Livestock Guarding Dogs: a New Experience for Switzerland

by
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Introduction

Wolves *Canis lupus* were eradicated from Switzerland about 150 years ago. However, since 1995, dispersing wolves from Italy and France have regularly attacked livestock. Swiss sheep farming is no longer adapted to large carnivores because sheep are free-grazed unguarded on alpine pastures. Losses to wolves can potentially be high: surplus killing is common and sheep panicking often fall over cliffs in mountainous regions. Moreover the wolf in Switzerland is fully protected, implying that solutions must be found through changes to sheep husbandry rather than through wolf control. To try to deal with this situation, the Swiss Agency for the Environment, Forest and Landscape (SAEFL) instigated the Swiss Wolf Project (SWP) in 1999. The prime goal was to set up mitigation measures, to monitor wolves, and to spread information about wolves and mitigation measures. For financial and political reasons, the project ended in December 2003. In 2004 a new project was initiated involving more agriculture interests, and dealing only with mitigation measures. This paper discusses the implementation of livestock guarding dogs (LGDs) during the SWP (1999–2003). A separate article in CDPNews No 9 will present briefly the concept of the new project led by the Service Romand de Vulgarisation Agricole (SRVA, information center for agriculture).

Sheep farming in Switzerland

Since the Uruguay round of world trade negotiations in the early 1990s, Switzerland was forced to adapt its highly conservative agricultural sector to the world trade rules. Trying to reduce the number of farms that were closing, the government defined a new multifunctional role for the agricultural sector (e.g. to preserve natural resources, to keep livestock in an environmentally responsible way, etc). These new responsibilities are considered as public services and are not influenced by the market prices since farmers are subsidised by direct governmental compensations (FOAG[1] 2000). However, the farmers' wages are slowly decreasing forcing them to look for another job to complement their incomes (SFU[2] 2002). Since 1992, the price of the lamb meat declined by 20%. Small farms (≤49.4 acres or 20 ha) are disappearing while big farms are slowly expanding (FOAG 2002). The agricultural context makes the future of many sheep farmers uncertain, even if for many of them, keeping sheep is only a supplementary job or hobby. Prices and markets will no longer be guaranteed (e.g. as of 2007, lamb meat is expected to loose 30–50% of its actual value) and financial support will be reduced. The wolf could not choose a more turbulent period to return to Switzerland.

Since the Second World War, shepherding was abandoned to decrease the costs. Sheep are currently free ranging on alpine pastures and checked once a week. Today the average size of a flock of sheep does not exceed 300 animals in 99.6% of the farms in Switzerland and in 77% of the alpine pastures. Only a few big flocks are still guarded by shepherds. Alpine pastures can be located at more than 2,500 m

Figure 1. Alpine pasture where sheep are grazed during the 100–140 day summer season. (Photo: Jean-Marc Landry)

[1] Swiss Federal Office for Agriculture
[2] Swiss Farmers'Union

a.s.l. and can be very steep (Figure 1). Unguarded sheep are allowed to roam over large areas of up to several km^2, generally delimited by natural borders like ridges, rock faces or forests. However, the flocks are well manageable even if they scatter in small groups because pastures are often at a mountain side of a valley. To make them stay on the pasture and to return to the same night time places they are fed regularly with salt at the same places. As the sheep of a flock normally belongs to one breeder they know each other and stay more or less in a flock. Some flocks are fenced at the beginning of the summer season until mid-august and then are allowed to roam free. If a shepherd is present, daily or weekly sectors are delimited to graze the flock. In spring and fall, flocks are usually kept in the bottom of valleys in small wire netting or electrified enclosures. Most of these pastures are located near forests or are overgrown with bushes and small trees. Since the winter is severe, the sheep are kept in barns from December to late March/mid April. The lambing season runs from January to March and the lambs are sold in autumn for the meat. If LGDs are present, they are always living with the flock, event if it is unguarded or in winter time in the barn.

