the flock (11).

Radio

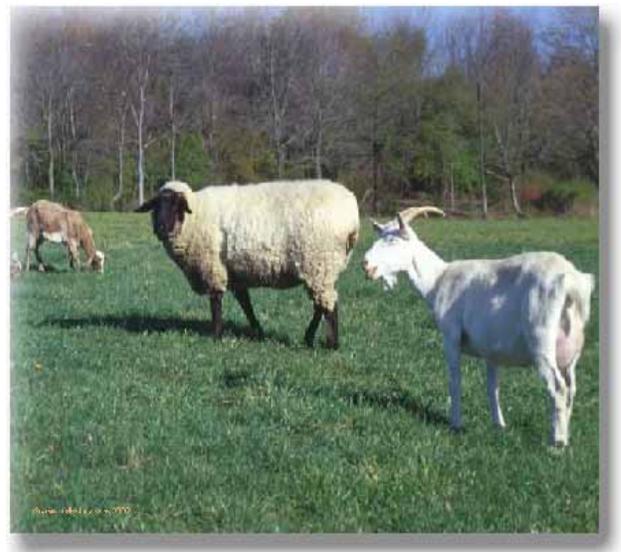
According to the Predator Defense Institute, "Use of a tractor radio or other loud radio tuned to an all night station (especially talk radio) is at least temporarily effective at deterring coyotes" (13).

Parking Vehicle in Area of Loss

Parking a car or pickup near the area where losses are occurring may temporarily deter coyotes, especially if the vehicle is moved frequently (16).

Other Visual and Noise Distractions

Eugene L. Fytche, author of *...May Safely Graze*, cites a producer who used visual distractions around the edges of his pasture. These included large pieces of styrofoam, wheel discs and aluminum pie plates, wind chimes, plastic oil containers filled with a variety of liquids, balloons, old clothes, and whatever came to hand. Fytche commented that the producer didn't have any losses in three years despite living in a high-risk area (17).





Courtesy of Iowa State University, Ames, Iowa

Guard Animals

Dogs, donkeys, and llamas can all serve as full-time guard animals. Which animal or animals are best depends on the type of livestock, the number and kind of predators, the type of terrain and acreage of pasture, as well as the producer's personal preferences. The effectiveness of any of these guard animals will also depend on the bonding, training, instincts, and temperament of individual animals. All guard animals require an investment of time and money, and there is no guarantee that they will be successful.

Sometimes a single guard animal will not be enough to protect the livestock. Several guard dogs can be used to patrol larger areas or to work together to better protect against packs of predators. A llama and guard dog combination can be trained to work cooperatively, but donkeys or llamas will not properly bond to livestock if more than one of their own species is present with the livestock. Rotational grazing can sometimes help, because the livestock are confined to a smaller area, allowing guard animals to be more effective.

Producers should research the costs and advantages of the various guard animals, and seek advice from other producers in the area with guard animal experience. Producers need to remember that guard animals by themselves will probably not be successful without implementation of other predator control methods. No one predator control method will solve every producer's predator problem, but combining several methods can help.

Some good general information on livestock guard animals is available from:

- The Maryland Small Ruminant webpage "Predator and wildlife management," an excellent source of information on all types of guard animals, <<http://www.sheepandgoat.com/predator.html>>.
- The Missouri Department of Conservation publication *Using Guard Animals to Protect Livestock* at <http://www.conservation.state.mo.us/documents/landown/wild/guard_animals.pdf>.
- The book *...May Safely Graze: Protecting Livestock Against Predators* by Eugene Fytche, which has several chapters on different guard animals. (See **Further Resources**: Books, for ordering information.)

GUARD DOGS

Livestock-guarding dogs originated in Europe and Asia. Most are large (80–120 pounds), mainly white breeds. Guard dogs do not herd sheep; they are full-time members of the flock. They stay with or near the flock most of the time and aggressively protect the sheep. In some instances guard dogs may injure the stock they are guarding or attack other animals, such as pets that enter their territory. They may also confront unfamiliar people (hikers, etc.) who approach the livestock. Producers using guard dogs should post signs to alert passers-by, and escort visitors going near the sheep (18). Neighbors should also be notified that you are using a guard dog, because a patrolling guard dog may be mistaken for a predator dog.

