

ke the bears do not hesitate. Losses are generally well documented by trained personnel, and have steadily increased during the last 10 years. In 1998 compensation was paid for 4265 bear-killed domestic sheep. When the estimated population size is between 25 and 50 (we share a population with Sweden, so the number of bears actually in Norway varies a lot, this means that each bear is on average killing about 100 sheep each summer. This is a world record in terms in the number of livestock killed per individual bear, and is in fact 20 times higher than the nearest competition. It is also a world record that Norway could do without. As a result there is an enormous conflict between sheep farmers and the government which is greatly hindering the process of reestablishing viable bear populations inside Norway.

In order to try and reduce predation, a number of measures have been, and continue to be evaluated.



Drawing: Dominique Roth

Bringing the sheep in from the forest early in August avoids the season with the highest losses, but means that farmers lose up to 30% of their grazing season. Currently an experimental project to test livestock guarding dogs and shepherds is currently in its third year. Guarding dogs were imported from Italy and Poland and so far have proved to be very effective. However, before they could be used to guard a flock, shepherds with herding dogs needed to be included in the husbandry system to prevent the sheep from spreading out. This is a new component in Norwegian sheep husbandry and greatly adds to the cost of the system. However, in two years they have not had a single case of bear predation on the experimental

flocks. Although such efforts can demonstrate that it is possible to farm sheep in bear areas, the extra costs may mean that it is not practical on a large scale. In addition farmers are often slow to accept new methods.

The lessons so far from Norway are the following; (1) There is a difference between good bear habitat being available and bears being allowed to use it. (2) Depredation rates can be enormous if sheep are grazed without supervision in forest habitats. (3) It appears that shepherd / guarding dogs systems prevent most predation, but economics may prevent their widespread application. (4) Long term solutions will probably involve some changes in husbandry and increased zoning of both sheep and bears.

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Large Carnivore Damage in Spain

Three species of large carnivore exist in Spain: the brown bear, the wolf and the Iberian lynx. There are some 80 bears in the Cantabrian Mountains, in the northwest of Spain, slightly decreasing. In addition, there is a remnant population of 5 or 6 bears in the western Pyrenees and maybe 6 other bears in a recently reintroduced population in the Central Pyrenees; most of these bears are on the French side. In the Cantabrian Mountains, bear damage is scarce and it is not a conservation problem. The amount compensated by regional governments in the Cantabrian Mountains is 7 million pesetas (43,750 \$) per year, but only 50% of this is estimated to be actually caused by bears. Bears are perceived as a minor problem by Cantabrian local people for several reasons: sheep are very scarce in bear range, so damage is moderate and surplus killing is rare; wolves are common in the Cantabrian Mountains, and compared to them, bears appear not so bad. In recent years, as bears attract tourists, they are perceived more and more positively by local people. In the Pyrenees, sheep are common, and the very few remaining bears cause much more damage in relation to their numbers than those in the Cantabrian Mountains.

There is an increasing population of 2,000 wolves covering about 100,000 km², living mainly in the northwest of Spain. We can roughly estimate the da-

ages to be 1-2 Mio \$ per year, and maybe 40% is compensated by regional governments. The main factor affecting wolf damage is the management system of livestock. In mountain areas (i.e., Cantabrian Mountains) livestock is free ranging from May to November, and the average damage caused per wolf per year can be 10 times higher than in the plain, where the livestock is always protected by shepherds. Only 20% of the Spanish wolves live in these mountain areas, but they cause 80% of all losses. Surplus killing is common, and the conflicts are very high when wolves expand into sheep areas, as for example, to the Basque Country and the Picos de Europa National Park. In the south of Spain, wolves occur in large, private, fenced states devoted to red deer hunting; they are almost extinct due to the illegal persecution through gamekeepers because of their predation on game. The wolf is by far the most controversial species in Spain, and the social conflicts and the polarization are increasing in recent years, as a consequence of the campaigns of animal right groups.

There are 500 to 1,000 Iberian lynx in sharply decreasing, very fragmented populations in the southwest of Spain. Unlike the European lynx, they almost never attack livestock and they are not perceived by local people as a problem. Hunters sometimes claim that they kill rabbits, but recent awareness campaigns seem to have improved the lynx image even among hunters.

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Testing Livestock Guard Donkeys in the Swiss Alps

Since 1995, Switzerland experiences the immigration of wolves spreading along the western Alps. Genetic studies have revealed that the animals belong to the Italian population (Taberlet *et al.* 1996). As elsewhere, the wolves cause damage in the free ranging sheep herds (Landry 1997a). Livestock husbandry is no longer adapted to the presence of large carnivores, and preventive measures will have to be re-applied in and adopted to the Swiss Alps to prevent losses (Landry 1997b). This is one of the goals of the Swiss Wolf Project by KORA. The most promoted prevention system, is the use of livestock guard dogs. Additionally, other prevention systems such as electric fences (Speeder Pac), fladry and guard donkeys are tested.

In 1995, several farmers in the Valais (southwestern Switzerland) bought donkeys to be placed with their herds. Their integration into the flock did not cause major problems. The sheep took about a week to get accustomed to their presence. It seems that a donkey of any age can be integrated into a herd, unlike with the dogs; it is nevertheless advisable to use very young animals. In the stable, the donkey is placed in a stall near the sheep, especially during lambing. However, the farmers are afraid that a donkey might crush a lamb by accident.

A donkey stallion is much more aggressive than a female or a castrated male, and donkey breeders advised against using such an animal to guard a flock. Farmers who used stallions noted their aggressiveness particularly in autumn. The donkeys ripped wool from the backs of the ewes and lifted 40 kg lambs to walk around with them. The nearby presence of other equids can incite the donkey to attack them, especially the stallion. One of the farmers had to remove his donkey because it prevented the ram to mount the sheep.

A donkey is much simpler to use than a dog and it clearly has a higher ability to adapt (change of owner, climate, activity) than the dog. No specific knowledge is needed to look after a donkey, which daily consumes up to 8 kg of hay, the same amount as 4-5 sheep. In winter (150 days), 1 tonne of hay and one tonne of straw must be reckoned. The stall must measure about 10 m², to allow the donkey to roll on the ground. Donkeys readily eat what sheep do not consume in the pens.

The presence of a donkey in the pen seems to reassure the sheep (they are less nervous). At night, the donkey remains with the sheep. One donkey even