



United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Agriculture
Information
Bulletin
Number 588

Livestock Guarding Dogs Protecting Sheep from Predators



The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

Issued March 1990
Revised July 1999

Livestock Guarding Dogs

Jeffrey S. Green
Wildlife Services, APHIS, USDA
12345 W. Alameda Parkway, #204
Lakewood, CO 80228

Roger A. Woodruff
Wildlife Services, APHIS, USDA
720 O'Leary Street, N.W.
Olympia, WA 98502

Cover photo: An Akbash dog, watching over sheep on Idaho rangeland.

Photos on pages 7 and 19 were provided by the American Sheep Industry Association.

Acknowledgments

The authors acknowledge the contributions of Robinette Harman and Robin Van Horn. Their services as dog handlers in the care, training, and evaluation of dogs were vital to the success of the guarding dog research at the U.S. Sheep Experiment Station in Dubois, ID. Many people responded to questionnaires, which also benefited this research. Cooperating sheep producers who worked with dogs from the project also added information to the study. R. Coppinger, C. V. Hulet, A. Knight, and J. McGrew provided helpful reviews of the manuscript. R. Beach and W. Paul provided helpful comments on a previous edition.

Contents

Introduction	5	Managing Dogs on Rangeland and Pastures	20	Sources of Additional Information	31
The Guarding Dog Concept	7	Considerations in Fenced Pasture Operations	20	Bibliography	32
Selecting the Right Dog	7	Dogs on Rangeland	22		
Characteristics of an Effective Guarding Dog	7	Kenneling Dogs Through Winter	23		
Considerations	7	Transferability	23		
Selecting an Appropriate Breed	8	Owner Responsibilities	24		
Behavioral Evaluation	9	Dogs and Human Welfare	24		
Male or Female?	14	Dog Health and Care	24		
How Many Dogs?	15	Dog Safety	25		
From Puppy to Guarding Dog	12	Dog Breeding by the Livestock Producer	26		
Dog Rearing and Socialization	12	Economic Considerations	26		
Training and Obedience	14	Benefits and Problems	27		
Dog–Sheep Interactions	16	Effectiveness Against Various Predators	28		
Dog Age and Effective Guarding	16	Integrated Livestock and Predator Management	29		
Daily Routine and Behavior	17				
Dog Response to Frightening Experiences	17				
Extent of Human Contact	17				
Guarding Dogs During Lambing	17				
Interactions Between Herding and Guarding Dogs	18				

Introduction

In the late 1970's, there began a resurgence in the use of an ancient form of sheep protection, the guarding dog. Several factors contributed to this phenomenon, including Federal restrictions on the use of substances to kill predators, the relative inability of existing techniques to provide adequate relief from predation in certain situations, and a desire by some to use nonlethal methods of reducing the loss of livestock to predators.

The use of guarding dogs to protect livestock¹ can be traced to many centuries B.C. in Europe and Asia, but little was recorded about how the dogs were actually worked. Only recently have researchers begun to find answers to pertinent questions about livestock guarding dogs.

There is no doubt that some dogs can protect sheep, but under what conditions is a guarding dog a good choice or an unwise choice for deterring predation? If a guarding dog is a reasonable choice, how does the owner acquire, raise, train, and effectively use a dog with a flock? Which breeds are best

¹ Although this publication speaks specifically about sheep, the concepts also relate to most other species of livestock (e.g., goats, cattle, and swine).

suiting to the task, and what are the costs and risks involved?

A sheep producer who has significant losses to predators may be willing to deal with the potential problems involved with raising and using a guard dog. If losses are low, the producer may not find it worth the effort to raise and train a dog.

Some think that the purchase of a guard dog will immediately solve their predator problems. Unfortunately, this is rarely the case. There may be an apparent lack of any immediate benefits from using a dog, or a young dog may not seem as aggressive or protective as the producer expects it to be. The owner and herder should both express commitment to the guard dog concept when attempting to establish a dog in the flock. Guard dogs cannot be turned on and off at will, and possible benefits offered by the dog are generally not realized without an initial investment of time and patience.

We have raised numerous dogs under similar conditions. Most became good livestock guardians, but some did not. Instinctive ability must be present for a dog to be successful, and no amount of proper training and early exposure to livestock can guarantee that a dog will become a good guardian.

There have been some dogs raised as pets that were later trained by dedicated people to become good guardians. Other exceptional dogs have suddenly shown a desire to be with sheep despite not having been raised under ideal conditions. Instances such as these are rare, and most dogs will require some degree of appropriate socialization and experience with sheep to become reliable guardians.

In general, acquiring a guarding dog does not offer immediate relief from predation because mature and effective guardians are not available to most producers. Considerable time, effort, and good fortune are required to bring a puppy to maturity. In some situations, a dog may be ineffective. In others, a dog may be all that is necessary to stop predation. Between these two extremes, dogs may be used to supplement electric fencing, trapping, aerial hunting, or other forms of control.

There are few hard-and-fast rules with respect to dogs and sheep. Many variables interact to produce successful guarding dogs. This bulletin presents information based on experiences of the authors, various researchers, and a growing number of ranchers who have successfully used dogs as part of their program of predator management.

The Guarding Dog Concept

A livestock guarding dog is one that generally stays with sheep without harming them and aggressively repels predators. The dog chooses to remain with sheep because it has been reared from puppyhood with them. Its protective behaviors are largely instinctive, and there is relatively little formal training required other than timely correction of undesirable behaviors (e.g., chewing on ears, overplayfulness, and excessive wandering). The guarding dog is not a herding dog but rather a full-time member of the flock. Success of the dog is a result of a quality genetic background with an emphasis on proper rearing.

Success may be enhanced by viewing a livestock guarding dog as a tool to be incorporated into the overall management of a sheep operation. Dogs do not perform automatically like a piece of machinery, and their behavior is variable. Producers who successfully use a dog may need to slightly alter their management routine to take advantage of the traits of the dog. This may include grazing sheep in different pastures, separating or grouping sheep,



These guarding dogs, a Great Pyrenees and an Akbash dog, stay close to the flock, causing no harm to the sheep but aggressively repelling predators.

moving supplemental feed or sources of water, changing fence design and

configuration, or altering schedules of checking the flock.

Selecting the Right Dog

Characteristics of an Effective Guarding Dog

An ideal guard dog is intelligent, alert, and confident. It must act independently and react instinctively while protecting the flock. It will investigate and aggressively confront intruders, but above all, it must be attentive to sheep and not harm them. An investigative and aggressive dog is of little benefit if it will not stay near its flock. The dog should be physically sound and of good conformation. It should be free from serious genetic defects such as hip dysplasia or a poor bite.

It is important to understand the distinction between herding dogs and guarding dogs. Herding dogs (border collies, Australian shepherds, and others) move sheep from one area to another by biting, chasing, or barking at the sheep. Herding dogs work according to signals (verbal and hand) from a handler, and they are generally not left alone with the sheep. Guarding dogs usually do not herd sheep, are discouraged from biting, chasing, and barking at sheep, and act independently of people. (Also see section on “Interactions Between Herding and Guarding Dogs.”)



This border collie, a herding dog, is bred to “bunch” and move sheep from one area to another on command from its owner.

Considerations

The behavior displayed by a mature guarding dog is a result of heredity (genetic factors) and how the dog was raised. Most important are experiences during the dog’s first few months of life. (See section on “Dog Rearing and Socialization.”)

Generally speaking, livestock guarding dogs mature slowly. Komondors and Anatolian shepherds seem to reach a degree of behavioral maturity at 18 to 30 months of age, while Great Pyrenees appear to mature earlier. During maturation, a dog experiences rapid physiological and behavioral changes. The young dog may show strong desires for playful activities and seemingly irrational behavior. A puppy or adolescent dog should not be expected to match the performance of a mature, experienced guardian. During the first several months with sheep, a young dog will almost certainly make mistakes.

Another trait common to the guarding breeds is a predisposition for independent behavior. Some dog breeds are selected for their responsiveness to humans, but the guarding

breeds have been historically selected for their ability to act independently in their guarding role. This trait makes them relatively hardheaded and unresponsive to verbal commands. Some training as a pup and familiarization with the handler can help eliminate problems in the mature dog.