Usually, a successful guard dog is a standard guard breed that has been properly reared and trained. However, sometimes despite good breeding and training, a dog just won't guard properly. Many, but not all, of these failures trace back to improper rearing or to the dog being too old to bond with the sheep. Research and surveys indicate that only about three-fourths of guard dogs are temperamentally suited to being good guardians (18). In order to properly raise the best guard dog, the producer needs to understand what a good guard dog does, assess the temperament of the pup, and raise it correctly.

Some key points for raising a guard dog are:

- Select a suitable breed and reputable breeder.
- Rear pups singly from 8 weeks of age with sheep, minimizing human contact (probably the most critical ingredient for success).
- Monitor the dog and correct undesirable behaviors.
- Encourage the dog to remain with or near the livestock.
- Ensure the dog's health and safety.
- Manage the livestock in accordance with the dog's age and experience (e.g., use smaller pastures while the dog is young and inexperienced).
- Be patient and allow plenty of time to train your dog. Remember that a guardian dog may take 2 years or more to mature. (18)

The nearest office of the USDA/APHIS Wildlife Services (WS) should have additional information about using dogs to guard livestock. State WS contact information is available at <http://www.aphis.usda.gov/ws/statereportindex.html>.

The USDA/APHIS/WS has two predator prevention publications, *Livestock Guarding Dogs Protecting Sheep from Predators*, and *A Producers Guide to Preventing Predation of Livestock*, as well as a loaner video on using guardian dogs. These free publications and the video are available by contacting USDA/APHIS/LPA, Wildlife Service Publications, 4700 River Road, Unit 51, Riverdale, Maryland 20737, or by phone at (301) 734-7799. The publications are also available at <http://www.aphis.usda.gov/oa/pubs/guarddog.pdf> or <http://www.aphis.usda.gov/oa/pubs/prodguide.pdf>.

Additional information about using guardian dogs is also available by contacting any of these USDA/APHIS/WS specialists: Roger A. Woodruff (19), Jim Luchsinger (20), or Jeffrey S. Green (21).

Additional information on livestock guard dogs is available at:

- The 1988 Oregon State University publication *Raising and Training a Livestock-guarding Dog*,

available for \$1.50 (postage and shipping included) from Publications Orders, Extension & Station Communications, Oregon State University, 422 Kerr Administration, Corvallis, OR 97331-2119, (541) 737-2513, or at <http://eesc.orst.edu/agcomwebfile/edmat/EC1238.pdf>.

- The 2001 book *Dogs: A Startling New Understanding of Canine Origin, Behavior, and Evolution* by Raymond Coppinger and Lorna Coppinger, Scribner Publisher, ISBN #: 0-684-85530-5, which has an excellent chapter on Livestock Guardian Dogs. This book is available from [Amazon.com](http://www.amazon.com) and many other bookstores.
- The C&C Farm website, <http://www.c-c-farms.com>, a good source of practical information on guard dogs. C&C Farm's Beverly Coate is the author of the book *Ain't Life Grand with a Great Pyrenees Guarding the Flock*. (See **Further Resources: Books**, for ordering information.)

DONKEYS

Donkeys make good guard animals because they naturally hate dogs and coyotes, are not afraid of them, and like to intimidate them. Donkeys also are social animals that will associate with other species of livestock in the absence of other donkeys; however, it can take a donkey four to six weeks to fully bond with a sheep flock. Because they can eat what the sheep eat, guard donkeys can be low-maintenance; however, it is also important to feed the donkey something at the same time the sheep are fed. This will help the donkey understand that if it stays by the flock it will not miss a meal. Do not overfeed the donkey or let it become overweight. Never feed the donkey away from the flock; you want the donkey to stay always with the flock (22). It is very important that donkeys do not receive any feed that contains Rumensin, Bovatec, urea, or other products intended only for ruminant animals, as they can be poisonous to single-stomached animals like donkeys. Donkeys need routine veterinary care, such as hoof trimming, teeth filing, and parasite management. Hoof care is very important, and all donkeys need to be trained to accept hoof trimming.

