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Livestock Guarding Dogs and Wolves in the Northern Rocky Mountains of the United States

by

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Introduction

The grey wolf *Canis lupus* was once distributed throughout North America (Nowak 1995). Conflict with livestock and historic public hatred of wolves resulted in extirpation of wolf populations in the western United States (U.S.) by 1930 (Mech 1970). In 1974, wolves were protected by the federal Endangered Species Act of 1973 (ESA) and their recovery became the responsibility of the U.S. Fish and Wildlife Service (USFWS). Wolf restoration in the western U.S. began in 1986 when a 'Canadian' pack denned in *Glacier* National Park, Montana (Ream et al. 1989). Management in northwestern Montana emphasized legal protection and building local public tolerance of non-depredating wolves (Bangs et al. 1995). Wolves from Canada were reintroduced to central Idaho and *Yellowstone* National Park in 1995 and 1996 to accelerate restoration (Fritts et al. 1997, Bangs et al. 1998). The wolf population grew to an estimated 800–850 wolves in the *Northern Rocky* Mountains (NRM) of Montana, Idaho, and Wyoming by late 2004 (USFWS et al. 2005). Since 1987, wolves have killed a minimum of 410 cattle, 1,044 sheep, 70 dogs [18 of which were being used to guard livestock], 12 goats, 9 llamas, and 3 horses. To minimize conflicts, we moved wolves 117 times and killed over 275 (Bradley 2003, USFWS et al. 2005). We encourage sheep producers to use livestock guarding dogs (LGDs) and other methods to reduce the risk of wolf depredation (Bangs et al. In press, Bangs et al. 2004, Bangs and Shivik 2001). A private group, Defenders of Wildlife, helps pay for LGDs with sheep producers to encourage their widespread use. LGDs are working well against a diverse carnivore guild but this paper is intended to show some novel aspects of their use against wolves. We discuss some interactions we have observed between LGDs and wolves and speculate about increasing the effectiveness of LGDs to protect livestock from wolf depredation.

Study Sites

The NRM Wolf Recovery Plan identified preferred wolf habitat as large areas of public land with adequate year-round wild prey and few livestock (USFWS 1987). Based on those criteria, northwestern Montana, central Idaho, and the *Greater Yellowstone Area* (GYA) were recommended for wolf restoration (USFWS et al. 2004, maps at <http://westerngraywolf.fws.gov/>) (Figure 1). Each area has a large core of national park or national forest wilderness, where livestock grazing is limited. Other mountainous habitat is undeveloped federal public land, managed for multiple uses such as forestry, mining, hunting, recreation, and summer livestock grazing. Lower elevation valleys are often private agricultural lands. Coyotes *Canis latrans* are numerous. Black bears *Ursus americanus*, mountain lions *Felis concolor*, and golden eagles *Aquila chrysaetos* are common. In the GYA and parts northwestern Montana brown bears *Ursus arctos* are common. Wild ungulates, numbering between 100,000–250,000 per recovery area, (mule deer *Odocoileus hemionus*, elk *Cervus canadensis*, moose *Alces alces*, white-tailed deer *Odocoileus virginianus*, big-

horn sheep *Ovis canadensis*, antelope *Antilocapra americana*, and bison *Bison bison*) typically disperse to higher elevations in summer but winter at lower elevations. Consequently, many wolves also use private land at least part of the year.

Livestock are commonly raised on these private lands year-round. Livestock are also grazed on the majority of adjacent public lands during the summer grazing season (May-October). We estimated that in the central Idaho and Yellowstone recovery areas there were about 350,000 cattle and 110,000 sheep on private land each spring. Each summer 82,000 to 145,000 cattle, 223,500 to 265,000 sheep, and about 1,200 horses were grazed on public land in these areas. Private ranches and public land grazing allotments are large [often 1,000s of ha.] and remote. Cattle are typically grazed in a highly dispersed fashion as cow/calf pairs or yearlings from April-October. Cattle are not closely herded in summer and are often checked only weekly or less often. Range sheep are typically grazed on remote pastures from June-October in bands of 1,000 ewes and 1,200 lambs while farm flocks are typically a few hundred or less and grazed in fenced pastures. Bands are typically managed by 1–2 shepherds with herding dogs