Consequences of the return of the wolf to Switzerland

Until now, the wolf has reappeared only in the south of Switzerland (cantons of Valais, Tessin and Grisons), which represents 36.7% of the Swiss territory (15,142 km^2). This is where nearly half (44%) of the alpine pastures are located and in which nearly $^2/_3$ (59%) of the sheep graze during the 100–140 day summer season (147,000 heads or nearly 10 sheep/km^2). Lots of cattle (119,000 heads or nearly 8 cows/km^2) are also grazing in this area, on pastures situated at lower altitudes. Besides these livestock, some 94,000 wild ungulates (chamois *Rupicapra rupicapra*, red deer *Cervus elaphus* and roe deer *Capreolus capreolus*) share this area.

From 1998 to 2003, 456 sheep and goats have been compensated as wolf kills. The carcasses are checked by a local gamekeeper. In 1999, 128 sheep, which "disappeared" after wolf attacks, were also compensated. In 2000, 105 sheep killed by an unknown canid (probably a wolf) were compensated as well (damage statistic for wolf see: www.kora.unibe.ch). The amount of the compensation paid from 1999 to 2002 for 387 sheep/goats killed in 123 attacks reached € 161,000 (a mean of € 416 per animal). It is generally admitted that 1–4% losses during summer grazing is normal (without predation). There is no official data on dog attacks on livestock, but interviews with sheep owners seems to show that it is not negligible.

Predators and management plans

Officially, there are about 3 to 6 wolves in the southern part of Switzerland (2004). All wolves that have been reported in Switzerland since 1995 originate from the Italian population (Valiere et al. 2003). There are regular wolf observations elsewhere in Switzerland, but they have never been confirmed scientifically (genetic analysis, good pictures, dead animals). The lynx *Lynx lynx* was reintroduced in Switzerland in the early seventies. Presently, there are about 100 adults; about 20 in the Jura Mountains, 70 in the Alps and a small population of 8 recently translocated lynx in the eastern part of the country. These lynx kill about 50–100 sheep / goats per year

Figure 2. *Great Pyrenees* on alpine pasture. (Photo: Jean-Marc Landry)

on average. A wolf and a lynx management plan allows the culling of predators under certain conditions (see www.kora.unibe.ch for more details).

The Swiss Wolf Project

The initiative to introduce livestock guarding dogs (LGDs) came from two sheep owners who faced the first wolf attacks in 1995. They bought two *Great Pyrenees* (Figure 2) pups in the Alps Maritime (*Mercantour*, South of France) in 1996. Unfortunately, they were already strongly bonded to people and not trustworthy with the sheep. J.-M. Landry had the opportunity to follow them to try to find solutions to correct them with advice from Ray and Lorna Coppinger and the rich information gathered in the DogLog Newsletter (Lorna Coppinger editor), from Joël Pitt, who introduced the first LGDs in France and from Günther Bloch (German Wolf Society) who shared his experience and his literature on LGDs. This first experience has influenced our further mode of working with LGDs. We have developed a strong bond from the dog to the sheep to the detriment of the relationship with the owner. Today, some sheep owners can still not catch their dogs (e.g. to give vaccinations or worm treatments, etc.) or to move the LGD without the sheep / goats (e.g. vet control), which complicates the management of the LGD. In 1998, we introduced the first pup (*Great Pyrenees* female) in the flock of one of the two already "experienced" sheep owners. She is still working today. After a series of wolf attacks at the end of 1998, the SAEFL was initiating the SWP led by KORA (Coordinated research projects for the conservation and management of carnivores in Switzerland).