Additional Guard Donkey Guidelines

- Select donkeys from medium- to large-size stock. Do not use extremely small or miniature donkeys.
- Do not acquire a donkey that cannot be culled or sold if it fails to perform properly.
- Use jennies and geldings. Jacks are usually too aggressive.
- Test a new donkey's guarding response by challenging the donkey with a dog in a corral or small pasture.
- Use only one donkey or jenny and foal per pasture.
- Isolate guard donkeys from horses, mules, and other donkeys.
- To increase the probability of bonding, donkeys should be raised from birth or placed at weaning with livestock.
- Raise guard donkeys away from dogs. Avoid or limit the use of herding dogs around donkeys.
- Monitor the use of guard donkeys at lambing, calving, or kidding, as some may be aggressive to new borns or overly possessive. Remove the guard animals for a period of time if necessary.
- Use donkeys in open pastures with no more than 200 head of sheep, goats, or cattle for best results. Large pastures, rough terrain, dense brush, and too large a herd lessen the effectiveness of guard donkeys (22).

Additional information on using guard donkeys is available from the following sources:

- The Ontario publication *Guidelines for Using Donkeys as Guard Animals with Sheep* provides excellent information on many of the considerations for determining whether using guard donkeys is best for a producer's situation. It is available at <<http://www.gov.on.ca/OMAFRA/english/livestock/sheep/facts/donkey2.htm>>.

- The Alberta publication *The Donkey: Management* is a good source of general information on donkeys and is available at <<http://www.agric.gov.ab.ca/agdex/400/6700201b.html>>.
- The American Donkey and Mule Society, Inc., is a good source of information and can be contacted at PO Box 1210, Lewisville, TX 75067, by phone at (972) 219-0781, or at <<http://www.lovelongears.com>>.

LLAMAS

Llamas are aggressive toward coyotes and dogs. When they spot a predator or intruder, most llamas give a warning call, walk or run toward the intruder, and then begin to chase, kick, and paw at it. Llamas are easy to handle, can usually be trained in a few days, and have a high success rate. Once a llama is attached to the sheep and area, the area and sheep become the llama's territory and family. The llama becomes an active leader and protector. Llamas often play with lambs. Llamas seem to bond with cattle as well as they bond with sheep and goats (22). Llamas with long hair may need shearing occasionally. Llamas that have bonded with humans by bottle-feeding or excessive handling may not make good guard animals (23).

Llamas are good guardians against single coyotes and some other predators. However, llamas (like other guard animals) can be killed by packs of coyotes or dogs, or even a single neighborhood dog that is not intimidated by the guard animal's aggressive attitude. If the llama's attitude is not sufficient to scare off the predator, the llama may become prey itself, be-



cause it is about as defenseless as the animals it is guarding. Good fencing is a must to help llamas better protect themselves, but even that may not be enough in all circumstances (24).

In a 1990–'91 Iowa State University study, researchers interviewed 145 sheep producers throughout the United States who were using guard llamas. The study looked at the characteristics of guard llamas and at their husbandry. Some of the report's results are:

- Most introductions require only a few days or less for sheep and llama to adjust to each other.
- The average ranch uses one gelded male llama pastured with 250 to 300 sheep on 250 to 300 acres.
- Sheep and lamb losses average 26 head per year (11 percent of flock) before using guard llamas and 8 head per year (1 percent of flock) after.
- More than half of guard llama owners report 100-percent reduction in predator losses.
- Llamas are introduced to sheep and pastured with sheep under a variety of situations.
- Multiple guard llamas are not as effective as one llama.
- Ranchers estimate an annual savings of \$1,034, and 85 percent say they would recommend guard llamas to others.
- Protectiveness of sheep and easy maintenance are the two most commonly cited advantages.

The report from the Iowa State University study is summarized in the publication *Guard Llamas: A Part of Integrated Sheep Protection*, available for \$0.75 plus \$1 shipping from Extension Distribution Center, 119 Printing and Publications Building, Iowa State University, Ames, IA 50011–3171, by phone at (515) 294–5247 or on their website at <<http://www.extension.iastate.edu/Publications/PM1527.pdf>>.

- Problems encountered include aggressiveness and attempted breeding of ewes, overprotection of flock, and sheep interference with feeding the llama.
- Overall, llamas are effective guards with high sheep-producer satisfaction. (25)

Other excellent sources of information on guard llamas include:

- The International Llama Association, which has many great brochures on llama management, including *Guard Llamas: An Alternative for Effective Predator Management* and *Guard Llama Guidelines: Recommendations for Selection & Placement of Guard Llamas*. Go to <<http://internationalllama.org/html/secure/silabrochures.html>>.
- The Website Llamapaedia, a good source of general management, maintenance, and other practical information about llamas. Two Llamapaedia publications on guard llamas are: *Sheep Guarding* and *Guarding Behavior* at <<http://www.llamapaedia.com/uses/guard.html>> and <<http://www.llamapaedia.com/behavior/guardbehav.html>>.

