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July 2001

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## **Managing wolf conflict with livestock in the Northwestern United States**

by

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### **Wolf Recovery in the Western United States**

Wolves (*Canis lupus*) were once common throughout North America but were deliberately exterminated in the lower 48 United States, except in northeastern Minnesota, primarily because of depredations on livestock. Wolves remained abundant in areas with few livestock such as most of Canada and Alaska. Sixty years after being nearly exterminated, the gray wolf was listed under the United States Endangered Species Act (Act) in 1974. The combination of natural recovery in NW Montana, and reintroduction in central Idaho and the Greater Yellowstone area (NW Wyoming, eastern Idaho, and SW Montana) has resulted in an expanding wolf population (Bangs et al. 1998). In this paper we discuss our attempts to minimize conflicts between wolves and livestock and to build human tolerance for restoring wolf populations.

### **Wolf Predation and Conflicts**

Since 1987 total confirmed minimum livestock losses in NW Montana totaled 82 cattle, 68 sheep, 7 dogs, and 2 llamas. Depredations averaged 6 cattle, 5 sheep, and less than 1 dog annually. Agency control killed about 3 wolves a year. On average, less than 6% of the wolf population is annually affected by agency wolf control actions (Bangs et al. 1995). Minimum confirmed livestock losses have annually averaged about 4 cattle, 28 sheep, and 4 dogs in the Yellowstone area and 10 cattle, 30 sheep, and 2 dogs in central Idaho. In addition, 1 newborn horse and probably 3 adult horses were killed in the Yellowstone area. In total there have been 148 cattle, 356 sheep and 37 dogs confirmed killed by wolves from 1987 until January 2001. Since 1987, the Service and USDA Wildlife Services have relocated or killed, respectively, 32 and 41 wolves in NW Montana, 33 and 18 in central Idaho, 34 and 26 in the Yellowstone area, because of conflicts with livestock. Wolves are removed by leg-hold trapping, neck snaring, and darting or shooting from the ground or air.

A detailed analysis of the potential impact of wolf reintroduction [USFWS, Environmental Impact

Statement (EIS) 1994] predicted that 100 adult-sized wolves would kill about 10-20 cattle and 50-70 sheep in each recovery area, worth \$2,000 to \$30,000, annually. The EIS predicted that wolf control to resolve livestock conflicts would kill about 10% of the wolf population annually. Annual livestock losses in each of the Idaho and the Yellowstone areas prior to wolf reintroduction from all causes, a small fraction of which were predator-caused, were reportedly 8,000 to 12,000 cattle and 9,000 to 13,000 sheep annually. Between 300,000 and 400,000 sheep and cattle graze summer pasture on public lands in each recovery area. The rate of confirmed wolf-caused livestock losses and the number of wolves that have been removed in agency control actions is one third to one half of the levels predicted. Despite lower than expected losses and less wolf control than predicted, wolf depredations and control remain inordinately controversial. Even the most routine wolf depredations and control action still result in major local news coverage. To the general public this probably greatly exaggerates both the role of wolves as livestock predators and the level of agency control. Since 1987, livestock producers who experienced confirmed or highly probable wolf-caused losses in Montana, Idaho, and Wyoming have been compensated a total of \$150,000 by a private compensation fund administered by the Defenders of Wildlife, who support wolf recovery and management efforts. In the United States, the federal government does not directly compensate for property damage caused by wildlife including wolves, but some states have compensation programs.