Our main objective was to examine the feasibility to protect a flock of sheep and goats in the Swiss Alps against wolves and to determine the advantages and the limits of the methods. Livestock guarding dogs were one of the main subjects. Besides, we have also tested the implementation of fences (Angst et al. 2002), fladry, the use of donkeys (Landry 2001), flashlights, protection collars like those used to protect the neck of the sheep against lynx attacks (Angst et al. 2002) and sheep herding. We tested techniques to correct problem dogs as well. We have also tried the option to leave a dog alone with the flock on an alpine pasture during the entire summer and have taken the opportunity to test and improve automatic dog feeders. In addition, we have experimented with the possibility to introduce an adult LGD in a flock recently attacked by a wolf. Finally, our role was to communicate our data through publications and talks and to share our knowledge with sheep owners, from whom we have learned a lot. As KORA was in charge of both the Swiss Wolf and Lynx Project, we rapidly applied LGDs to protect some flocks against lynx attacks. The results obtained by the SWP have been compiled in a final report (Burri et al. 2004).

LGDs in the projects

We have placed pups in flocks according to the methods of Lorenz (1985), Lorenz & Coppinger (1986), Coppinger (1992) and Coppinger et al. 1983. As the use of the LGDs was unknown by the sheep

Figure 3. *Maremmano-Abruzzese* accustoming to the sheep on the first day after their arrival at their new farm. (Photo: Damiano Torriani)

Figure 4. *St-Bernard Dog* in the sheep pen. (Photo: Jean-Marc Landry)

Figure 5. *Spanish Mastiff* with sheep on alpine pasture.
(Photo: Jean-Marc Landry)

breeders – and by ourselves as well – we first wrote a short synthesis on the use of this kind of dogs (Landry 1999). From 1998 to 2003, 64 LGDs were introduced in flocks in Switzerland. 3 other LGDs were bought by sheep owners but followed by our project. We acquired 20 *Great Pyrenees* directly from France (10 females and 10 males, from three distinct regions) and four *Maremmano-Abruzzese* (Figure 3) from Italy (*Abruzze* province). Every LGD was bred from working parents. We also bought 3 St-*Bernard* (Figure 4) pups at the St-Bernard Hospice. We have received two *Spanish Mastiffs* (Figure 5) and one *Mioritic* from a Romanian worker from *Brasov* as well. 42 pups were directly born in our project from 9 litters and 36 (19 females and 17 males) were introduced in flocks, the others in families. In several cases, we have introduced adults already socialised with sheep. Besides, we had to move 4 adult LGDs to new flocks: one sheep owner had to leave Switzerland and the three other LGDs were not trustworthy with the flock. The problems disappeared after they have been introduced into their new flock.

At the end of the project, 41 LGDs (64%) were still working, while 36% (23) of them died (12 = 19%) or were removed (11 = 17%). Six were euthanised, three for skeletal problems (2 hip-joint dislocation and 1 knee lateral dislocation) and three for behavioural disturbances[3]. Two had a stomach torsion, one was killed by another LGD in a barn (food domination) and three died for unknown reasons. Of the eleven LGDs placed in families, 8 were too friendly with humans and were not attentive to sheep, two were removed following mistreatment and one was chasing wildlife. Generally, the socialisation process with the sheep was not adequate and was outside of our control[4]. We are convinced that the possibility to choose the pups and a ensure a good follow-up can reduce the number of problems with LGDs.

Academic research on LGDs

Since LGDs are working in tourist areas with up to 25,000 hikers crossing some alpine pastures in one season, we have also observed the LGDs behaviours towards hikers (Landry 2004). This work led to recommendations for the government, the sheep owners, shepherds and hikers to deal with potential conflicts with tourism and local people. If any dog had

Figure 6. LGD following a group of tourists along the electrified fence.
(Photo: Jean-Marc Landry)

[3] One was untrustworthy with the sheep and was shoot by the owner, one was not anymore attentive and was put to sleep by the owner. The last one was not socialised with humans at all and developed fear aggression behaviours.
[4] Three LGDs were given to us, the three *St-Bernard Dogs* were not born with sheep and therefore were already strongly bonded to people.

bitten someone, a lot of people would be afraid of LGDs. Tourists generally do not know how to interpret and behave when they face a LGD.

