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Livestock Guardian Dogs: An Overview

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Domestic livestock, especially sheep and goats, are vulnerable to predators from both wild and domestic animals. Control methods to limit predation are diverse, including lethal options like snaring, trapping, and shooting, as well as non-lethal approaches such as fencing, deterrents, and guardian animals. Predation remains a leading cause of losses in small ruminants in the United States, posing a significant economic challenge for livestock producers. While no single method works in all situations, livestock guardian dogs (LGDs) consistently perform well across different production systems. With deliberate breeding, proper training, and effective management, LGDs can often be the most effective predator-control option for many farmers (Fig. 1).

Figure 1. Livestock guardian dog (LGD) eating at sunset with goats.
AgriLife photo courtesy of Brown, 2023.

How LGDs Reduce Predation

Unlike lethal control methods such as hunting and snaring, LGDs reliably deter predators. This approach can save money and bring peace of mind. LGDs mainly reduce predation through three methods: 1) territorial exclusion, 2) disruption, and 3) confrontation. Territorial exclusion is vital for protecting against canid predators like coyotes and domestic dogs. All dogs, whether wild or domestic, use scent to mark their territory boundaries. Other canids, even from different species, recognize these scent marks and generally avoid invading another dog's territory. Disruption involves aggressive behaviors, such as barking and posturing, which stop short of direct physical attack.

When predators are not deterred by exclusion or disruption, confrontation may occur. However, even confrontation is not necessarily lethal to potential predators.

Well-trained LGDs are introduced to livestock at an early age. They do not view livestock as a threat to their territory, but rather as part of their pack. LGDs include livestock within their territory and help prevent losses by deterring predators, such as coyotes, from entering. In the end, predators avoid protected pastures and stay safely away from flocks to prevent detection or confrontation by the guardian dog.

Competition is common among all canine species, including wolves, foxes, coyotes, and domestic dogs. Large canines usually harass or kill other canines within their territory. Wild canines react more strongly to other canines than to other species, like bobcats. That is why LGDs are considered especially effective at reducing coyote predation, the leading predator of sheep and goats in the U.S.

Birds of prey, black-headed vultures, and feral pigs also prey on small ruminants, although to a lesser extent than coyotes and domestic dogs, across

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the country. Some LGDs will look up and chase birds, while others will not. This behavior has both advantages and disadvantages; it can help reduce bird predation by chasing them away from the field, but if the dogs spend all their time chasing birds that pose no threat, it can tire them out and interfere with livestock management. More research is needed to better understand how LGDs interact with non-canine predators.

Effective livestock guardian dogs:

- are effectively bonded with livestock,
- exhibit protective behavior against intruders,
- establish areas that predators avoid, and
- remain on premises.

Problem livestock guardian dogs:

- roam beyond ranch borders;
- leave the herd unprotected for extended periods;
- are overly aggressive toward humans, livestock, and nonpredatory wildlife; or
- are ineffective at deterring predators.

Finding the Right LGD

Every dog has its own personality, and each ranch has unique livestock protection requirements. Some dogs prefer to stay with their livestock constantly, while others like to patrol the perimeter. Some are aggressive and will chase predators that invade their territory. Conversely, others prefer to stay with the flock and bark to warn off predators (Fig. 2). It is essential to match a dog's behavior to the rancher's specific needs. Take the time to talk with dog breeders and other ranchers before buying a guardian dog.

Figure 2. Most often, the dominant guardian dogs will investigate disturbances in a pasture and create a buffer space between themselves and their flock/herd.
AgriLife photo courtesy of Thorne, 2025.

Some breeders sell fully trained or bonded livestock guardian dogs. If you do not already have guardian dogs and are facing heavy predation, this can be a good option because trained dogs can start working right away. However, it takes 18 to 24 months for puppies to become effective guardians. Trained dogs cost more, but they are often worth the expense. This is especially true if the breeder offers money-back or full-replacement guarantees. The risks of buying a trained LGD include the dog running off or failing to bond with your livestock. Talk with the breeder about these risks before bringing a dog onto your property.

Before releasing an LGD, inform your neighbors that you are adding a dog or dogs to the ranch and specify what actions you would prefer they take if your dogs are found off the property. It is advisable to use dog tags that contain contact information and clearly indicate that the dog is a livestock protection animal. Post signs along the ranch boundary near public roads to let people know that guardian dogs are on duty (Fig. 3).