The young guarding dog will respond in various ways to novel stimuli, and certain responses may be problematic. Some guarding dogs may chase wildlife (rabbits, deer, elk, antelope). This behavior should be discouraged if the chasing continues beyond a short distance. Harassing big game is illegal in most States, and it removes the dog from the sheep the dog is supposed to protect.

It is difficult to generalize on how each dog will respond to each new experience. Most dogs will be sprayed by a skunk or get a nose full of porcupine quills if they encounter these particular animals. Each situation must be evaluated by the dog owner and handled appropriately.

Selecting an Appropriate Breed

Dog research in the United States was conducted primarily at two locations, Hampshire College's New

England Farm Center (NEFC) in Amherst, MA, and the U.S. Sheep Experiment Station (USSES), U.S. Department of Agriculture, Agricultural Research Service, Dubois, ID. Researchers at NEFC worked with several

breeds of dog from Europe and Asia including the Maremma (Italy), the Shar Planinetz (Yugoslavia), the Anatolian shepherd (Turkey), and various crosses of these breeds. Work at the USSES involved the Komondor (Hungary), the



At about 7 to 8 weeks of age, these Great Pyrenees pups will be separated and placed in close contact with sheep so that they will become bonded to them.

Great Pyrenees (France and Spain), and the Akbash (Turkey).

Other breeds of dog with a history of protecting livestock include the Kuvasz of Hungary and the Briard of France. Only a limited number of these dogs is available. Several other breeds have been used in the past with livestock, but it is not certain whether their primary function was one of protection. In addition to distinct breeds, some Navajo Indians use mongrel dogs to protect their sheep and goat flocks. These dogs are not the result of a specific breeding program. Their success appears to be related to the manner in which they are reared and trained.

In 1986, the University of Idaho conducted a survey of approximately 400 people who used livestock guarding dogs. These individuals reported on 763 dogs, 95 percent of which were recognized guarding breeds. Great Pyrenees (57 percent) and Komondor (18 percent) were the most common, followed by Akbash (8 percent), Anatolians (7 percent), Maremmas (3 percent), and others (7 percent). The rate of success among the breeds was not different, but behavioral differences were noted. More Komondors bit

people than did Great Pyrenees, Akbash, or Anatolians, and fewer Great Pyrenees injured livestock than did Komondors, Akbash, or Anatolians.

In a recent evaluation of yearling livestock guarding dogs, Great Pyrenees were rated significantly higher than Anatolian shepherds (83 percent of 59 Pyrenees versus 38 percent of 26 Anatolians rated as good). Anatolian shepherds were rated lower primarily because of their higher tendency to injure or kill sheep.

Most dogs in the 1986 Idaho survey were aggressive to predators and other dogs, although Great Pyrenees seem to be somewhat less aggressive to dogs than other guarding breeds. We observed a difference in the rate of behavioral maturation in Great Pyrenees and Komondors at the USSES. Great Pyrenees (26 dogs from 11 different breedings) exhibited behavioral maturity at a younger age and displayed puppy behaviors (playfulness and exuberance) less frequently than USSES Komondors (26 dogs from 10 different breedings). In our recent work with several breeds, Anatolians exhibited a delay in behavioral maturity similar to that of Komondors.

Certain bloodlines of dogs may prove to be better than others, and guarding ability varies among dogs of a specific breed. There is no guarantee that a dog will be successful merely because it is of a particular breed or bloodline. It is also conceivable that certain breeds or lines can be matched to specific guarding situations (pastures or open range).

Ranch operators should purchase a dog of a recognized guarding breed from a reputable breeder who knows the dog he or she sells. With a little research, you can determine which kennels have supplied good dogs in the past. Many breeders offer some type of guarantee with their working dogs. The details of the guarantees vary, but some provide for replacing a dog that doesn't work satisfactorily. These guarantees certainly are a benefit, but they don't absolve the livestock producer of the prime responsibility of properly rearing and caring for the dog. (See section on "Economic Considerations" for information on purchase price.)

Behavioral Evaluation

It would be advantageous to be able to select a pup from a litter based on key behavioral characteristics and

have a reasonable assurance that, with proper rearing, the dog would perform the guarding task well as an adult. One researcher determined that the basic temperament of young pups remains with them throughout their lives, and that general temperament can be assessed at 6 to 8 weeks of age. However, it has also been observed that temperament can vacillate and be unstable in the 4- to 18-month-old dog.

Pups at the USSES were observed periodically from 8 weeks of age to maturity (20 to 30 months of age). Several points concerning puppy behavior merit attention. We recommend selecting a pup that is not timid but appears self-confident and alert. A pup should bark as an expression of aggressiveness or suspicion but not fear. A dog that is shy around people may show appropriate aggression to predators and have a strong bond with sheep, but the chances for success are probably greater by selecting a self-confident pup.

Observe the pup's behavior both with and apart from people and littermates. We observed one Akbash female that was submissive to people, but she was aggressive to other dogs and had an affinity for sheep. A shy pup

may gain confidence when placed with another dog.

All successful dogs at the USSES displayed positive traits within the first 3 to 8 months of life. Although some traits may develop with maturity, most good guarding dogs will show promise at a young age.

Male or Female?

In the 1986 survey of 763 guarding dogs, there was no difference between the success of males and females. Making a selection on the sex of the pup is a matter of personal preference. However, to avoid future problems, consider the sex of other dogs used in the livestock operation. If all dogs are neutered, gender may become unimportant.

Our survey revealed no significant differences between the rate of success of intact versus neutered dogs. We strongly recommend spaying females at about 6 months of age before the first heat cycle and neutering males at about 9 months of age. There is no indication that neutering is detrimental to the guarding dog. Indeed, neutering is more likely to be beneficial. The regular heat periods of the bitch can cause problems. Dogs attracted to a bitch in

heat may add to the predator problem. If a female is kenneled during heat periods, late pregnancy, whelping, and nursing, she is not out protecting the flock. Neutering probably lessens the usually undesirable behavior of wandering in some male dogs and perhaps females. We have seen no evidence that neutering males significantly decreases their effectiveness. (See section on "Dog Breeding by the Livestock Producer.")

How Many Dogs?

The characteristics of each sheep operation will dictate the number of dogs required for effective protection from predators. The performance of individual dogs will differ. Some experienced dogs may effectively patrol several hundred acres containing hundreds of sheep, while younger dogs may not cover as much territory.

The type and number of predators and the intensity of predation help dictate how many dogs are needed. If predators are scarce, one dog will be sufficient for most pasture operations. Range operations often use two dogs, but if the predator is a grizzly bear, even several dogs may not be able to deter it. (See section on "Effectiveness Against Various Predators.")

The topography and habitat of the pasture must also be considered. Relatively flat, open areas can be adequately covered by one dog. When brush, timber, ravines, and hills are in the pasture, several dogs may be required, particularly if the sheep are scattered. However, at noted later, problems may be encountered when establishing more than one dog in the flock.

The behavior of the sheep is important also in determining the number of dogs needed. Sheep that flock and form a cohesive unit, especially at night (a typical time of predation), can be protected by one dog more effectively than sheep that are continually scattered and bedded in a number of locations. For example, at the USSES a young Komondor effectively protected 600 ewe lambs in a 125-acre pasture. In another situation, a young Komondor was unable to eliminate predation in a flock of 600 ram lambs in a 160-acre pasture. The ram lambs grazed in a scattered fashion, and the pasture contained rock outcrops and brush that provided cover for coyotes. An older, experienced dog might have

protected the lambs more effectively than the young dog, but in this situation, two dogs would have been more desirable.

In another instance, a 7-month-old Great Pyrenees eliminated predation effectively in 4 adjacent 160-acre pastures, each containing approximately 30 sheep. The dog was observed with each of the four groups of sheep on different occasions. He later guarded seven different 160-acre pastures, each containing several hundred sheep.

With a range band (usually 1,000 ewes plus their lambs), some operators have reduced predation with a single dog; others have used four or more dogs per band. However, we generally recommend starting with a single dog and adding a second dog after the first is well established. Once the experienced dog has developed an effective working pattern, it can become a role model for an untrained (but previously socialized to sheep) dog. The younger dog will mimic the older, more experienced dog and learn the routine of protecting the flock.