LGDs and hikers

We observed the interactions[5] of 14 LGDs (13 *Great Pyrenees* and a *Spanish Mastiff*) towards hikers and their dogs during three years (2000–2002), mainly on alpine pastures (Landry 2004). We took into account 1,221 encounters from 2,071 persons. In 57% of the encounters the LGDs didn't react (barking or approaching). When approaching hikers, LGDs generally kept a distance of at least 10 m (75%). In the vicinity of the hikers, LGDs showed neutral behaviour (e.g. walked aside, Figure 6) or presented friendly behaviours (e.g. greetings). One LGD occasionally frightened hikers by barking close to them. It was then temporally removed. Nevertheless, the probability of approaches increases considerably when a companion dog accompanies the hikers ($P < 0.00001$[6]). In general, there have been no problems with tourists, but one LGD especially bit hikers' dogs, two of them were even on a lead and not in the vicinity of the flock.

To minimize the risks, recommendations were addressed to the new LGDs commission in 2004, which was mandated by SAEFL to make proposals regarding the management of the LGDs in Switzerland. Two of them are:

1. To monitor the LGD breedings to obtain LGDs that are both tolerant to people and effective against predators.
2. To join the national ongoing programme PAM (Prevention des Accidents par Morsures[7]) dedicated to children (especially) and adults. This program was initiated by the Swiss Federal Veterinary Office to teach the right behaviours to adopt when encountering a dog (known or unknown) to reduce the number of accidents.

In the future we may have problems with LGDs attacking other dogs. In our country with many tourists, it is difficult to teach a LGD to defend the flock from predators and stray dogs, but to respect dogs on a lead, even if it is only passing the flock. We think that LGDs interact with other dogs not only to defend territory limits or to safeguard the flock. These interactions may have other explanations. The role of the pheromones and the phenotype of the dog may have an influence, which is not yet known.

Some municipalities have attempted to ban LGDs on their alpine pastures. Since 2004, the canton of Valais has elicited a list of "dangerous" breed, comprising the *Spanish Mastiff*. These breeds must be constantly muzzled and be kept on a lead! The canton of Valais can at any time modify the list. Therefore, the next step of this study is to measure the tolerance of LGDs towards hikers related to their capacity to protect efficiently a flock of sheep against a mock predator. This work might help us to select LGDs, which fit the best in our "political" tourist context.

Cost of a livestock guarding dog

The yearly average cost of a LGD is € 712 ($ 937 US), including the food, the vet, dispersing the cost of the dog over 8 years and the trip to get the dog. The price of the food and the travelling expenses vary a lot. In our case, we had a special agreement with a dog food manufacturer (60% reduction). In a rich country like Switzerland, the acquisition and the support of a LGD seems not to be a problem. However, in our sheep-farming context, the average annual cost for three LGDs, the minimum theoretical number to protect a flock against a pack of wolves, can reach a monthly salary. The project has financed the dogs, the food, the vaccinations and the vermifuges during the whole project. A contract described the obligations of the sheep owner and the responsibilities of the project.

Problems with livestock guarding dogs and techniques to improve them

Apart from the "normal" problem encountered with young dogs – chasing, grab-biting, wool-pulling, tail-biting, and ear-biting – our two main problems were to deal with the oestrus period of the bitches and to prevent certain LGDs from escaping from an enclosure to roam around. Unfortunately, sheep owners often do not watch the heat of their females. Consequently, we had several crossbreeds between herding dog males and LGD females. The pups were all euthanised , except one litter. These pups were placed in families. In one case, the father bred with his daughter on the alpine pasture. These were dogs of two owners regrouping their flocks during summer time. These pups were also euthanised. To help to control the heats, we have recommended that dogs' owners give injections or permanently sterilize the bitch. The first method requires that injection

[5] Their behaviours towards hikers when they approach and bark at them and when they are in their vicinity.