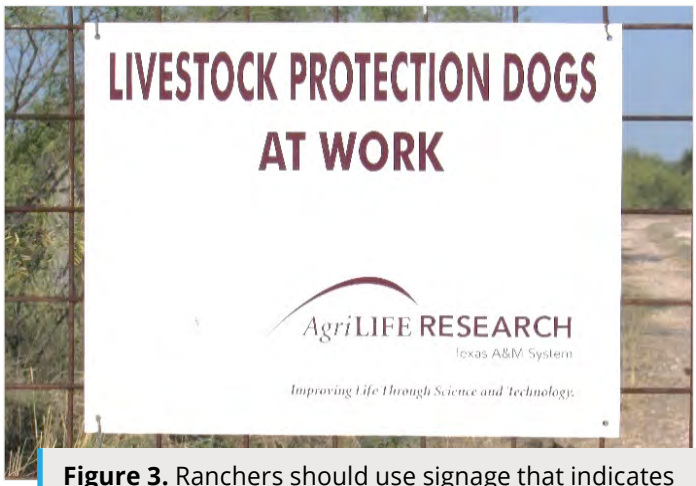

Figure 3. Ranchers should use signage that indicates the presence of livestock guardian dogs in the area. This can prevent conflict and provide contact information for people who suspect a problem.
AgriLife photo courtesy of Costanzo, 2025.

GPS Tracking of LGDs

GPS trackers make using and locating LGDs more convenient and efficient by allowing producers to find them from their phone or computer. GPS trackers can help identify holes in your fences if an LGD roams onto a neighbor's property or if your livestock leaves the pasture. By viewing the travel path in the GPS tracker provider's software, you can pinpoint the exact spot along the fence line where the dog or livestock escaped.

There are many GPS trackers available today, varying in price, ease of use, and especially battery life. It is best to choose trackers with lithium-ion batteries to extend battery life. Trackers explicitly designed for domestic dogs often have a short battery life because manufacturers assume you'll catch the dog to change the batteries regularly. The devices we use are commercially available and readily accessible, allowing producers to purchase them and receive customer support if needed (Fig. 4). Most of these devices are easy to attach to a dog's collar and run on batteries readily available in stores.

Figure 4. Oyster 3 cellular tracker. *AgriLife photo courtesy of Costanzo, 2021.*

GPS trackers are valuable for new LGD producers and those with young dogs, helping monitor behaviors and patrols and locate animals if issues with neighbors or roaming dogs arise. They can indicate if a dog was on a neighbor's property and help track if a dog has been caught. Tether-trained dogs often lie down before pulling a snare; geofence alerts notify when dogs approach fence lines. As technology advances, buyers should choose the latest units to avoid obsolescence.

Bonding LGDs to Livestock

Research shows that social bonding between dogs and small ruminants depends on imprinting puppies between approximately 5 and 16 weeks old (Fig. 5). This developmental stage effectively shapes the dog's adult behavior. Put simply, imprinting has a lifelong influence on the dog. During this period, puppies are most capable of learning specific social skills. This is when dominance hierarchies are formed, and dogs learn and practice submissive behaviors. Some people say that the dog thinks it is a sheep, but that is incorrect. It knows it is a dog; the social behaviors it shows toward sheep are typical of dogs, not sheep.

Figure 5. This is a small bonding pen for young LGDs. The area in the background is blocked off for the guardian dog and its feeding station. *AgriLife photo courtesy of Walker, 2016.*

Old-world shepherd dogs usually spend their lives from birth with one or two littermates, a few adult dogs, including their mother, several hundred sheep or goats, and a shepherd. By 16 weeks, the dog has been behaviorally shaped to prefer staying with the group for the rest of its life. Since most sheep in Texas are not herded, a human is often absent from the flock's social structure. During the bonding phase, adjustments are necessary to help young guardian dogs bond with small ruminants without constant human oversight.

Start Them Young

The best time to start bonding LGDs with livestock is between 4 and 8 weeks old, while they are still nursing. Research indicates that dogs may not form a proper bond with livestock if the introduction process begins after 16 weeks of age. Puppies 8 weeks of age and older should remain in constant contact with the animals they are to be bonding with. Do not bring the puppy into your home to socialize it.