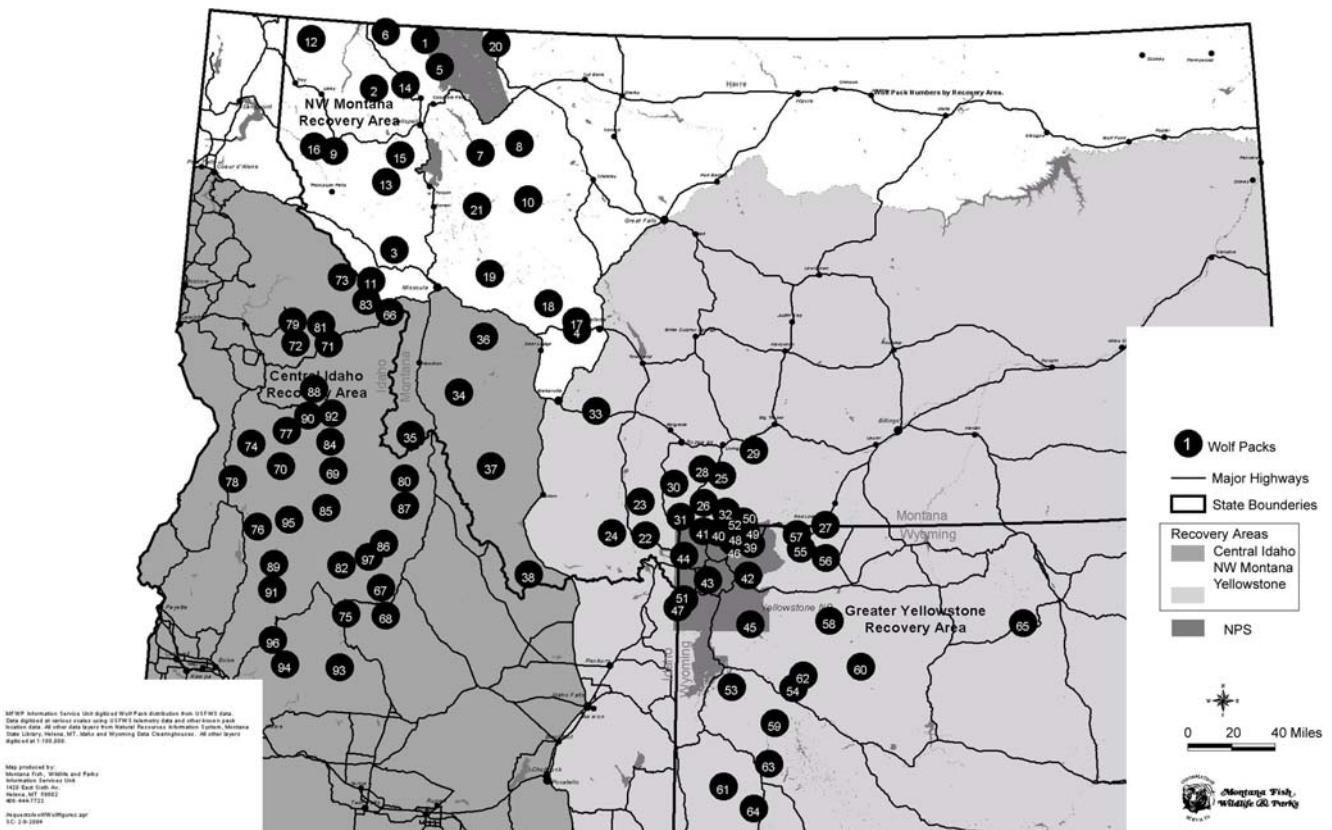


Figure 1. Wolf packs in the Central Idaho, Northwest Montana and Great Yellowstone Wolf Recovery Area. (Map produced by Montana Fish, Wildlife and Parks Information Services Unit)

and often protected by 1–5 LGDs. Bands are usually night-bedded and herders camp near the bands. Horses are grazed in small herds of less than 40 and are typically in fenced and accessible pastures. Other types of livestock are not grazed on public land and are rare on private land. In northwestern Montana livestock are almost exclusively cattle, but sheep are more common in the Idaho and *Yellowstone* areas. Due to global markets, sheep grazing is increasingly less common. Livestock guarding dogs (primarily *Great Pyrenees*, but also some *Anatolian Shepherd Dogs*, and other breeds), and sometimes llamas on private pastures, are used to guard sheep from predators, primarily coyotes that cause the vast majority of all predator damage (Bangs et al. In press). Dogs that guard cattle in summer are often ‘pets’ in winter and are kept at the farm house. Sheep and cattle are commonly herded with dog breeds such as collies, heelers, and shepherds that physically accompany the human shepherd or rider.