A pair of guarding dogs at USSES exhibited behaviors that were comple-

mentary. One dog was aggressive and routinely patrolled a wide area around the sheep. The second dog usually remained close to the band and responded aggressively only when the flock was directly confronted by a predator. It is rather common for two dogs to exhibit complementary behaviors in this manner.

Adding additional dogs to the flock may also cause problems. If one of the dogs displays inappropriate behaviors, the second dog may adopt them also. These behaviors may include being aggressive to the sheep, being inattentive to the sheep, and roaming, the most common potential problem with multiple dogs. Roaming may be more common with multiple dogs than single dogs and clearly can be a significant problem in many situations. Early appropriate training and neutering can help reduce roaming. We recommend that first-time users of a guarding dog begin with a single pup. No amount of reading and studying the manuals can take the place of hands-on experience. If additional dogs are needed, they can be added later.

From Puppy to Guarding Dog

Dog Rearing and Socialization

The goal with a new puppy is to channel its natural instincts to produce a mature guardian dog with the desired characteristics. This can best be accomplished by early and continued association with sheep to produce a bond between the dog and sheep. If this bond is not developed, the dog may not stay with the sheep. The optimum age to bring the pup home is between 7 and 8 weeks of age. Place the pup immediately in the pen you have prepared as described below. The following discussion describes rearing one pup with sheep. Some people report success rearing two pups together with sheep.

The ideal place to rear a pup is in a small pen or corral from which it cannot escape. A pup that has been removed recently from littermates and the frequent association of humans may not want to remain in a pen with lambs. If the pup is able to leave its designated area, the inclination of the pup to escape and return to the kennel, home, and people becomes progressively stronger. If the pup is unable to escape, the bond with sheep may develop more



Rearing this Great Pyrenees pup with sheep creates a bond that will be important in determining the dog's future success as a protector.

easily. Later, as the dog is placed in larger pastures where it can leave, the

tendency to return to the farm house is minimized.

The pup's pen need not be much larger than about 150 ft², although a bigger area is more desirable as the pup grows. The pen should contain three to six sheep, preferably lambs (orphans are ideal). If lambs are not available, pick sheep that will not be aggressive to the young pup, for example, replacement ewe lambs. The sheep can be rotated through the pup pen, thereby exposing a number of sheep to the dog that will eventually be living among them.

The pup should have a small area in the pen to which it can retreat to be away from the sheep. This area should contain the dog's food and shelter (if the pen is outside) and can be partitioned from the rest of the pen by wooden panels such that the dog can crawl through but not the sheep. It is desirable to have the water in an area common to both the pup and sheep so that some mingling is forced.

The pup should be checked several times a day for the first few days and then at least daily thereafter to ensure that it can find food and water easily and that the sheep and the dog are interacting properly. If a particular sheep is overly aggressive to the pup, it should be removed and replaced with another

sheep. During these daily checks it is permissible to pat the dog, but excessive handling should be avoided. During this socialization process, the emphasis is on the dog-to-sheep association. The dog-to-human association should be minimized.

Socialization in dogs is a developmental phase during which permanent emotional attachments are easily and rapidly formed. Data from one study suggest that the process begins at 3 weeks, peaks at 6 to 8 weeks, and levels off by 12 weeks. After 12 weeks, socialization may never be satisfactorily achieved. A dog left in kennels beyond this time may be permanently shy and may have difficulty adjusting to later changes in its environment (a syndrome often termed kennelosis).

Some breeders allow 4-week-old litters to be in the company of young lambs with good results. Body contact between dog and sheep enhances the formation of a strong bond. Separating littermates soon after 7 weeks is desirable. The lone pup seeks companionship from the sheep, and it is also removed from the intralitter hierarchy. For pups that have been continually dominated by littermates, this solitary experience, which, in effect, places

them at the top of the social ladder, can encourage the development of confidence.

Some pups exhibit "pack" behavior in groups of three or more. A pack will often include sheep in its play; and torn ears, pulled wool, and even more serious injuries can result. Rough play is detrimental to the sheep, and it promotes highly undesirable pup behavior. It is a potentially serious problem and must be closely monitored. However, some gentle play behavior with sheep can be tolerated and may even enhance the bond of the dog to sheep.

If a pup plays too much or becomes too aggressive with the sheep, several corrective measures should be taken. Pups learn rapidly at an early age, and a brief shaking by the scruff of the neck and the command "NO" can be an effective reprimand. Excessive playfulness can sometimes be controlled by using larger lambs that will not tolerate as much playful puppy behavior. If a pup can't be trusted alone with sheep, another alternative is to separate the pup from the lambs in a nearby pen. This should be viewed as a temporary measure lasting from several days to several weeks. During this period, the

pup can be released with sheep under supervision.

After the initial socialization period (pup should be at least 16 weeks old), the pup and the sheep it was raised with can be put into a larger area or with the rest of the flock in a pasture operation. Again, monitor this change to ensure that the other nonsocialized sheep don't injure the dog. The dog will respond to this new freedom with enthusiasm and will "check out" the new territory. Most likely, the fencing in the larger pasture will not hold a small dog, and the dog will probably go through the fence here and there as it explores. The dog should always return to the sheep within a reasonable time. If it doesn't, the dog should be taken back and encouraged to remain. Repeat this process as often as necessary. If the early socialization was done properly, the dog should prefer to be in the area where the sheep are. It is important that the dog not be allowed to hang around the house, the kids, or any area where the sheep aren't. If the dog persists in staying away from where it is supposed to be, return it to its small escape-proof area with sheep for the night and try again the next day.

Once the dog has a strong bond to sheep and remains with them routinely,

it may include peripheral areas around the pasture in its scouting. Under some circumstances, a dog that can negotiate fences and protect a buffer area around the pasture will be a more effective guardian than one that is completely contained within the pasture. In some situations a dog must stay within the fenced area. This is a critical factor in more urbanized settings. (See section on "Owner Responsibilities.")

As a dog matures, there will likely be changes in its behavior with respect to staying with sheep. Some pups that do not stay in one pasture may readily stay in another. Other dogs have difficulty in adjusting to frequent moves to different pastures. At the USSES, some dogs gained interest in sheep and guarding suddenly in the course of maturation. Some pups display a greater sense of responsibility when they are removed from a small barn or pen to a large pasture with sheep.

Training and Obedience

Teaching some obedience to dogs is important. A dog should understand what "NO" means and should cease whatever it is doing when the command is given. Use this command (or one similar to it) whenever the dog does

something that is definitely wrong (e.g., chewing on a sheep, chasing a sheep or vehicle, and jumping on a person). You want the command to be heeded promptly, so don't use it carelessly.

A dog should also be taught to come when it is called or at least remain where it is so you can catch it. There are few things more annoying to you and potentially more dangerous for the dog than being unable to catch the dog when you need to. Maintaining proper health (i.e., vaccinations) and properly managing the sheep depend on being able to get your hands on the dog when necessary. If you expect the dog to consistently respond to "Come," make sure the dog receives a pleasant experience when it obeys. Don't use the command to call the dog to you so you can reprimand it for some other misbehavior. If you need to reprimand the dog, go to it and give the correction.

We recommend that a dog be taught to walk on a leash. There are times when you need to tie a dog, usually temporarily, while sheep are moved or loaded, or to take the dog to a different location. A dog should always be restrained when it is riding in the back of a truck. (See section on "Dog Health.")

Some owners teach their dogs additional commands. However, it is important to remember that by nature guarding dogs are independent and are without human supervision during most of their working life. Although they can be obedience trained, we question the value of teaching commands that may have little utility for the working dog. Excessive or unnecessary obedience training may tend to strengthen the dog-to-human bond and disrupt the dog-to-sheep bond.

Some owners teach their dogs no commands. We feel this is a mistake. You should at least be able to catch your dog.

Various methods of teaching obedience may provide satisfactory results. Several points are noteworthy. Owners should be consistent and decisive when giving commands and expect a consistent response from the dog. Dogs are praised for correct behavior and, rather than verbally or physically reprimanding a puppy for an incorrect response, praise is withheld. This positive approach will often achieve the desired results and will avoid the possibility of causing the pup to become shy or fearful of people. Some dogs do not take harsh punishment well. Proper

corrections will not cause even the most subordinate pup to become shy as long as the pup is praised more than it is reprimanded.