Use Bonding Pens

Place one or two LGD pups in a small pen (about 3600 sq. ft.) with four to six calm, dog-socialized livestock. Socialized dams with older offspring are ideal, but inexperienced dams can be used if aggressive animals are removed. These livestock provide companionship and help correct unwanted pup behaviors. Pups should be exposed to several types of livestock (such as hair/wool sheep and meat/Angora goats) to reduce potential conflicts with animals they may not have encountered before. Provide a pup-only area for feeding. At around 12 weeks, release the pups with their bonded livestock into larger training pens, approximately 1 acre in size, and monitor them closely until they are 6 months old (Fig. 6). At that time, they should be placed in small training pastures of roughly 25 to 50 acres until the pups are at least 10 months old.

Figure 6. AgriLife 1-acre bonding pen in San Angelo. The feeding station (located at the center back) doubles as a safe area for the puppies to retreat to if they are bullied by livestock. Pens are also enclosed with electric fencing at the base.
AgriLife photo courtesy of Costanzo, 2020.

Teach Fence Respect

This is the most important lesson an LGD can learn. Research shows that only 52 percent of LGD live to age 6, and 57 percent of their deaths happen after they leave the property (Fig. 7). The second leading cause of loss is culling due to bad behavior, including escape. The saying "good fences make good neighbors" also applies to livestock and LGDs!

However, on many properties, this is not feasible, and some dogs will find a new hole in the fence each time another is patched. If you notice this behavior during the bonding period, the dog should be retrained first and then supervised for any additional issues. A triangular PVC yoke can help as a training tool to prevent dogs from breaching fences. Some producers also use electric fences to keep livestock and LGDs within pastures or bonding pens. Our research shows that electric fencing inside bonding pens effectively teaches LGDs to respect a fence. Additionally, studies on virtual fence collars after the bonding phase show promise in completely reducing roaming in adult LGDs.

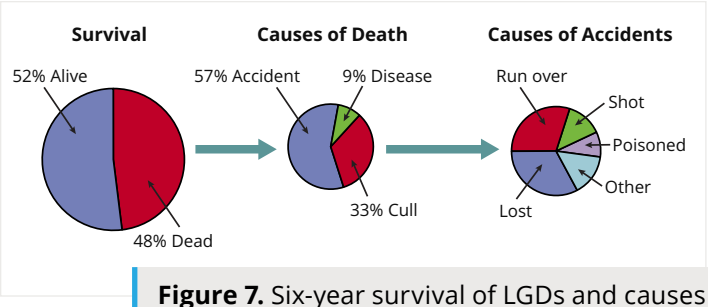

Figure 7. Six-year survival of LGDs and causes of losses. Most accidents would not have occurred if the LGD had not left the grower's property (Lorenz et al., 1986).

Teach Basic Commands

LGD puppies should learn a basic "come" command, practiced during feedings with livestock. Brief petting or belly scratches can be used as rewards but should remain limited to avoid excessive bonding with people. They should also learn "stay." Tell the puppy to stay every time you leave the bonding pen, rewarding only those that remain in place. Never reward a puppy that leaves the pen or pasture. Teach a firm "no" to correct unwanted behavior. A loud verbal "NO" or an air horn can stop issues such as chewing or biting livestock—common during bonding but still requiring immediate correction.

In larger pastures, dogs 6 to 18 months old may chase animals. A dangle chain with a small object (2×4 piece, tire, or PVC pipe section) can slow the dog and discourage chasing (Fig. 8). Remove any weak livestock that the dog targets. Puppies should also be trained to walk on a leash and accept tethering. Start with 2 minutes per week, and gradually increase each week. A small harness works well initially before transitioning to a regular collar. For tether training, use a lightweight chain with swivels on both ends, and attach it to a slip collar. Secure the chain low to the ground, and begin with 1 to 2 minutes, increasing weekly (Fig. 9). Tethering is legal for agricultural working dogs in Texas. Never leave a puppy unattended during tether training, as they can injure themselves. Over time, shorten the tether until the dog can remain calm for at least an hour on a 12- to 18-inch tie-out.

Figure 8. Komondor puppy wearing a dangle stick to slow chasing behavior.
AgriLife photo courtesy of Costanzo, 2023.