Livestock producers in Montana, Idaho and Wyoming reported to the National Agricultural Statistics Service that predators killed 8,500 sheep and 33,100 lambs in 1999 (NASS 2000). Sheep producers said coyotes were responsible for 67% of sheep losses and 80% of lamb losses to predators. Sheep producers protected their sheep by using lambing sheds (average of 56% reported using them), night pens (50%), guard dogs (40%), fencing (36%), herding (12%) and frightening devices (7%). Cattle producers in Montana, Idaho, and Wyoming reported losing about 400 adult cattle and 6,700 calves to predators in 2000 (NASS 2001). They believed coyotes caused most of those losses (73%). Cattle producers reported protecting their cattle by carcass removal (36%), guard dogs (27%), fencing (26%), herding (12%) and night pens (9.9%).

Wolf attacks on dogs

Wolves infrequently kill dogs and usually do not eat them in North America (Kojola and Kuittinen 2002, Fritts and Paul 1989, Treves et al. 2002). Only a few of the dogs killed in the NRM were fed upon

and most conflicts appear related to inter-species competition (Figure 2). Adult wolves in our area are large. Males weigh up to 50 kg, females 45 kg. To date 70 dogs (10 pet, 18 guard, 19 hunting (almost exclusively <20 kg hounds used to chase and tree mountain lions and black bears), 18 herding, and 5 undocumented breeds have been confirmed killed by wolves in the NRM from 1987 until the end of 2004. From 1 to 4 dogs were killed per attack (average 1.2). Breeds range in size from a *Pomeranian* to *Great Pyrenees*. Although Humane Society organizations in each state euthanize thousands more dogs than wolves kill, wolf depredation on dogs is a serious and emotional social issue. It is one of the most difficult conflicts that we address because people form particularly strong emotional bonds with dogs. Depredations near homes also raise fears for human safety and anger over the perceived violation of personal space. Private compensation, up to (US) \$ 2,000, is only provided for herding and guarding dogs confirmed killed by wolves. Wolves that attack dogs on private land can be legally relocated or killed (USFWS 2003), but to date none have been because most attacks were isolated incidents in remote areas. In this paper we only address fatal agency-confirmed wolf depredation on LGDs that were being used to protect livestock (Table 1). We recognize that confirmed fatal wolf/LGD encounters are a fraction of all wolf-caused LGD deaths, since a LGD may simply disappear and its fate never documented, however our data show a pattern in wolf interactions with LGDs.



Figure 2. Farmer preying over his wolf-killed LGD. (Photo: Rick Williamson)

Table 1. Confirmed fatal Livestock Guarding Dog [LGD] depredations caused by wolves in Montana (MT), Idaho (ID), and Wyoming (WY), USA. The three wolf recovery areas are; northwestern MT (NW MT) where naturally dispersing wolves from Canada first denned in 1986; and the *Greater Yellowstone Area* (GYA) and central ID were wolves were re-introduced in 1995 and 1996. Anatolian (*Anatolian Shepherd Dog*), Pyrenees (*Great Pyrenees*).

Date	Area/Location	Livestock guarded	Breed	Wolf Pack	Notes
08/00/1995	NW MT, Ninemile, MT	cattle in summer	Anatolian	Ninemile	near house, eaten
06/16/1996	NW MT, Ninemile, MT	cattle in summer	Pyrenees	Ninemile	near house, eaten
07/16/1996	ID, Boise NF, ID	band of sheep	Anatolian	unknown	range
04/21/1998	GYA, Dubois, WY	cattle in summer	Pyrenees	Washakie	near house
10/03/1998	GYA, Tom Miner, MT	flock of sheep	Pyrenees	Chief Joe	near house
03/29/1999	ID, Iron Creek, ID	flock of sheep	Pyrenees	Jureano	range
11/06/1999	GYA Soda Springs, ID	band of sheep	pup Pyrenees	Lone wolf	2 LDGs wounded
01/25/2000	GYA, Tom Miner, MT	flock of sheep	Pyrenees	Chief Joe	near house
03/03/2000	NW MT, Ninemile, MT	cattle in summer	Pyrenees	Ninemile	by house
07/24/2000	GYA, Tom Miner, MT	flock of sheep	Pyrenees	Chief Joe	near house, eaten
08/17/2000	GYA, Dubios, WY	cattle in summer	Pyrenees	Washakie	range
09/20/2000	GYA Jackson, WY	cattle & camp in summer	3 Catahula	Gros Ventre	range
06/10/2001	ID, Stanley, ID	band of sheep	Pyrenees	Whitehawk	range
08/10/2002	ID, Hill City, ID	band of sheep	unknown	Chimney Creek	range
08/30/2004	GYA, Dillon, MT	band of sheep	2 Pyrenees	Freezeout	range
11/29/2004	ID, McCall, ID	band of sheep	Anatolian	Florence	range