MULTISPECIES GRAZING

Dr. Dean M. Anderson at the USDA Jornada Experiment Range (JER) in New Mexico has been working on using bonding between cattle and sheep to create what is called a “flerd,” a bonded herd of cattle and flock of sheep for free-ranging conditions. The flerd is created by pen bonding a small group of around 7 weaned lambs of the same gender with 3 non-aggressive or non-abusive heifers or cows for about a month and a half or two months. The pen bonding process conditions the sheep to bond to the cattle and stay close to them when they are foraging in the pasture, rather than forming two separate groups. When a threat appears, the bonded sheep run among the cattle and stay there until the threat is over (whereas non-bonded sheep bunch together and stay independent of the cattle.) The sheep are evidently protected by the number and size of the cattle. The bonding

seems to be only one-way, with the sheep changing their behavior, and the cattle seeming just to tolerate the presence of the sheep (26).

Pen confinement to establish bonding can be incorporated into other management strategies such as pen lambing or winter-feeding. When pen bonding is initiated, it is important to have a safe area where the sheep can escape if the cattle become aggressive. On the first day of bonding, have the sheep confined in a safe area with the cattle on the other side. After the first day allow the sheep into the cattle area to begin eating and socializing together. The sheep's location in the pen can highlight problems; sheep with abusive cattle will spend twice as much time in the safe area as sheep with non-abusive cattle. Dr. Anderson's research suggests that penning recently weaned lambs or kids with docile, gentle cattle for a minimum of 40 to 50 consecutive day of uninterrupted confinement can result in a consistent bond. Dr. Anderson is attempting to find ways to reduce the necessary bonding time (26).

Besides predator protection, bonded flocks provide the other benefits of multispecies grazing. Grazing both species together makes better use of the forage in the pasture. Anderson recommends "sheep-proof" boundary fences but adds that "sheep-proof" internal fencing is not necessary for the flock, because the sheep consistently remain with the cattle during both foraging and resting. Flocks are not limited to sheep and cattle. Dr. Anderson has also bonded 5-month old mohair kids and 100-day-old Spanish kids with cattle. Some of the Spanish kids dem-

onstrated few flocking tendencies, but Dr. Anderson considers it possible to create a Spanish goat flock by selecting only animals that stay with the flock, and eliminating any that refuse. The mohair kids seemed to flock readily and to bond well with both the cattle and the sheep (26).

For additional information on bonding cattle, sheep, and/or goats, contact Dr. Dean M. Anderson, at USDA/ARS, MSC 3JER, New Mexico State University, PO Box 30003, Las Cruces, NM 88003-0003, or phone at (505) 646-5190.

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- 7) Wildlife Services. No date. Protecting American Livestock: An Important and Successful Federal Role. USDA/APHIS. 2 p. <<http://www.aphis.usda.gov/ws/introreports/livestock.pdf>>.

Other ATTRA Publications on Multispecies Grazing and Pasture Management:

[Multispecies Grazing](#)
[Sustainable Pasture Management](#)
[Rotational Grazing](#)
[Matching Livestock and Forage Resources in Controlled Grazing](#)
[Introduction to Paddock Design & Fencing-Water Systems for Controlled Grazing](#)
[Assessing the Pasture Soil Resource](#)
[Nutrient Cycling in Pastures](#)

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- 11) Animal and Plant Health Inspection Service. 1994. A Producers Guide to Preventing Predation of Livestock. USDA Agriculture Information Bulletin No. 650. 14 p. <<http://www.aphis.usda.gov/oa/pubs/prodguide.pdf>>.
- 12) Anon. 1997. Protecting Livestock from Predation with Electric Fences. Alberta Agriculture, Food, and Rural Development. 5 p. <<http://www.agri.gov.ab.ca/agdex/600/684-7.html>>.
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- 19) Roger A Woodruff
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5949 S. 58th Street
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(303) 969-6565, Extension 233
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Further Resources

WEBSITES

USDA/APHIS/WS:

<http://www.aphis.usda.gov/ws/statereportindex.html>

Each state's Wildlife Service activity report and state WS contact information.