Figure 9. LGD puppy being tether trained.
AgriLife photo courtesy of Costanzo, 2024.

Socialize Your LGDs

Socialization of LGDs is another crucial step in managing dogs. We strongly recommend that producers socialize their LGDs so they can be easily managed and caught in the field if needed. Unsocialized dogs pose a liability to ranch owners, as they may become aggressive when caught, injure themselves, and harm employees. Socialization should be done during training periods in the bonding pens. Good animal welfare dictates that LGDs should be socialized and properly cared for just as any livestock on a ranch.

We have found that 15 to 20 minutes of socialization and training, three to four times a week, during the bonding and training period, will yield well-socialized dogs as adults. It is important to remember that LGDs need continual socialization as adults to remain manageable. LGDs should be praised and given treats when found in the field with their livestock. Likewise, dogs found away from livestock or their pastures should be immediately returned to their proper location and not rewarded in any way.

Normal LGD Behavior

Ideally, guardian dogs should approach people and animals that come near their herd. A simple pat on the head rewards them for good behavior. However, they should return to the herd shortly after learning that the intruders mean no harm. Some LGDs spend much of the day sleeping and stay alert at dawn and dusk. Good guardian dogs often patrol the perimeter of the ranch or pasture. They do not need to stay with the herd at all times. However, LGDs should not spend too much time away from the herd unless they are patrolling for signs of intruders.

Dogs caught roaming off the premises or loitering away from the herd, such as at the ranch headquarters, should be disciplined appropriately. They can be given a firm "no" command or a blast from an air horn, prompting them to return to their herd. If this does not correct the behavior, some breeders have found that kenneling a dog away from their herd for a day or two is enough to prevent it from happening again.

Breeds of LGDs

The most common LGDs in Texas are Great Pyrenees, Anatolian Shepherds, Maremma, and Akbash. These and similar guardian dog breeds are highly recommended. Breeds without strong protective instincts are less likely to be effective. Breeds that hunt or herd tend to display behaviors that are counterproductive to guarding small ruminants and rarely become effective LGDs. Survey data indicate that the Great Pyrenees is the most common guardian dog, primarily due to its reputation as a good guardian breed and its generally less aggressive nature toward people and livestock. However, its long hair coat can pose a significant problem in Texas. Proper grooming is essential for long-haired LGDs in warmer climates.

Since most people who own sheep and goats have small flocks and live in more populated areas, these dogs are well-suited. Larger-range flocks, however, might need a more aggressive breed to control predation. The Akbash is considered one of the most aggressive and protective breeds for small ruminants. Breeds like the Maremma or Karakachan tend to stay close to their herds. Regardless of breed, individuals within each breed vary widely, so it is crucial to observe each dog's tendencies.

Sex of LGDs

Either sex can be an effective LGD, and spaying or neutering does not seem to decrease a guardian dog's protectiveness. Research shows no differences in guardian abilities between males and females or between fixed and intact LGDs. Neutering males often reduces their roaming and can be beneficial, especially when this roaming causes conflicts with neighbors. Heat cycles in intact females can disrupt protection by attracting outside dogs or distracting male LGDs from their duties. Additionally, when females whelp and raise a litter of puppies, they become less effective as protectors.

How Many LGDs Do You Need?

The number of dogs needed for optimal protection depends on the size of the pasture, the number of herd groups, terrain, the flocking instinct of the livestock, the type and number of predators, fencing, and the behavior of the guardian dogs. Generally, one to two dogs per 100 ewes or nannies is recommended;

however, this is not a strict rule. Producers facing large predators, such as wolves, bears, or mountain lions, or dealing with a high number of predators, may require more livestock guardians, such as one to two dogs per 50 ewes or nanny goats. Producers with several livestock species on rotational grazing systems may need one dog per species to provide adequate protection. A key rule of thumb is to continue adding LGDs until predation stops or reaches an acceptable level of loss for the ranch.

Research indicates that herd size and type determine the number of LGDs needed to reduce or prevent predation effectively. Except for small flocks near the house, having two dogs is generally preferable because if one dog is lost, the animals will still be protected. Conversely, flocks of 1,000 or more usually have no more than eight LGDs. Start with one or two dogs and assess their effectiveness once they reach maturity. Introducing newly bonded dogs to a herd that already has a mature and effective LGD is often more successful than starting with three or more untrained dogs. Younger dogs learn from experienced guardians. Periodically, add new LGDs to maintain an even age distribution and ensure there are always enough mature, effective LGDs with the flock.