Wolf interactions with LGDs

At least 18 LGDs have been killed by wolves (Table 1). We do not typically record the sex or age, but of the 18 LGDs killed, 11 were *Great Pyrenees*, 3 *Anatolian Shepherd Dogs*, and 3 *Catahula Hounds*. Our limited data do not allow us to determine if some LGD breeds are more effective or less likely to be killed by wolves. LGDs can be relatively effective at protecting herded livestock from coyotes, mountain lions, and bears and are commonly used by sheep producers for such purposes (Coppinger and Coppinger 1978, 1980a, 1980b, 1982, Green and Woodruff 1983, Green, Woodruff and Tueller 1984, Linhart et al. 1979, McGrew and Blakesley 1982). Cattle producers in range operations rarely use LGDs because of the highly dispersed cattle grazing strategies used in the western U.S. Coyotes (10–15 kg) are much smaller than LGDs. Mountain lions, black bears, and to a much lesser extent brown bears, seem naturally wary/frightened of dogs - even relatively small ones. We speculate that this is likely because they evolved with gray wolves - which have been documented to chase, harass, or kill these other large predators. As expected, our data suggest, as others have, that dogs are most likely to be killed by wolf packs. Conflicts peak in summer when wolves are rearing pups and LGDs are in remote areas and most likely to encounter wolves. Some conflicts occur in

winter when wolf breeding behavior seems to make them more territorial and wolves seemed to seek out dogs. All dog conflicts including LGDs suggest attacks are more likely when people are not present and the dogs are outnumbered or out-weighted. We describe several reported interactions between LGDs and wolves where we have data collaborating at least parts of these stories (dead livestock, dead LGDs, dead wolves, radio telemetry data). These incidents illustrate the complex and variety of relationships that can occur between LGDs and wolves. Behavioral interactions between guard dogs and wild wolves are very difficult to obtain and are often primarily stories related from herders or others working with livestock. Such data may be extremely biased since only interactions that were perceived a 'problem' were reported - who knows how many times dogs and wolves have interacted without serious consequences or without documentation. Therefore we urge caution in any attempts to interpreting these data/stories more broadly than intended.

Lone LGD interactions with lone wolves

In Fall 1996, 10 wolf pups from a pack that was killed because of chronic cattle depredations in NW Montana were placed in a large pen with 2 sub-adults near the center of *Yellowstone National Park*. The 12 wolves were released in Spring 1997. One of

those pups, female #68, now a yearling, dispersed from the Park in early August and we lost radio-telemetry contact with her. She traveled about 100 miles south, through many other grazed areas – primarily cattle – and some rural developed areas. She apparently settled where domestic sheep were being grazed in Wyoming. Before depredations were confirmed, the herder reported that his lone LGD (sex unknown) had been behaving aggressively toward a lone ‘wolf’ for several days and reportedly chased it and howled back and forth with it at night. However, he reported that eventually the two seemed to adjust to one another and were actually seen bedded near one another. On August 14, 1997, 38 lambs and 3 ewes were confirmed as wolf kills. Wolf #68 was captured in a leg hold trap and relocated back into the center of *Yellowstone* National Park on August 16. On September 4, wolf #68 was seen bedded near the LGD in the same flock of sheep. Fifteen more sheep were confirmed wolf-kills shortly thereafter. She was killed by an agency control action in that same area on September 9, 1997. It seems likely that wolf #68's quick return to the sheep flock was not related to food, since prey is abundant everywhere that time of year and her primary interest was returning to the LGD, that apparently had become a companion. There were few other wolves south of *Yellowstone* National Park at that time. We have documented less than a dozen other instances (unpublished data) where lone dispersing wolves and dogs were reportedly not overtly aggressive or appeared only mildly curious of one another. We have antidotal information suggesting a lone wolf and a LGD guarding sheep in southern Idaho became companions while sheep were being killed. After we killed the depredating wolf, the LGD continued to prey on sheep and was also euthanized. We have never documented wild wolves and dogs breeding in the wild.