[6] We have used the logistic regression through the GLM procedure after normalizing the data. We have taken into account the number of reactions ($n = 696$). We have tested the influences of four variables (number of persons, presence or absence of a companion dog, distance of detection and distance of reaction) to predict the probability of the variable "approach". The variable "presence or absence of a companion dog" is very significant ($P = 7.97e\text{-}011$) $T = 6.60$ (this value follows a distribution of Student and allows to calculate the p-value. T-value = value of the logistic regression divided by the standard error). Degree of freedom (df) = 691.

[7] Prevention of the accidents from dog bites.

dates are carefully followed while still allowing occasional heats to prevent uterus infection. Generally, the dogs' owners do not want to sterilize their bitch, because they hope to have pups one day to sell them. In one case we have obliged the sheep owner to operate his female, because she had successively four litters.

When a dog escaped from the enclosure to defecate, to get water from the stream instead of water from the bucket, to mark or to roam, we – and the sheep owner –often received complaints form local people, and the local gamekeeper has threatened to shoot the dogs on several occasions. Consequently, we have implemented techniques to try to correct the LGDs behaviour. Initially, we have used the electric shock collar. This system is very time consuming if you are not able to provoke the dog to leave the enclosure to correct him at this precise moment. Moreover, the dog often knows that you are in the vicinity and stays quiet in the middle of the sheep. Therefore, we have improved the invisible fence so it does not require our presence. The pasture is surrounded by an electric lead connected to a box which gives electric impulsions. The dog wears a light electric collar giving at first an acoustic signal and then a smooth electric shock when the dog approaches the fence. We were able to cover even one kilometre fences in very difficult terrains. The two systems described above work quiet well, but the results are never definitive! That means that the experience must be regularly repeated. (e.g. in springtime when the sheep and the LGDs join the spring pastures or in autumn when the flock descends from the alpine pastures to be kept in fences).

Effectiveness

Because wolves are quite rare in Switzerland, it is impossible to estimate the effectiveness of our LGDs. However, sheep owners recognized that their dogs are very effective against fox *Vulpes vulpes* and raven *Corvus corax* predation on lambs and against stray dogs. We have observed and even filmed LGDs encounters with other dogs and found dead foxes and badgers Meles meles near flocks. The presence of one or several LGDs seems to calm the herd, which may panic less when predators approach.

In contrast, we have good evidences that LGDs are effective against lynx predation (Burri et al. 2004). In flocks with repeated lynx kills, the damages ceased after the introduction of two or three LGDs. Since forest or bushes often surround the pastures on lynx territories, one dog is not always enough. Nevertheless, we should be careful before drawing any conclusion, because lynx predation depends as well on other factors like lynx and prey density, presence of lynx that specialised on livestock etc. (Angst et al. 2002). Moreover, the number of protected flocks involved (n = 8) still remains small.

Importance of the shepherd on the effectiveness of the LDG

Sheep herding is a lost tradition in Switzerland and usually alpine pastures have no infrastructure for shepherds. As most sheep are free grazing and shepherds are very rare in Switzerland, we tested the possibility to leave LGDs alone accompanying the sheep during 100 days. We experimented with three flocks: one herd with a lone LGD, one herd with two LGDs and one herd containing the sheep of two owners with one LGD each. Several automatic dog feeders (Figure 7) were placed where the sheep used to bed. The sheep owners controlled the flock every 7–10 days. The dogs followed the sheep wherever they went for grazing during the day and returned with

Figure 7. LGD feeding on an automatic dog feeder on an alpine pasture. (Photo: Alberto Stern)

them to the night places where the sheep owners placed salt for the sheep and the automatic dog feeders. These experiments have shown that it is possible to leave LGDs alone with a flock of sheep during at least 100 days, with a weekly control. The dogs stayed with the flock during the whole trial. However, the majority of LGDs are under supervision of shepherds.