Proper Care

Feed LGDs a high-quality dog food, especially when they are young. Consistent feeding helps keep them healthy and discourages roaming. Use self-feeders inside feeding stations if you cannot visit daily, but be aware they can attract varmints like raccoons, increasing feed costs (Fig. 10). Daily checks allow you to hand-feed during flock inspections, rewarding dogs for staying with the herd and preventing waste. LGDs may also eat afterbirth from birthing ewes or nannies, which most ranchers allow because it helps reduce predator and varmint attraction at birth sites (Fig. 11).

Figure 10. This feeding station is constructed from square tubing and is 4 ft. × 6 ft. × 4 ft. The livestock gate is used to allow LGDs to jump into the feeding station, keeping livestock and feral hogs out.
AgriLife photo courtesy of Costanzo, 2019.

Proper healthcare for LGDs should be carefully planned with a licensed veterinarian and include scheduled vaccinations, deworming, and heartworm prevention. Manage external parasites, such as fleas and ticks. Consider rattlesnake vaccines for added protection, as LGDs are more likely to encounter rattlesnakes than typical pets. Rabies vaccination is required in all 50 states, either annually or every 3 years. Some LGD breeds need grooming to prevent matting and heat stress. Longevity helps reduce LGD costs, and good healthcare is crucial. Also, avoid letting LGDs eat carcasses, as diseased meat can infect livestock, causing diseases like sheep measles and carcass condemnation.

Figure 11. Dogs are attracted to animals at parturition and provide added protection when small ruminants are most susceptible to predation.
AgriLife photo courtesy of Walker, 2016.

Limitations When Using LGDs

Using LGDs limits other predator-control methods, such as snares and M44s, but many find the benefits outweigh this limitation. Respecting boundary fences allows lethal strategies outside the LGD area. Ideally, LGDs would replace other control methods. Some still use snares with LGDs; dogs in snares usually survive with daily checks, but this is risky and costly. Conditioning dogs to snares beforehand and tether-training LGDs during adolescence can reduce problems.

Cost of LGDs

Most sheep and goat producers view their LGDs as a valuable asset to their operations; however, there are notable costs associated with them. The initial cost of a new LGD is at least $1,800, with annual expenses of around $900 afterward. Figure 12 emphasizes the importance of LGD longevity. The LGD expense for the first 3 years is high due to purchase costs and limited protection in the initial year. However, by age 4, an LGD only needs to save five lambs each year to cover its cost.

While these expenses are considerable, no value is assigned to the peace of mind and increased safety that a successful LGD program provides for shepherds. Local breeders and veterinarians can offer more accurate cost estimates in your area. These expenses are often minor compared to losses from predation, not to mention the value of peace of mind.

LGDs and Nonpredatory Wildlife

When choosing LGDs to manage predators on your livestock ranch, you also need to consider their effects on non-predatory wildlife. For many producers, this wildlife is a vital part of their income from sheep or goats. State or federal laws may also protect some wildlife against harassment. These laws vary in protection, so consulting with local wildlife agency law enforcement is recommended. Adverse impacts from LGDs on wildlife could lead to serious financial and legal problems for your farm. If you or your neighbors suspect your dogs are killing non-predatory wildlife, you must carefully identify the actual cause before blaming anyone. While well-trained dogs are unlikely to disturb non-predatory wildlife, it is still advisable to be aware that you may need to correct their behavior.