Interactions between groups of wolves to LGDs

Wolves in packs normally have territories that they aggressively defend from other canids. One of the primary causes of adult wolf death, other than people, is other wolves (Mech and Boitani 2003). Not surprisingly, wolf packs will kill dogs when they can. The usual result of a lone dog fighting a wolf pack is a dead dog. There is a wolf pack territory in the *Gravelly* Mountain range west of *Yellowstone* National Park that includes public allotments grazed by sheep bands. This area has been used by the Freezeout pack in 2001 (6 wolves, 4 pups, no depre-

dations), 2002 (9 wolves, 6 pups, 2 cattle, 2 sheep killed), 2003 (8 wolves, 4 pups, 20 sheep killed), and 2004 (12 wolves, 5 pups, 2 LGDs and a herding dog killed). The sheep producer in this area has herders who travel with and camp near where the sheep are night-bedded on his public grazing allotment. The herders use herding dogs and 1–2 LGDs. We provide them telemetry receivers and the collar frequencies for members of the Freezeout pack. They report that their herders commonly hear the wolves howling or pick up their radio signals near the sheep in summer. If the dogs start barking and acting aggressively the herders quickly move toward the wolves to protect the dogs and scare away the wolves. They have had few losses on their public grazing allotment due to their diligence. However in 2004, 2 LGDs and a herding dog fought with wolves as they approached the sheep at night. Before the herder could intervene a herding dog and a LGD were killed, and the other LGD was badly wounded. It disappeared that night and likely died. No sheep were killed. We also know of a large sheep producer in central Idaho who used herders and up to 5 LGDs per band. They were very pleased with the low numbers of wolf-caused losses, until this year. In 2004 at least 140 sheep and probably over 300 were killed in those bands despite a similar level of protection to previous years. No LGDs were killed. Some of this could be random chance but we suspect it has to do with the increasing distribution of wolves and larger packs that are raising pups on those sheep ranges.

In 1998 the Chief Joseph pack (9 wolves, 6 pups) that lives in and out of the northwestern corner of *Yellowstone* National Park killed a LDG at a farm in Tom Miner Basin. LGDs were replaced by a conservation group. In 1999, they (8 wolves, 3 pups) killed six sheep protected by LDGs at that farm. In January 2000, (13 wolves, 6 pups) the pack returned to that farm and killed another LGD. In May the pack returned and killed a calf from a small cow/calf herd nearby. In July they killed another LGD on the sheep farm. It appeared that when the pack came into Tom Miner Basin they routinely went to the sheep farm/house and howled at, scent marked, and attempted to intimate/fight the LGDs. There were other farms and dogs in the Basin but the wolves tended to repeatedly visit this farm. After the third LGD was killed, we and a conservation group helped him construct a fence to night pasture his sheep and protect his remaining dog. However, he reported that he still had to lock up his guard dog in a horse trailer at night because the wolves seemed more attracted to them than his sheep. He believed the wolves were coming

to his farm so often to harass the LGDs. He ended up moving his LGDs and sheep to another farm for 2 years because they were primarily used by his wife for her weaving hobby and he approved of efforts to restore large carnivores in *Yellowstone* National Park. In summer 2004 he brought a LGD and 15 ewes back to his farm and a sheep was killed by a wolf in November 2004.

Patrolling dogs and their interactions with wolf packs

A cattle producer in Wyoming used a pack of 6 *Catahula Hounds* (25–30kg) to help patrol his public grazing allotment and camp, often near him and his riders. He believed the dogs 'aggressive' behavior helped to reduce damage from grizzly bears that were common in the area and routinely depredated on his cattle. This was a very uncommon livestock husbandry practice and hounds are rarely used to guard livestock. His allotment bisected the territories of the Teton (4 wolves-no pups) and Gros Ventre (6 wolves, 3 pups) packs. In mid July 2000 the Gros Ventre pack wounded a cattle herding dog but it lived. On September 20, 2000, the Gros Ventre pack (including the alpha male and female) killed one of his calves on a public grazing allotment. The hounds encountered the wolves at the carcass and two hounds were killed. A day or so later, the pack apparently searched out and killed another of his hounds.