In some instances a verbal reprimand is not sufficient to get the dog's attention. A light swat with a rolled-up newspaper may be in order. The intent is to get the dog's attention, not hurt it. Once a correction is given, the dog should be shown the correct and desired behavior, then praised when it responds properly. The handler should ensure that a pleasurable experience (where praise can be given) follows a reprimand.

An important concept of correcting misbehavior has been revealed in several studies. If punishment is to be effective, it must be given within seconds of the undesired behavior. Reprimands given hours or even minutes after a misdeed has occurred are meaningless to the dog. Also, punishment must be given at a high enough level to immediately stop the offensive behavior. Training should continue as the dog matures, but formal training need only persist as long as it is necessary.

Guarding behavior is largely instinctive. It would be difficult to train a

dog without the guarding instinct to perform some of the necessary functions, such as patrolling, barking, and scent marking. Nevertheless, dogs will likely need direction in their development and will need to be taught or shown what, where, and when they are to guard.

The guarding dog is a working animal and should be treated as such. It is not a pet, and making this distinction at the outset is important. One dog owner said that "all you have to do is love the dog and it will guard whatever is yours." It is true that a guarding dog, lavished with human attention, becomes very protective of its master and its master's property. And if the sheep happen to be in the back yard, they will be protected as much as the children, the car, and the house itself. But if the sheep are kept any distance from the master's home, it becomes difficult to keep the dog with the sheep because it knows that it can get human attention where its master is, and that is most frequently at the house.

How much human affection should you give the guarding dog? If a dog recognizes as praise a pat on the head and words "Good dog," it will work to receive that praise. Giving it no more

affection should not be considered cruel or unkind. Dogs become confused when they have been allowed to stay at the house as a pet and then are suddenly placed in a pasture with sheep and expected to remain there.

Dog–Sheep Interactions

Most pups are submissive toward lambs, particularly during their first encounters. Later, as the pups and lambs become accustomed to each other, some pups solicit play from the lambs. The lambs respond either by moving away or by briefly butting or romping with the pups.

Some dogs show a great deal of interest in grooming lambs and may spend several minutes licking them, especially around the face, ears, and urogenital region. This grooming behavior of the dog may strengthen the dog-to-sheep bond.

Dog Age and Effective Guarding

Mature, experienced, and effective guarding dogs are generally not available to most sheep producers. Although there are exceptions, most ranchers purchase their guarding dogs as inexperienced pups and are obliged to assist in directing their development.

When the dog reaches a certain level of maturity, it will begin to display territorial and protective behaviors toward predators threatening the flock. This level of maturity can vary; there is no predetermined age when an adolescent dog can be expected to become an effective guardian.

There are several criteria that may indicate a dog's readiness to assume the guarding role. The following behaviors tend to increase in frequency as guarding maturity is reached: (1) male dogs (and sometimes females) use raised-leg urinations rather than squat urinations to scent-mark, (2) scent marking (urination and defecation) becomes more deliberate and marks are concentrated near the periphery of a pasture, (3) barking at novel stimuli becomes more predictable and direction oriented, (4) dogs are active more frequently and for longer periods, (5) dogs become more interested in the sheep than in the handler, and (6) deliberate patrolling activities increase in frequency and duration.

Dogs exhibit much of this behavior as young as 4 1/2 months of age. However, before a young puppy is placed where sheep losses to predators are high, it should have attained a

certain level of physical maturity. This level is difficult to define specifically, but the dog should at least be large enough to defend itself if confronted by predators.

As a dog becomes more experienced, it may display certain behaviors (barking, scent marking, and patrolling) more or less often, depending on various factors. If coyotes are frequently near, the dog may mark and patrol more than it would if they were not. As a dog becomes more familiar with its area and the normal activities that occur there, random barking may occur less frequently. Some dogs seldom bark.

Successful guarding dogs have an appropriate mix of physical and behavioral maturity, combined with experience with sheep. Dogs may respond with uncertainty or even fear during their first encounter with a predator. At the USSES a coyote chased a physically mature guarding dog three times its size. During this first experience with a coyote, the dog exhibited immature behavior and ran away. The following day the dog chased the coyote and did so in all succeeding encounters. Other dogs may have reacted differently in this situation, but experience is necessary for all successful guardians.

In most situations, we recommend moving the pup along with the sheep it was reared with out to the main flock or band as soon as the dog is able to physically keep up and defend itself if necessary. If people err on this point, it is usually by not putting the dog out with the flock soon enough.

Daily Routine and Behavior

How should a new owner of a guarding dog expect the dog to behave during a 24-hour period? Some people are surprised that a dog that appears to sleep most of the time still can be an effective guardian. Some guarding dogs, especially immature dogs, seem to spend a large part of their time sleeping.

If the sheep are active (moving and feeding), the dog may also be active. However, dogs are not necessarily with the sheep constantly. The dog may sleep during the day while the sheep are feeding, or the dog may be away from the sheep investigating adjacent areas. With experience, the dog will learn when disturbances from predators are likely to occur (evening and early morning hours) and will be actively patrolling or on alert at a selected location. A dog will often bed with the sheep but is usually quickly

aroused by any disturbance. Some sheep appear to learn to return to the dog when they are threatened by a predator.

A guarding dog uses its senses and experience to know when and where to patrol and how best to keep predators away from the sheep. Some people have mistakenly attempted to impose their own conceptions of the guarding routine on the dog. The dog should be free to develop its guarding behaviors within the restrictions dictated by each particular livestock operation.

Dog Response to Frightening Experiences

Certain conditions may cause even effective guard dogs to leave the sheep or otherwise temporarily interrupt their guarding behaviors. Intense rain storms or continual rain for one or more days has resulted in dogs leaving the sheep and returning to the ranch. This problem may be less likely to occur in pasture where a dog may retreat to a shelter during prolonged rains. In a range operation where no shelter is provided, a dog may leave the sheep in search of a dry place.

We have observed a small percentage of dogs abandon the sheep

because of thunder and other loud noises such as gun shots. Some noise-shy dogs will become familiar with these sounds over time, but others may continue to leave the sheep despite their experience with frightening noises.

Extent of Human Contact

There is an appropriate level of human contact with a guarding dog, but it varies depending on the temperament of the dog. The dog should be visited daily in the pasture. If food is not provided in a self-feeder, it can be given to the dog each day. (We recommend using a self-feeder.) The daily visit can also provide an opportunity to observe the health of the dog and to briefly praise the dog for remaining with the sheep.

As the dog matures, less human contact may be required. Good management practices dictate, however, that the livestock and the dog be regularly visited.

Too little human contact can cause a dog to be shy or fearful of people. Such dogs are difficult to handle for physical examination and are hard to control. They cannot be moved readily to other pastures and cannot be kenneled. Some dogs with this type of

temperament are effective guardians and may fit into some livestock operations. However, it is almost essential to be able to handle and work with the guarding dog.

Guarding Dogs During Lambing

What should be done with a new guarding dog during lambing? There are no definite rules to follow, but several suggestions may be helpful.

The ewe is more defensive and subject to stress during lambing than at any other time. The antics and playful behavior of a puppy or immature dog could be detrimental to sheep before, during, and immediately following lambing. Young dogs, therefore, should not generally be in direct contact with the ewes but should perhaps be kept in an adjacent area.

Once lambing is completed and the ewes and lambs have been turned into mixing pens and are "mothered up," introduce the young dog under human supervision. Lambs will quickly become accustomed to the dog, and the ewes will soon learn that the dog poses no threat to them. If the dog acts calmly, it can be left alone for longer periods with the sheep until it remains with them permanently. Care should be taken to

ensure that the young dog does not make any serious mistakes. Here, as in other situations, prevention of a problem is better than finding a cure.

Once the dog experiences a lambing season and proves it can behave correctly, it may be allowed free access to the entire lambing operation. Owners report some guarding dogs take a great deal of interest in lambing, protect lambs from inclement weather, and even assist the ewe in cleaning newborn lambs. The dog owner must decide how much freedom the dog should be given at this time. Even proven dogs can make mistakes.