A recent study funded and initiated by the Nez Perce Tribe, a host of federal agencies, and local livestock producers found that confirmed livestock losses may be a fraction of actual losses under some circumstances (John Oakleaf, Univ. of Idaho, personal communication). That study determined the cause of death and detection rate of 231 radio-tagged livestock calves of about 700 that grazed on large very remote and heavily forested USDA Forest Service public grazing allotments near an active wolf den. After 2 years, natural mortality (pneumonia, etc.) killed the most calves (64%), but wolf predation was the second leading cause of death (29%). Sample sizes were very small (1999 n=9 and 2000 n=5) but 2.3 to 5.7 calves may have died from wolf predation for every one found and confirmed killed by normal livestock herding practices. Calf survival was 95% and 98%. Wolves killed calves that were the lowest weight, less guarded by people, nearest to an

active wolf den, and in the heaviest forest cover, suggesting that wolves tested and hunted cattle like wild prey and attacked the most vulnerable animals.

In general, research indicated that wolves often lived near livestock (primarily cattle) and other domestic animals but conflicts were uncommon considering the potential for depredations. Given the common and widespread exposure of domestic animals to wolves, it is somewhat surprising that more are not killed. Dogs, almost exclusively mountain lion (*Felis concolor*) hunting hounds and livestock guard and herding dogs, were apparently killed as "trespassing" competitors rather than as prey, because few were eaten. Wolves commonly fed on carrion of both livestock (carcass dumps) and wild ungulates (road and train kills, lost hunter-killed deer and discarded deer parts) so exposed carrion can attract wolves to areas with livestock and increase the encounter rate between wolves and livestock. In a few instances, abundance of natural prey and relative vulnerability of livestock appeared to affect how often wolves attempted to attack livestock. Sick or wounded livestock or small livestock, such as calves or sheep, appeared particularly vulnerable to wolf predation. But often, wolves appeared to attack livestock without any predisposing factors and nearly all wolf packs with regular exposure to livestock sporadically caused depredations. Wolf depredations on livestock are an insignificant impact to the livestock industry in Montana, Idaho, and Wyoming and the vast majority of ranches never have problems, but a few individual small livestock producers can be greatly impacted.

### **Minimizing Livestock Conflicts—Developing Techniques**

The experimental population rules allow for harassment and killing of problem wolves by the public and government agencies. The Service has permitted livestock producers to shoot wolves actually seen attacking livestock, and in a few chronic cases of depredation on private property, to shoot wolves on-sight, but lethal control techniques used to minimize conflicts of wolves with humans, pets, and livestock directly interfere with western wolf recovery efforts by removing potential breeding individuals from wolf populations. Therefore, extensive investigations into non-lethal predation management techniques are essential and useful for building wolf populations, but also for building a relationship of trust and action (through assistance) with livestock producers and the

general public. The Service is evaluating a wide variety of methods to prevent or reduce conflicts with livestock in addition to relocating or killing problem wolves. Wolf relocation, for example, has been used extensively in an attempt to minimize conflicts. However, relocation has generally been unsuccessful at preventing future attacks by depredating wolves or at keeping relocated wolves alive long enough to reproduce (Bangs et al. 1998). Unfortunately, there have been no unqualified successes using any other non-lethal tools of predation management (Clark et al. 1996).

The most important aspect to realize regarding the development of alternative methods of predator control is that there is no one method that will always work in all situations, but some are appropriate and useful in specific situations. Aversive conditioning through conditioned flavor avoidance (CFA) using lithium chloride, for example, is effective for some species in some situations, especially when consumptive behavior, and not predatory behavior is to be altered (Conover and Kessler 1994), and electric fencing can be cost-effective for some species in some situations (Balharry and Macdonald 1999). Because some non-lethal tools are very effective in certain situations, some managers and especially members of the general public are easily misled into believing that one method, such as CFA, electric fencing, guard animals (Meadows and Knowlton 2999), or scare devices (Koehler et al. 1990), are the solution to all livestock depredation problems, and this is not the case. In the case of guard animals, for instance, wolves have killed a series of guard dogs even when multiple dogs were used to protect sheep and wolves have recently killed llamas which under other circumstances can be successfully employed to protect sheep from coyotes.