Discussion

We have recorded two instances where lone wolves have fought with groups of 3–4 LGDs, but in only one instance was a LGD killed, and it was a young pup [11/06/1999 Soda Springs]. However in those instances 2–3 adult LGDs were injured. We do not have many other examples of multiple LGDs interacting with lone wolves. We suspect this is because lone wolves probably go out of their way to avoid groups of strange canids. Dispersing lone wolves must constantly avoid resident wolf packs, lest they be detected and killed. We speculate that multiple LGDs can repel lone wolves if the wolf does attempt to challenge them, and behaviorally, multiple LGDs might be less likely to 'accept' a strange wolf as a companion. More conflicts between a lone wolf and multiple LGDs might go unreported since LGDs appear less likely to be killed in fights with a lone wolf.

The case studies presented in this paper show a

pattern where wolf packs with established territories and pups perceive dogs as trespassing 'wolves'. They actively searched out certain dogs and when possible attempted to attack and kill them. Dogs killed during these types of encounters are usually not eaten. This could just be a function of these encounters occurring near people and the dog's carcasses being discovered relatively quickly, but we believe it is more because the dogs are killed in territorial battles. This territorial behavior is well documented and appears to mainly manifest itself most strongly when the wolves outnumber or outweigh the dogs involved. Wolves routinely chase, attack, and kill coyotes if the opportunity presents itself. Perhaps a more evenly matched battle might still occur between multiple LGDs and wolves, but with less injury to LGDs, although wolf-to-wolf conflict often results in dead wolves. However we speculate that in contrast to defense of food (Coppinger and Coppinger 1995) defense of territory/pups is often considered a life or death matter by wolves. We also speculate that areas with resident dogs that are considered trespassers by wolves may be deliberately visited by wolves who repeatedly attempt to harass or kill them. This could mean that LGDs that are roaming with bands of livestock may encounter wolves on a more random basis rather than having wolves deliberately searching the dogs out at homes or farms. Our observations also suggest that after a pack detects dogs, it may for a short period of time increase its attentiveness and aggressiveness toward them.

Recommendations

We cautiously recommend the following to make LGDs more effective in protecting livestock from wolves. Of course all the standard livestock protection issues should continue to be followed- graze healthy livestock, keep carcass-free pastures, have vigilant herders, calve/lamb in protected environments away from large predators, free-graze larger older livestock, vigorously harass any predators near livestock, and whenever possible have effective predator-resistant barriers or fencing. To be protected, livestock must be within the LGD's ability to detect predators, so fenced, confined, or closely night-bedded livestock are more easily protected by LGDs than dispersed livestock. Such barriers or confinement can also protect LGDs. Conflicts can occur at any time, but at night extra vigilance and protection is wise. LGDs should be protected by people or wolf packs can kill them. Multiple LGDs should be

used, both to increase their ability to detect wolves and defend themselves, and to reduce the opportunity for a lone LGD to react non-aggressively toward a lone wolf. Lastly, LGDs can help reduce livestock losses, but some livestock losses are inevitable in the presence of wolves. The smaller the livestock, the more likely it can be easily killed by wolves, the more will be killed per wolf attack, and the more the livestock needs to be protected by people. LGDs can help to reduce losses and are most likely to be successful when used in combination with other techniques to reduce the potential for depredations on livestock by wolves.

Summary

The pattern we have observed between wolves and dogs, including LGDs, is very similar to that detected elsewhere (Fritts and Paul 1989). We speculate that the vast majority of wolf-dog conflicts in our area have not been related to food. The numbers of wolves in our relatively new and rapidly expanding population is very low compared to wild prey and livestock availability. Most of the encounters we have documented appeared to involve intra-species aggression. In most instances, dogs were killed but not eaten. Almost all of the dogs, including LGDs, were killed in areas within resident pack territories and were not being directly protected by people. However, in several instances wolves fought dogs in yards or even porches with people very close by, but in nearly all of those cases the wolf(s) were driven-off before the dog was killed. Multiple LGDs accompanied by herders appear to be a viable tool to reduce the potential of wolf depredation on confined or closely herded livestock. LGDs appear ineffective at protecting highly dispersed livestock and LGDs must be protected from wolf packs.

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