Should the dog be allowed to eat afterbirth and docked tails or feed on dead lambs or sheep? Most dogs will eat sheep remains, afterbirth, and tails. In our experience, this does not make them inclined to kill sheep, but it may detract from their effectiveness because some dogs become possessive of dead sheep. Where it is practical, we recommend removing carcasses and not allowing a guarding dog to feed on them. There are potential parasitic and bacterial health hazards associated with dogs eating sheep carcasses, particularly carcasses of sheep that have died from disease. In addition, the presence

of sheep carcasses may attract predators.

Interactions Between Herding and Guarding Dogs

Herding dogs are an integral part of most sheep operations, particularly range operations. Can the herding dog and the guarding dog coexist, and if so, what is their relationship?

Generally, guarding and herding dogs are able to work on the same operation. The guarding and herding dogs should be familiar with each other but should be discouraged from playing together. In range bands, the herding dogs remain with the herder and work at his direction. Social bonds between the guarding dog and the herding dogs could cause the guarding dog to leave the sheep and follow the herder to camp.

The guarding dog should be taught that its role is different from that of the herding dog. Immature guarding dogs may attempt to mimic the herding dog as it moves the sheep. This should not be allowed. Juvenile guarding dogs can interfere with a working herding dog and sometimes must be restrained (tied or held). As the guarding dog matures, it will learn that there are times when the herding dog is in charge (when the

sheep are moved), but that it assumes the dominant position at all other times. Brief fights may result between the herding and guarding dogs while they learn their respective roles. On rare occasions, guarding and herding dogs may be incompatible, and a change of dogs may be warranted.

Many people ask if sheep still respond to a herding dog once they are accustomed to the presence of a guard dog. Sheep recognize individual dogs and respond according to each dog's behavior. Therefore, they learn to ignore a guarding dog that quietly approaches the flock but will bunch and run from a dog that chases them.

Unrestrained nonworking dogs are found on many farms and ranches. These dogs can present a problem to a guarding pup that is being trained to protect the flock. They are a source of distraction and at worst can involve the pup in learning inappropriate behaviors. In some instances a choice has to be made between rearing a good guarding dog and having unrestrained pets.



These sheep are responding to the herding actions of this border collie.

Managing Dogs on Rangeland and Pastures

Management practices on pasture and range operations differ and affect the overall concept of using guarding dogs. Pastures have fenced boundaries which provide a clearly defined, stationary territory for a dog to defend. There is little chance that the sheep will be lost if they scatter within a pasture, so a full-time herder is usually not needed.

Fences are rarely encountered on most rangeland, and a herder tends the flock, controls the grazing pattern, and provides some degree of protection from predators. A dog on the range must learn to identify the sheep and the ever-changing area they occupy as a defendable territory. A dog must adapt to new areas as the herder implements the grazing plan, and since the dog remains unsupervised with the sheep much of the time, its behavior must not cause the flock to scatter.

Considerations in Fenced Pasture Operations

More than 80 percent of the people who raise sheep in the United States maintain their flocks in fenced pastures during all or part of the year. This



To protect large numbers of sheep on open rangeland or pastures, more than one dog may be required. These two Great Pyrenees guard a large rangeland flock.

represents more than half of the Nation's sheep. It is predicted that the greatest growth in the sheep-raising industry will come from pastured flocks of sheep. Although the magnitude of predator losses is often smaller on pastures than in open range operations, the result of losses can be severe. The use of dogs to protect fenced livestock is a workable technique and is currently being used successfully by hundreds of producers.

A major concern for many guarding dog users at one time or another is how to get the dog to remain with the sheep in the pasture. As was stated in the section on "Dog Rearing and Socialization," correct handling of a puppy can eliminate many potential problems. It is vital to immediately place the new puppy with or near sheep away from the house and people. If the dog develops a strong bond to sheep at the outset, corrective measures may be needed only infrequently as the dog matures.

If a newly acquired dog or a puppy requires additional encouragement after socialization to remain in an area, the following techniques may be effective. When introducing a dog to an unfamiliar pasture, place the dog's shelter and feeder in the pasture. Also include any objects familiar to the dog. The handler

should then walk the dog (on a leash if necessary) around the perimeter. This activity should be repeated daily until the dog learns the area. Most dogs are enthusiastic when exploring new terrain and will scent-mark during the patrolling activity. The dog should initially be left alone with the sheep in the pasture for short periods of time (1 to several hours), but the time should be progressively extended to longer intervals. The dog should be checked frequently and given praise when it remains in the pasture. The dog should be returned promptly each time it leaves and should not be reprimanded until it knows clearly what it is expected to do.

An appropriate command ("Stay" or something comparable) may be given to the dog when it is left in the pasture. One producer yelled "SHEEP" and chased his dog back to the sheep every time it strayed too far from them. Patience is required, as it is in almost all phases of working with young guarding dogs. One successful Komondor owner said it may take up to 1 year to see certain aspects of training become effective. However, some positive results should be apparent much earlier.

If repeated efforts fail to keep the dog in the pasture, several other

methods can be tried. The dog can be chained to an area near its house, food, and water (and preferably the sheep) for prescribed periods of time. These periods can be as short or long as necessary and will vary in each situation. Some owners have attached a tire on a chain (approximately 10 feet long) to the collar of the dog. This permits the dog to move within the pasture but prevents it from jumping over or crawling through the fence.

Another technique has been used at the USSES to encourage a dog to remain in a designated area. If a dog leaves its pasture and returns to the headquarters, it is immediately kenneled in relative isolation for 1 to several days. The dog is then returned to the pasture. Repetitions of this process have been successful in discouraging several dogs from returning to the headquarters.

Some dogs will leave a designated pasture for short periods to explore and return shortly thereafter. If it does not conflict with neighboring farms or residences, a dog may be a more effective guardian if it can patrol the area around a pasture to create a buffer zone devoid of coyotes or other predators. Furthermore, it may be desirable for dogs to be able to negotiate fences.

Most pups crawl through or over, whereas older dogs often jump fences as high as 6 feet. Depending on individual dogs and particular needs, dogs could be trained to jump fences or pass through fences using special sheep-proof crossings.

In some situations it is best for the dog to remain exclusively within a fenced pasture, especially if heavily traveled roads or highways parallel the pasture or neighbors will mistreat a dog that trespasses. These conditions may be common in urbanized areas and particularly in the Eastern United States.

Dogs on Rangeland

Grazing livestock on range and forest lands is a traditional method of sheep production in the Western United States. Range sheep often suffer greater exposure to coyote predation than pastured sheep. Increasing numbers of people are using guarding dogs to protect range sheep because some methods of reducing predation in pastures are ineffective or impractical on unfenced lands.

Planning is the key to successful use of a livestock guarding dog on the range. Several months are required to socialize and prepare a pup for range-

land use. An appropriate time to place a Great Pyrenees on the range is between 4 and 6 months of age. Therefore, a producer should purchase a 7- to 8-week-old pup 2 to 4 months prior to incorporating the dog into the range flock. Other breeds that mature more slowly may not be ready to go to the range as early as Great Pyrenees. The key factor is whether the dog acts calmly around the sheep. A range band is no place for a dog that wants to play continually.

An ideal time to place a dog with range sheep is when the sheep are confined in a pasture or fenced area. Sheep producers can incorporate a dog into the flock shortly after lambing when the main flock is being formed. However, any period of confinement lasting a week or more can be used. During this period the herder can get to know the dog and emphasize the commands "No" and "Come" discussed previously. This period will also allow the herder to observe how the dog and sheep interact before going on the range.

Many problems initially experienced by producers who use guarding dogs with range sheep result from the sheep being frightened of dogs. In a small pasture, sheep cannot escape from a

dog and become accustomed to its presence as they learn that it will not harm them. On rangeland, sheep unaccustomed to a dog respond by running from it whenever it attempts to approach them. Repeated attempts by the dog to approach the sheep scatter the flock. The dog may become discouraged and eventually ignore the sheep.

It is important that the sheep are accustomed to the presence and activities of the guard dog before leaving the pasture (this can take from 1 to 6 weeks). This is one of the most important steps in integrating a dog successfully into a range operation.