However, the sheep used to scatter in small groups which makes efficient protection difficult. Moreover, one flock was attacked several times by an unknown predator, which killed preferentially an isolated ewe whereas its lamb was saved. A shepherd and two LGDs from the project stayed during one week with the flock. He penned the sheep with the LGD around every night and no further losses were recorded. Unfortunately, there was no cabin and due to bad weather, he had to leave the area. The predation restarted immediately. The next year, we hired a shepherd. The first day when he arrived with the herd, sheep were attacked during the night. The herder then always penned the sheep with the two LGDs at night. The predation ceased for the whole season. This is however the way shepherds are working with LGDs on alpine pastures in Switzerland.

These experiences demonstrate that the presence of a shepherd is important to increase the effectiveness of the LGDs. His work is to look after the flock, to manage the grass and to group the sheep – preferentially in an electrified enclosure – to assist the work of the LGDs. Nevertheless, the shepherd also needs a cabin where he can warm himself, dry his clothes and cook his food. That requires investment in infrastructure. On the other hand, sheep owners should provide LGDs that work properly, because shepherds typically don't have time to spend time to correct problematic LGDs.

Problems dealing with the project

LGDs like wolves quickly became a political object! As a result, the KORA team was often held responsible for the political decisions – e.g. the strict wolf protection – and often accused of having reintroduced the wolves. In general, sheep breeders were not in favour of getting a LGD. For them, accepting a LGD and mitigation measures means accepting the wolf. As a majority of the sheep breeders are not able to finance the mitigation measures (LGDs, salary of the shepherd, etc.), they also wanted to be reassured that the SAEFL will support the mitigation measures for a long time. We tried to find solutions to help sheep owners to manage their dogs' problems, to encourage them in their work and to improve our communication. We organised annual meetings to talk about the results of the previous year and to listen to their wishes, which were directly transmitted to the SAEFL. During the last year of the SWP (2003), we organised a new sheep association (SSALGD[8]). The prime goal of this association is to be the main interlocutor about LGDs in Switzerland and to collaborate with the new project at the SRVA, which was mandated by the SAEFL as interlocutor for damage prevention in Switzerland.

Cost for optimal prevention measures on alpine terrain

The prevention measures (3 LGDs, a shepherd, costs of a caravan, helicopter flights, etc) to protect an alpine pasture during 120 days (which was the average number of grazing days in the SWP) cost € 14,000 ($ 18,425). Summer grazing of sheep on alpine pastures is subsidised by the state. To be able to afford this amount only due to the subsidizes dedicated to summer grazing sheep, the sheep owners need to collect a minimum of 800 animals on the alpine pasture. Presently, this size flock represents only 5–8% of the sheep grazed pastures in Switzerland. Even if flocks are gathered, the majority of the alpine pastures remains too small to reach the limit of 800 animals. Therefore, subsidizes for summering sheep, already at the level of those for cows, should be augmented for flocks of sheep below 800 to allow protection. However, the FOAG will not subsidize sheep more than cows for political reasons: the sheep industry only corresponds to 0.8% of the national agricultural incomes, unlike the cow industry, which reaches 48%. Due to the government's restricted budget policy planned for the next years, the actual ability of the SAFEL to finance the mitigation measures is compromised. Due to the new agrarian policy, more and more farmers are working two jobs and therefore have less time to implement mitigation measures and have less personal funds to finance them.

Recommendations

Our experiences with LGDs and sheep owners during the five years of the SWP allow us to make recommendations especially to the Swiss government, to politicians, and to the new LGDs commission.

- It is essential to involve the sheep owners directly in the project through an existing – or to be created – sheep association, like the SSALGD. We

[8] The Swiss Sheep Association of sheep breeder owners of Livestock Guarding Dogs

think it is important that sheep owners pay for their own LGD, which might make them more responsible. The government should help to finance the rest of the mitigation measures. It is fundamental to select the sheep owners who really want to protect their flocks.