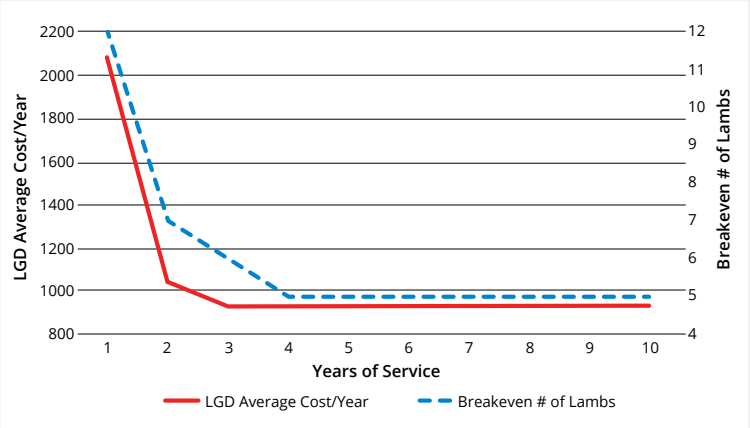

Figure 12. Effects of LGD longevity on average annual cost and breakeven of additional lambs weaned. Assumes an 80 lb. market lamb at $175 each. LGD costs are approximately $2,000 the first year, $1,000 the second year, and $900 in succeeding years.

Deer

On many sheep and goat operations, fee hunting for whitetail deer or other similar big game species is a key source of income. Small numbers of LGDs have been documented as chasing, harassing, and killing deer. In these cases, the LGD perceives the deer as a trespasser. If this behavior cannot be corrected, the dog might need to be removed or restrained from certain areas at specific times of the year. Conversely, dogs that do not interfere with deer and keep predators away create a safe environment for deer to raise their offspring (Fig. 13). Recent reports indicate that captive deer breeders are using LGDs to reduce fawn predation.

Figure 13. This guardian dog found a newborn fawn hidden in tall grass. The guardian dog provided a safe haven for the deer. In other situations, guardian dogs may prey on newborn fawns.
AgriLife photo courtesy of Walker, 2016.

Small Game

Small game, such as rabbits and squirrels, can have economic value but may also be harassed by LGDs or even hunted for food. Many predators rely on this small game as their primary food source, and removing it might cause them to shift to livestock that they would not otherwise target.

Game Birds

Bobwhites, turkeys, doves, and other game birds are essential elements of many fee hunting operations on agricultural lands in Texas. While doves might easily escape LGD harassment, ground-nesting birds such as quails and turkeys

cannot. If repeatedly stressed by LGDs, these game birds can suffer weakened immune systems and even die. Females incubating nests in the summer may abandon them if disturbed by dogs. This reduces annual bird production and hunting opportunities. Conversely, LGDs that do not disturb game birds might reduce predation and improve recruitment of their offspring.

Protected Species Concerns

Although unlikely in most parts of Texas, LGDs may harass or harm wildlife protected under various laws, such as the Endangered Species Act. In some areas of the country, this already presents a significant challenge for livestock producers. To avoid legal issues, consult a wildlife biologist and local wildlife law enforcement about where protected species might live on your property, if your dogs might encounter them, and how to prevent your dogs from disturbing or harming them. For species listed under the Endangered Species Act, working with regulatory agencies can provide landowners with limited exemptions from the law. On the other hand, LGDs could help reduce predation of endangered species. In Australia, guardian dogs are used to protect threatened seabird colonies from predators and are credited with increasing the populations of penguins and Australasian gannets.

Varmints

Varmints such as raccoons, opossums, and other animals often become overabundant nuisances for both ranchers and LGDs. This happens most often at feeders used for LGDs, wildlife like whitetail deer, or livestock. Moving dog feeders to less accessible locations can sometimes solve the problem. Since most varmints are active only at night, placing a feeder near sheep bedding sites or in an open area away from trees, where varmints seek cover, can help reduce the issue. If this does not work, trapping them near the LGD feeders may be necessary. Use specially designed, dog-proof traps to minimize non-target capture.

Conclusions

Purchasing high-quality livestock guardian dogs and properly training and managing them can be highly effective in controlling predation. Sheep and goat ranchers starting an LGD program should understand that it may take a couple of years for the program to become fully effective. Some dogs might not work out and will need to be replaced. LGDs, like other livestock, must be evaluated on an individual basis. By carefully observing and selecting them, their effectiveness should improve over time. Trained livestock guardian dogs are often viewed as a vital part of a small ruminant predator management plan (Fig. 14).

Figure 14. LGD protecting Angora goats in Ozona, TX.
AgriLife photo courtesy of Brown, 2023.

Reference

Lorenz, J. R., Coppinger, R. P., & Sutherland, M. R. (1986). Causes and economic effects of mortality in livestock guarding dogs. *Rangeland Ecology & Management/Journal of Range Management Archives*, 39(4), 293-295.