Some sheep operations use only the open range, and this may make incorporation of a guard dog into the flock difficult. The sheep must learn to accept the presence of a dog without the benefit of an enclosed area. In such a situation, it is essential that the dog be controllable and remain calm around the sheep. The attitude and ability of the herder play an important role in the success or failure of this process. The temperament of the dog and the sheep and the type of terrain being grazed are other factors that should be considered.

A trait exhibited by an ideal livestock guardian is a desire to remain with or near the flock most of the time. However, this behavior usually needs to be reinforced by the herder. Guard dogs should not be allowed to loiter or sleep around camps. The dogs must be taught and encouraged to stay with the sheep at all times. Feeding the dog near the sheep rather than at camp will help in this endeavor. A description of a mature guarding dog that is successful includes the statement that the dog continually accompanies the sheep.

Each situation is unique in some respects, and there may be some instances when predation may be reduced even if a dog routinely leaves the sheep. One herder regularly tied a young guarding dog to his camp during the day and released it each evening. The dog was tied because it followed him on his rounds during the day. By evening the dog was too tired to patrol and spent the night sleeping. Tying forced the dog to rest during the hours of least predation. The dog had little desire to stay at the camp when released and actively patrolled at night. The dog could normally be found near the sheep the next morning.

Kennelling Dogs Through Winter

At the outset of our research, we were concerned with the possible adverse effects of kennelling dogs for a prolonged period during winter when the sheep were in a feedlot. Since we used up to 10 dogs at a time, it was impractical to give them free access to the sheep pens. Other sheep producers who have only one or two dogs would likely leave the dogs loose most of the time. However, if kennelling is deemed appropriate, the following may be of interest.

We speculated that the relatively long period of removal from the sheep would result in a decrease or loss of the dog's bond to sheep. Ten years of experience with this situation has revealed that, for most dogs, the bond to sheep remains and may even be intensified with periods of separation. The period of isolation in the kennel appears to enhance the dog's desire and enthusiasm for the freedom of being with sheep. Almost without exception, when we release a dog after it has been apart from the sheep for any length of time, it quickly seeks the scent and trails off in the direction of the sheep. The bond between dog and sheep is established as the pup is raised with

lambs and appears to endure even though the dog is separated from the sheep for up to 6 months.

Transferability

If a dog is properly socialized to sheep, there is a high probability that it will successfully guard sheep in a variety of conditions. Such a dog can be moved from one area to another, even with strange people and surroundings, and its bond to sheep will help make the transfer successful. In small farm-flock conditions where the sheep are not far removed from the headquarters and people, the bond of the dog to sheep may not need to be as strong for success to be realized.

Although we have observed that transferring dogs from one situation to another is practical, the success of a dog is enhanced as it becomes more familiar with a particular set of conditions. If a dog is moved to a location that contains unfamiliar livestock (i.e., a species the dog has not associated with), it may initially react aggressively to them.

Owner Responsibilities

Dogs and Human Welfare

Ownership of a guarding dog implies certain responsibilities. The traditional guarding breeds are large, powerful, and protective of their perceived territory. This territory should primarily include the livestock to be guarded, but it may also include the owner's house, yard, and family members, particularly if the dog was allowed access to these areas during the rearing process.

How likely is it that a livestock guarding dog will bite someone? Much is dependent upon where the dog spends its time, and also on breed differences. In the survey of 763 livestock guarding dogs, 7 percent of the dogs had bitten people (17 percent of the Komondors, 9 percent of the Anatolian shepherds, 6 percent of the Akbash dogs, and 4 percent of the Great Pyrenees). Some dogs show more protective and aggressive traits than others, and it becomes the owner's responsibility to protect people who may be at risk. Neighbors and guests should be alerted, and if necessary, signs or other appropriate warnings should be displayed.

A guarding dog will likely include peripheral areas in its patrolling. This activity should be discouraged. Neighbors should be alerted to the fact that a dog may roam onto their property and that some predator control devices (e.g., traps, snares, and M-44's) present a danger to the dog. (See section on "Integrated Livestock and Predator Management.") Many counties enforce stringent laws regarding owner responsibility for damage done by roaming dogs. It is in the best interest of the owner, community, and dog to train the dog to stay in its designated area.

Dogs used with herded or unherded range bands or in expansive pastures such as those found in some Western States may also roam at times. Under these circumstances, a roaming dog may pose little threat to safety and property. However, a dog roaming over a wide range provides little or no protection to the livestock it is supposed to be guarding.

Dog Health and Care

Purchase of a guarding dog represents a significant financial investment. The value of the dog increases as it matures and is trained. The successful, mature dog is not easily

or quickly replaceable. Appropriate concern for health and safety, therefore, is an important consideration.

Consult a veterinarian for keeping vaccinations current and for recommendations about worming. Breeders should have administered puppy vaccines and sometimes puppy medication. New owners should periodically check teeth for soundness and proper bite, and ear canals should be kept free from a buildup of hair. Examine dogs routinely for cuts, abscesses, bone conformation, and muscle development. Any change in behavior, eating habits, or stools should be investigated immediately. Serious health problems can develop with dogs belonging to even the most conscientious and experienced people.

The coat of the working dog may require attention. The Komondor's coat, for example, must be clipped or corded (hand separated) as the dog matures. Many owners of working Komondors prefer to clip them each spring since cording can be laborious, and a long coat tends to collect burrs. Contact the Komondor dog clubs listed in "Sources of Additional Information" for details on coat care. Other long-haired breeds such as Great Pyrenees may also need

coat care. Mats and burrs should be removed periodically, especially around the toes and ears. A matted coat may lead to serious skin infections especially in, but not restricted to, warm or moist climates. Again, clipping is an option for resolving chronic skin or coat problems.

Guarding dogs may weigh 100 pounds or more and, particularly as pups, need proper nutrition. Generally, a high-quality dry dog meal (puppy meal for pups) will meet nutritional requirements. However, supplements as recommended by a veterinarian, are sometimes used. Although growing pups require large quantities of feed, they usually eat only 2 to 4 pounds of food daily once they are fully grown.

Working dogs expend a great deal of energy patrolling and investigating. Food must be readily available or they cannot be expected to function properly. Self-feeders are often used for dogs working in pastures. A barrier is constructed around the feeder to prevent sheep from eating the dog's food. If this precaution is not taken, the sheep may quickly empty the feeder, and consequently, the dog may go hungry for several days. If this occurs repeatedly, the dog may become possessive of the food and spend its

time guarding the feeding area. With herded sheep, the herder has responsibility for taking food to the dog at least once a day.

Livestock guarding dogs are hardy animals and often do not use a dog house or shelter even in inclement weather. They generally prefer to sleep in the open where they can easily observe their surroundings. However, some form of shelter should be provided for dogs in pastures. Some dogs regard their house and the surrounding area as their territory. The dog house may serve as a point of contact for the dog and enhance the tendency to remain in that area. The use of a dog shelter on rangeland where sheep move continually is usually not practical.

Dog Safety

Although a guarding dog may provide up to 10 years of productive service, there is a reasonable chance the dog will die prematurely. During a 5-year period of study at the USSS, 32 percent of the working guard dogs died before reaching adulthood. The major causes of death were as follows: hit by vehicle, 23 percent; maliciously shot, 23 percent; health problems, 18 percent; accident in field, 9 percent;



As demonstrated by this dog handler separating mats of hair, the coat of the Komondor requires special care and attention.

untrustworthy (destroyed), 4 percent; and unknown, 23 percent. The mortality rate from birth to 4 years of age was 41 percent. In a study from NEFC, 50 percent of livestock guarding dogs used on ranches were dead by 18 months of age, while 50 percent of dogs used on farms and farm/ranches were dead by 38 months of age (mortality rates included dogs removed due to culling).

These statistics show that livestock guarding dogs are susceptible to numerous hazards, some of which are within control of the owner. A little forethought and some preparation can help to avoid the accidental and untimely death of a dog. To this end, the owner should: (1) alert neighbors that the dog may wander onto their property and enlist their aid in preventing roaming, (2) post their property as to the presence of a dog, (3) keep the dog off roads, (4) be alert to the presence of poison baits, rodenticides, traps, and snares, and take appropriate precautions (see section on "Integrated Livestock and Predator Management"), (5) not chain the dog next to a fence or other obstruction where it can get entangled and die of strangulation, and (6) use safe chaining practices when hauling a dog in the open bed of a

pickup truck.