- It is vital to follow the genealogy of the dogs and to note down their behaviours and temperaments to be able to select the dogs which fit best in the project. In tourist areas, each dog that shows aggression towards people should be taken off the breeding program. We are convinced that the genetics of the dogs can facilitate the attachment to the sheep and decrease the common problems. We should bear in mind that several "breeds" have been selected more for a phenotype than for a behaviour.
- It is very important to take into account the psychology of the sheep owner and the behaviour of his flock before choosing, which dog to introduce. A LGD, which does not work in one herd, can be successful in another one. Not every LGD works in a team with other dogs. Taking into account the temperament of the dog helps to compose the best pack or to resolve problems by removing a dog.
- Implementation of infrastructure on alpine pastures to welcome shepherds should be facilitated by constructing cabins and provide them with fresh water.

Conclusion

We need to learn more from our LGDs to facilitate their integration in flocks. This will improve the acceptation of dogs by sheep farmers, who have often less and less time to spend time correcting the dogs. LGDs on alpine pastures, which do not react to hikers, may also help to smooth the acceptance of LGDs. A professional survey of our LGDs and a genetic selection for further breeding will be the next step.

The natural return of the wolf questions the way we deal with sheep husbandry in the Alps. There are methods that further the coexistence between predators and livestock, but they are costly. Politicians do not see the need to invest in funds to help to restore an old tradition. The problem is easily resolved through minimal prevention measures accompanied by a wolf management, which could allow the selective culling wolves when necessary. Yet, we should see the prevention measure in a broader view in term of the possibility to manage and conserve alpine pastures in the long term, to control the sanitary state of the livestock daily, to protected the flocks against "normal" predation like stray dogs, foxes, ravens or theft. However, the conservation of large carnivores (especially the wolf) and the implementation of mitigation measures depend on political decisions. Without public money, there will be no mitigation measures and no possible coexistence with large predators.

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Mishra, C. 2004. Livestock depredation by large carnivores in the Indian trans-Himalaya: conflict perceptions and conservation prospects. Environmental Conservation 4: 338–343.

Livestock depredation by the snow leopard, *Uncia uncia*, and the wolf, *Canis lupus*, has resulted in a human-wildlife conflict that hinders the conservation of these globally-threatened species throughout their range. This paper analyses the alleged economic loss due to livestock depredation by these carnivores, and the retaliatory responses of an agro-pastoral community around Kibber Wildlife Sanctuary in the Indian trans-Himalaya. The three villages studied (80 households) attributed a total of 189 livestock deaths (18% of the livestock holding) over a period of 18 months to wild predators, and this would amount to a loss per household equivalent to half the average annual per capita income. The financial compensation received by the villagers from the Government amounted to 3% of the perceived annual loss. Recent intensification of the conflict seems related to a 37.7% increase in livestock holding in the last decade. Villagers have been killing the wolf, though apparently not the snow leopard. A self-financed compensation scheme, and modification of existing livestock pens are suggested as area-specific short-term measures to reduce the conflict. The need to address the problem of increasing livestock holding in the long run is emphasized.

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Gunther, K.A., M.A. Haroldson, K. Frey, S.L. Cain, J. Copeland and C.C. Schwartz. 2004. Grizzly bear–human conflicts in the Greater Yellowstone ecosystem, 1992–2000. Ursus 15(1):10–24.

For many years, the primary strategy for managing grizzly bears (Ursus arctos) that came into conflict with humans in the Greater Yellowstone Ecosystem (GYE) was to capture and translocate the offending bears away from conflict sites. Translocation usually only temporarily alleviated the problems and most often did not result in long-term solutions. Wildlife managers needed to be able to predict the causes, types, locations, and trends of conflicts to more efficiently allocate resources for pro-active rather than reactive management actions. To address this need, we recorded all grizzly bear–human conflicts re-