<http://www.aphis.usda.gov/oa/pubs/guarddog.pdf>

Publication *Livestock Guarding Dogs Protecting Sheep from Predators*.

<http://www.aphis.usda.gov/oa/pubs/prodguide.pdf>

Publication *A Producers Guide to Preventing Predation of Livestock*.

National Association of State Departments of Agriculture:

http://www.nasda-hq.org/nasda/nasda/member_information/gen_main.htm

Each state's Department of Agriculture contact information listed in a directory.

Maryland Small Ruminant Page:

<http://www.sheepandgoat.com/predator.html>

Predator and Wildlife Management has links to many different sources of information and publications in all areas of predator damage control and management.

<http://www.sheepandgoat.com/fencing.html>

Fencing has links to many publications on fencing, as well as many fencing vendors.

Alberta Agriculture, Food, and Rural Development Ministry:

<http://www.gov.on.ca/OMAFR/english/livestock/sheep/facts/coydog2.htm>

Publication *Something's Been Killing My Sheep – But What? How to Differentiate Between Coyote and Dog Predation*.

<http://www.agric.gov.ab.ca/agdex/600/684-7.html>

Publication *Protecting Livestock from Predation with Electric Fencing*.

<http://www.agric.gov.ab.ca/agdex/400/6700201b.html>

Publication *The Donkey: Management*.

Ontario Ministry of Agriculture, Food and Rural Affairs:

<http://www.gov.on.ca/OMAFRA/english/livestock/sheep/facts/donkey2.htm>

Publication *Guidelines for Using Donkeys as Guard Animals with Sheep*.

Canadian Federation of Agriculture:

<http://www.cfa-fca.ca/english/publications/wildlife/wolf.htm>

Publication *Preventing Wolf Predation on Private Land*.

Iowa State University:

<http://www.extension.iastate.edu/Publications/SA8.pdf>

Publication *Composting Dead Livestock: A New Solution to an Old Problem*.

http://www.suite101.com/print_article.cfm/9948/63040

Article "Sheep In, Coyotes Out: High Tensile Electric Fencing."

<http://www.extension.iastate.edu/Publications/PM1527.pdf>

Publication *Guard Llamas: A Part of Integrated Sheep Protection*.

Minnesota Department of Agriculture:

<http://www.mda.state.mn.us/AMS/wolf.htm>

Publication *Wolves in Farm Country: A Guide for Minnesota Farmers and Ranchers Living in Wolf Territory*.

<http://www.mda.state.mn.us/composting/compostguide.pdf>

Publication *Composting Animal Mortalities*.

Missouri Department of Conservation:

http://www.conservation.state.mo.us/documents/landown/wild/guard_animals.pdf

Publication *Using Guard Animals to Protect Livestock*.

University of Nebraska-Lincoln:

<http://deal.unl.edu/icwdm/handbook.shtml>

Book *Prevention and Control of Wildlife Damage – 1994* has separate chapters for more than 90 species of wildlife that may cause damage to crops or livestock. Each of these chapters provides identification, damage prevention, and control methods.

Oregon State University:

<http://eesc.orst.edu/agcomwebfile/edmat/PNW225.pdf>

Publication *Building an Electric Antipredator Fence*.

<http://eesc.orst.edu/agcomwebfile/edmat/EC1238.pdf>

Publication *Raising and Training a Livestock-guarding Dog*.

Texas A&M University:

<http://texnat.tamu.edu/ranchref/predator/b-1429-2.htm>

Publication *Procedures for Evaluating Predation on Livestock and Wildlife*.

American Sheep Industry Association, Inc.:

<http://sheepusa.org/resource/handbook/chpredtr.htm>

The book *Sheep Production Handbook* chapter entitled "Fencing Against Predators."

American Donkey and Mule Society, Inc.:

<http://www.lovelongears.com>

Good source of general information on donkeys and guard donkeys.

C&C Farm Website:

<http://www.c-c-farms.com>

Good source of general management and great practical information on guard dogs.

International Llama Association:

<http://internationalllama.org/html/secure/silabrochures.html>

Brochures on llama management, including *Guard Llamas: An Alternative for Effective Predator Management* and *Guard Llama Guidelines: Recommendations for Selection & Placement of Guard Llamas*.

Livestock and Poultry Environmental Stewardship:

http://www.lpes.org/Lessons/Lesson51/51_Mortality_Management.html

Curriculum: *Lesson 51: Mortality Management* on composting dead livestock.