Premature death of a good guarding dog can be a significant loss to the livestock producer who relies heavily upon it. In addition to losing a primary source of protection, the producer must expend money and time to acquire, raise, and train a new dog. Some producers who depend on dogs for predation control should consider keeping a second dog as a backup in the event one dog dies. This option should be examined from both a practical and economic standpoint for each situation.

Dog Breeding by the Livestock Producer

Some of the dogs most eagerly sought after for use in livestock protection are those bred, whelped, and raised by livestock producers. Few people would know better what type of dog is preferred and what traits the good guardian should have than the livestock producer. However, relatively few ranchers have the time, inclination, or facilities to breed and raise dogs, especially dogs that require special care and consideration. In several instances, ranchers found themselves "stuck" with six or eight puppies and a bitch who was

no longer out protecting the flock because of her pregnancy.

To properly raise a litter of pups and then sell them to appropriate buyers by the time they are 8 weeks old is not a simple matter. Often, several pups go unsold for many months and if not kept with sheep during that time, the pups are beyond the point of being easily socialized to sheep. Dog breeding should be entered into only after careful consideration, research, and definite commitment to the welfare of the dogs.

Economic Considerations

The economics of using a livestock guarding dog are dependent upon a number of factors including the annual rate of predation, the ability and longevity of the dog, and the cost of purchase and maintenance. Purchase price varies according to age of the dog, breed, bloodline, breeder, and other factors. We purchased approximately one hundred 7- to 8-week-old guarding dog pups of various breeds during 1987 and 1988. The pups came from dog breeders throughout the United States, and the average price including air freight to Idaho was \$443 per dog. Since Great Pyrenees dogs were the most readily available, they were usually

less costly than the other breeds. However, in the long run, purchase price is probably one of the least important factors in the economics of using a livestock guarding dog.

In 1983, 70 livestock producers who used guarding dogs were surveyed. Average first-year cost for one dog, including shipping, feed, health care, travel associated with care and maintenance of the dog, damage caused by the dog, and miscellaneous expenses, totaled \$834. Subsequent average annual expenses totaled \$286. Producers reported an average of 9 hours/month to care for a dog, and 89 percent of the producers considered dogs to be an economic asset. Twenty-seven of 37 producers (73 percent) experienced estimated average annual savings ranging from \$180 to \$14,487, and 10 of 37 (27 percent) experienced average annual losses ranging from \$95 to \$3,405.

In the 1986 survey of about 400 producers with guarding dogs, 82 percent reported that the use of dogs represented an economic asset. Nine percent said dogs were a break-even investment, and 9 percent considered dogs an economic liability.

Clearly, dogs that are effective and long-lived represent a significant economic value. Many producers have identified “peace of mind” as a benefit of using a guarding dog. Although peace of mind is perhaps not a tangible benefit, it is one with some intrinsic value.

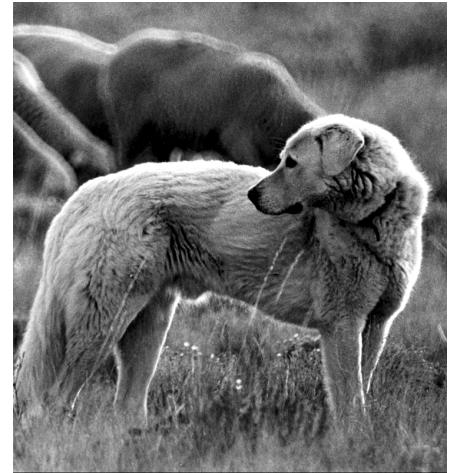
Benefits and Problems

In the course of our research, we identified the following potential benefits associated with using a guarding dog.

1. Reduced predation
2. Reduced labor (i.e., no longer confining or corralling sheep nightly, sheep graze in a tighter flock, thus are easier to monitor)
3. If night confinement is discontinued, pastures can be more efficiently utilized and condition of sheep may improve.
4. Increased utilization of acres where predators made grazing prohibitive prior to the use of dogs
5. Increase in grazable acres may provide opportunity to increase the size of the flock.
6. Improved potential for profit
7. Dog alerts owner to disturbance (predators) near the flock.
8. Increased self-reliance in managing predator problems

9. Protection for family members and farm property
10. Peace of mind

Although the majority of dogs that are reared to protect sheep are ultimately successful, there are potential problems during the adolescent period of the dog as well as problems that may develop with an experienced dog. Some of the problems are considered minor by producers; others are serious.



We identified the following potential problems:

1. Dog harasses sheep (usually a play behavior), resulting in injury or death.
2. Dog does not guard sheep.
3. Dog is overly aggressive to people.
4. Dog harasses other animals (livestock or wildlife).
5. Expenditure of labor to train and supervise the dog
6. Dog destroys property (chewing objects and digging).
7. Dog is subject to illness, injury, or premature death.
8. Dog roams beyond farm boundaries causing problems with neighbors (critical in urban settings).
9. Financial expenditure with no guarantee of the dog being successful
10. Dog interferes when sheep are moved or interferes with herd dog.
11. Dog affects the use of other predator control activities.

Predation may occur even with a guarding dog at work. Whenever this happens, the prudent livestock producer will first determine whether the dog was involved in the killing. Suspect the dog until it is clear that it was not at fault. Of the dogs in our survey, 14 percent

injured or killed sheep.

It is unlikely that one person will experience all of the potential problems or all of the potential benefits of using a dog. For most, the benefit of reduced predation is sufficient, and for others a single problem may be one too many.

Effectiveness Against Various Predators

Most of the research and practical experience with guarding dogs has focused on the dogs' ability to reduce predation by coyotes and domestic dogs, the two principal predators of sheep in the United States. Coyotes, about one-third the size of an adult guarding dog, usually avoid a direct encounter with a guarding dog; and as our survey revealed, 95 percent of the guarding dogs were aggressive to predators, primarily coyotes. Fewer of the guarding dogs were aggressive to domestic dogs (74 percent), but encounters between guarding dogs and intruding dogs usually differ from those between guarding dogs and coyotes. Whereas most coyotes avoid a confrontation, intruding dogs may spend time smelling and posturing around the guarding dog. Fights may occur, but more likely the intruding dog will leave

after a brief period of investigation. The end result is usually the same as with coyotes, no predation. However, some guarding dogs, particularly immatures, may stand by while intruding dogs harass the sheep. Occasionally, guarding dogs have joined intruding dogs and injured or killed sheep.

Foxes probably respond to guarding dogs as do most coyotes, by avoiding a confrontation and thus staying a reasonable distance from the flock. Several encounters between wolves and guarding dogs have been documented, but the results are not very predictable at this point. Some wolves avoid or bypass the area occupied by a guarding dog, others investigate and posture as described previously for domestic dogs, and others fight with the guarding dog. Wolves are likely more frustrated by the presence of a guarding dog than intimidated by it.

We gathered information about guarding dog–bear encounters. In a typical encounter with a black bear, the dog would bark repeatedly and approach to confront the bear. The bear would usually respond by retreating from the dog. There was usually no physical contact between the dog and the bear, and the dog would continue

pursuit for several hundred meters or until the bear was headed away from the sheep. The dog typically returned to the sheep soon after the encounter. Although our sample of guarding dog–grizzly bear encounters is small, it suggests that grizzly bears are less readily deterred by guarding dogs than are black bears.

There are few data describing the relationship between guarding dogs and feline predators such as cougars and bobcats. Intuitively, one would predict that the smaller bobcat would avoid an area occupied by a guarding dog. Cougars are known predators of dogs and might not avoid contact with the dog. In many areas where sheep are raised, predation by cats is minimal or site specific. The presence of predatory cats should be considered in selecting and placing a dog in the field.

Integrated Livestock and Predator Management

Proper management of livestock plays a role in minimizing the risk of depredation. Many farm-flock operators practice one or more of the following: night corralling of sheep, using lighted corrals, keeping sheep next to buildings occupied by people, shed lambing,

routine inspection of livestock, removal of dead animals, clearing natural cover adjacent to pastures, and avoiding the grazing of young animals in pastures with a history of predator problems. Some of these practices may not be practical for some producers. They have little application in range sheep production. Nothing short of total confinement will guarantee complete protection.

For managing predators, a variety of control methods must be available since there is not, nor will likely be, one method of predator control that will be effective for every producer. Some have found that they need little to protect their sheep, while most employ one to a dozen control techniques. Those who are successful use an integrated approach, combining good husbandry practices with electric fences, guard dogs, good herders (with range bands), trapping, shooting, or mechanical scare devices and are flexible enough to use whatever combination of methods solves the problem.

The use of a guarding dog does not eliminate the use of other control methods. It is important, however, that the control techniques used in conjunction with the guarding dog be compatible

with the dog's behavior. Toxicants used to control various pest species (including some insecticides and rodenticides) can be extremely hazardous to a dog and therefore are not compatible for use in areas where a guarding dog is at work.

The M-44 toxicant delivery device used in control of coyotes is an example of a toxicant which is very hazardous to dogs. Some people have successfully trained their dogs to avoid M-44's by allowing the dog to set off an M-44 filled with pepper, or by rigging the device to a rat trap. This unpleasant experience is meant to teach the dog to avoid the M-44 should it encounter one in the future. However, while this training process may be successful for some dogs, it is not foolproof—one error by the dog and the result is usually fatal. Therefore, with the exception of toxic collars (not legal in all States), it is recommended that toxicants not be used in areas where guarding dogs are working unless the dog is chained or confined while the control takes place.

Dogs that have been on a leash may become conditioned not to fight if accidentally caught in a snare set for coyotes or foxes. Likewise, dogs caught in a steel trap set for predators are

rarely injured. However, both devices can be fatal to dogs if they are not found and released within a reasonable period of time. If snares and traps are used where dogs are working, the producer should know where they are set so they can be checked if a dog is missing. This requires cooperation and communication between the producer and the trapper. Producers should realize that ensuring the safety of the dog is largely their responsibility. Aerial hunting and calling and shooting coyotes should pose no threat to guarding dogs.

Dogs may be viewed as a first line of defense against predators in many operations. Their effectiveness can be enhanced by good livestock management and by eliminating persistent depredated predators with suitable removal techniques.



Wildlife Services specialists can provide information and guidance to the dog owner.

Sources of Additional Information

Livestock Guarding Dog Breed Clubs

The Akbash Dog Association International, Inc.

The Akbash Dog Association of America, Inc.

David Nelson
P.O. Box 796
Middlebury, VT 05753

Akbash Dogs International
Diane Spisiak
P.O. Box 146
Wellsville, KS 66092

American Tibetan Mastiff Association
Valerie Bookman, Secretary
2607 Race Avenue
Medford, NY 11763

Anatolian Shepherd Dog Club of America
Q. S. Harned
P.O. Box 1271
Alpine, CA 92001

Anatolian Shepherd Dogs Worldwide, Inc.
Beth Goldowitz
P.O. Box 5815
Grand Island, NE 68801

Caucasian Ovtcharka Club of America, Inc.
Stacey Kubyn
P.O. Box 745
Painesville, OH 44077

Great Pyrenees Club of America
Kerry Kern Woods
1206 W. Bender Road
Ellensburg, WA 98926

Kangal Dog Club of America, Inc.
David Nelson
P.O. Box 1205
Castleton, VT 05735-9998

Komondor Club of America
Sandy Hanson
W359 S 10708 Nature Road
Eagle, WI 53119

Kuvasz Club of America
Maria Arechaederra
2612 Meats Avenue
Orange, CA 92667

Maremma Sheepdog Club of America
George McClellan, Secretary-Treasurer
P.O. Box 546
Lake Odessa, MI 48849

Middle Atlantic States Komondor Club, Inc.
Joy Levy
102 Russell Road
Princeton, NJ 08540

North American Yugoslav Shepherd Dog Club
"Sharplaninac"
Jilyn Crawford
P.O. Box 336
Yucca Valley, CA 92286

Polish Tatra Sheepdog Club of America
Carol Wood
2006 Highway 101, #209
Florence, OR 97439

United Anatolian Guardians
Karen Sen
14361 Maple Creek Rd.
Korbel, CA 95550

Guarding Dog Associations

Livestock Guard Dog Association
Hampshire College
Box FC
Amherst, MA 01002

Bibliography

Black, H. L.; Green, J. S. 1985. Navajo use of mixed-breed dogs for management of predators. *Journal of Range Management* 38: 11–15.

Bordeaux, E. S. 1974. Messengers from ancient civilizations. San Diego, CA: Academy Books. 43 p.

Coppinger, R.; Coppinger, L. 1978. Livestock guarding dogs for U.S. agriculture. Amherst, MA: Hampshire College.

Coppinger, L.; Coppinger, R. 1980. So firm a friendship. *Natural History*. March: 12–26.

Coppinger, R.; Coppinger, L. 1980. Livestock guarding dogs. *Country Journal* 7(4): 68–77.

Coppinger, R.; Coppinger, L.; Langloh, G.; Gettler, L.; Lorenz, J. 1988. A decade of use of livestock guarding dogs. In: Crabb and Marsh, eds. Proceedings of the 13th vertebrate pest control conference; Monterey, CA: 209–214.

Green, J. S. 1989. APHIS Animal Damage Control livestock guarding dog program. In: Proceedings ninth Great Plains animal damage control workshop; 17–20 April 1989; Fort Collins, CO. Gen. Tech. Rep. RM-171. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 50–53.

Green, J. S.; Woodruff, R. A. 1983. The use of livestock guarding dogs to protect sheep from predators in North America: a summary of research at the U.S. Sheep Experiment Station. In: Decker, D. J., ed. Proceedings of the first eastern wildlife damage control conference; Ithaca, NY: 119–124.

Green, J. S.; Woodruff, R. A. 1983. The use of three breeds of dog to protect rangeland sheep from predators. *Applied Animal Ethology* 11: 141–161.

Green, J. S.; Woodruff, R. A. 1988. Breed comparisons and characteristics of use of livestock guarding dogs. *Journal of Range Management* 41: 249–251.

Green, J. S.; Woodruff, R. A. 1990. ADC guarding dog program update: a focus on managing dogs. In: Davis, L. R.; Marsh, R. E., eds. Proceedings of the 14th Vertebrate Pest Conference; 6–8 March 1990; Sacramento, CA. Davis, CA: University of California at Davis: 233–236.

Green, J. S.; Woodruff, R. A.; Andelt, W. F. 1994. Do livestock guarding dogs lose their effectiveness over time? In: Halverson, W. S.; Crabb, A. C., eds. Proceedings of the 16th Vertebrate Pest Conference; 1–3 March 1994; Santa Clara, CA. Davis, CA: University of California at Davis: 41–44.

Green, J. S.; Woodruff, R. A.; Tueller, T. T. 1984. Livestock guarding dogs for predator control: costs, benefits, and practicality. *Wildlife Society Bulletin* 12: 44–50.

Koehler, W. R. 1967. The Koehler method of guard dog training. Howell Book House, Inc.

Linhart, S. B.; Sterner, R. T.; Carrigan, T. C.; Henne, D. R. 1979. Komondor guard dogs reduce sheep losses to coyotes: a preliminary evaluation. *Journal of Range Management* 32: 238–241.

Lorenz, J. R. 1985. Introducing livestock-guarding dogs. *Extens. Circ.* 1224. Oregon State Extension Service.

Lorenz, J. R.; Coppinger, L. 1986. Raising and training a livestock-guarding dog. *Extens. Circ.* 1238. Oregon State Extension Service.

Pfaffenberger, C. J.; Scott, J. P.; Fuller, J. L.; Gindsburg, B.E.; Bielfelt, S. W. 1976. Guide dogs for the blind: their selection, development, and training. Amsterdam: Elsevier.

Scott, J. P.; Fuller, J. L. 1965. Dog behavior: the genetic basis. Chicago: University of Chicago Press.

Sims, D. E.; Dawydiak, O. 1990. Livestock protection dogs: selection, care and training. Ft. Payne, AL: OTR Publications. 128 p.