Llamapaedia Website:

<http://www.llamapaedia.com/uses/guard.html>

Publication *Sheep Guarding*.

<http://www.llamapaedia.com/behavior/guardbehav.html>

Publication *Guarding Behavior*.

BOOKS

...May Safely Graze: Protecting Livestock Against Predators

Eugene Fytche

R.R. 1

Almonte, Ontario K0A 1A0

(613) 256-1798

Book is \$12.95 including shipping to U.S.

Prevention and Control of Wildlife Damage Handbook—1994

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University of Nebraska

Lincoln, NE 68583-0810

(402) 472-2188

<http://wildlifedamage.unl.edu/>

Book is \$40 plus \$5 shipping. CD-ROM is \$40 plus \$3 shipping.

Coyote Predation of Livestock—Agdex 684-19 for \$8 Canadian plus shipping or *Fencing with Electricity—Agdex 724-6* for \$10 Canadian plus shipping or *Methods of Investigating Predation of Livestock—Agdex 684-14* for \$8 Canadian plus shipping

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NCAT Agriculture Specialist

Edited by **Paul Williams and**

Richard Earles

Formatted by **Gail M. Hardy**

April 2002

The electronic version of **Predator Control for Sustainable & Organic Livestock Production** is located at:

HTML

<http://www.attra.ncat.org/attra-pub/predator.html>

PDF

<http://www.attra.ncat.org/attra-pub/PDF/predator.pdf>

Appendix: Disposal of Dead Livestock

Regulations for disposal of livestock mortalities vary from state to state. Most states require timely disposal of mortalities, usually within 24 to 48 hours. A state's Department of Agriculture is usually in charge of regulations concerning the allowable methods of disposal, including incineration, burying, rendering, and/or composting. Producers should contact their local Extension Agent or their Department of Agriculture (Department of Health in Arkansas) for specific regulations and requirements. The National Association of State Departments of Agriculture has each state's contact information listed in a directory located at <http://www.nasda-hq.org/nasda/nasda/member_information/gen_main.htm>.

Incineration of the carcass is one disposal method. Incinerators can be expensive to buy and operate, and their capacity is generally limited to smaller animals. Some incinerators may generate air pollution and objectionable odors. Incinerators are not very practical for small or mid-size livestock producers, if other disposal methods are available.

Burial is a common practice and is generally regulated by the state. The livestock carcass usually needs to be buried 4 to 8 feet deep, and the possible problem of contamination leaching into the ground water needs to be considered. Handling animal mortalities by burial in the winter with the ground frozen can also pose problems. Scavengers can uncover improperly buried mortalities.

Renderers' pickup services vary greatly from one area to another. Renderer pickup, if available, may be costly and be limited to certain quantities and/or species (sheep and goats are usually not picked up because of concerns about scrapie infection) (1).

Composting of livestock carcasses may also be regulated by the state; some states do not allow sheep or goat composting because of concerns about scrapie. If composting is allowed, producers should consider it because composting is cost effective, environmentally sound, and relatively easy. Composting dead animals is achieved by layering the carcasses and the organic waste amendments according to a prescribed plan and not mixing the materials until the composting has finished and the dead animals are fully decomposed (longer time for larger carcasses). Compost piles that are properly constructed and correctly covered with compost mixed to capture odors will not attract scavengers. However, fencing should be used around compost piles to keep out predators and dogs.

The Natural Resource, Agriculture and Engineering Service (NRAES) has two excellent publications on composting that provide specific mortality composting guidelines. They are *On-Farm Composting Handbook*, NRAES-54 for \$25 plus postage, and the *Field Guide to On-Farm Composting*, NRAES-114 for \$14 plus postage. They can be ordered at (607) 255-7654 or at <<http://www.nraes.org>>.

Other sources of information on composting livestock carcasses are:

- The publication *Composting Animal Mortalities* at <<http://www.mda.state.mn.us/composting/compostguide.pdf>>
- The website *Livestock and Poultry Environmental Stewardship Curriculum: Lesson 51: Mortality Management* at <http://www.lpes.org/Lessons/Lesson51/51_Mortality_Management.html>
- The publication *Composting Dead Livestock: A New Solution to an Old Problem* at <<http://www.extension.iastate.edu/Publications/SA8.pdf>>

Reference:

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