Because of the lack of effective non-lethal predation management techniques for most management situations, a concerted effort has been undertaken by the National Wildlife Research Center (NWRC) to hasten the process of non-lethal technique development. Historically, most of the alternative methods and information used to reduce conflicts between humans and wildlife were developed and/or tested by researchers at the National Wildlife Research Center (United States Department of Agriculture 1994). The Service has actively pursued a collaborative relationship with the NWRC and this partnership has become more fruitful due to generous assistance from other agencies and non-governmental organizations

(Turner Endangered Species Fund, Defenders of Wildlife, University of Montana, the Wyoming Animal Damage Management Board, and the Twin Spruce Foundation). The development of future non-lethal techniques is concentrating in two conceptual areas designed to prevent or limit wolf predation on livestock using aversive or disruptive stimuli.

### **Non Lethal Approach Using Aversive Stimuli**

As defined, aversive stimuli are stimuli that cause discomfort, pain, or an otherwise negative experience and are paired with specific behaviors to achieve conditioning against these behaviors (Shivik and Martin 2001). Gustavson (1976) suggested that aversive conditioning using lithium chloride may be an effective management tool, although it is more useful for reducing consumptive behaviors of particular foods rather than for limiting killing behavior by predators (Conover and Kessler 1994). Similarly, the concept and theory of using electric shock as aversive stimuli to alter animal behavior has been thoroughly studied even in field situations (Krane and Wagner 1975, Linhart et al. 1976, Quigley et al. 1997, Tiedeman et al. 1997). Andelt et al. (1999) recently demonstrated the effectiveness of electronic domestic dog training collars for conditioning coyotes, and this work has been expanded to wolves (Shivik and Martin 2001). Currently, the Service is supporting an ongoing research project investigating the use of electronic dog training collars for reducing livestock predation behavior by wolves.

### **Non Lethal Approach Using Disruptive Stimuli**

We continue to investigate the concept of disruptive stimuli for usefulness in solving conflicts between humans, their livestock, and predators. We define disruptive stimuli as undesirable stimuli that prevent or alter particular behaviors of animals (Shivik and Martin 2001). These stimuli include lights and sounds produced by strobes, sirens, or pyrotechnics that may startle or frighten an animal and cause it to retreat or otherwise not elicit a particular behavior. Frightening stimuli have been studied in the past (Bomford and O'Brien 1990, Koehler et al. 1990), with the conclusion that they are very limited in usefulness because of the effects of habituation. Limiting habituation through randomization of timing and stimuli can make electronic repellents effective (Linhart et al. 1984, Linhart et al. 1992), but behavior contingent activation (i.e., stimuli activated only by presence of the animal) appears to be very

important for developing long-lasting disruptive stimuli applications (Shivik and Martin 2001).

In cooperation with USDA Wildlife Services and private conservation organizations the Service has incorporated disruptive stimuli approaches into its management program by using: light and siren devices, including models triggered by the signals from individual radio-collared wolves (i.e., behavior contingent activation), guard animals, and flagging. In addition, landowners are now allowed to non-injuriouly harass wolves at any time, especially after being trained and issued cracker shells (exploding noise-makers) and less-than-lethal munitions (riot control ammunition such as 12 ga. bean bag shells). We hope that allowing property owners to harass wolves near livestock will help to ensure that wolves are wary of people and areas containing livestock (i.e., we hope to instill aversions in wolves through the use of disruptive and aversive stimuli).

In summary, the Service continues to promote healthy and growing wolf populations in the western United States. We realize that fostering human tolerance and minimizing wolf/human conflicts are the most important factors ultimately affecting wolf distribution and population viability (Fritts and Carbyn 1995). We remain committed to efforts to modify and improve wolf management techniques by supporting development of effective non-lethal techniques. Although lethal control currently remains a necessary management option, we are applying as many applicable alternative techniques as possible, such as fencing, extra surveillance of livestock with herders or agency personnel; harassing and moving and/or providing supplemental food to wolves that established dens/rendezvous sites in livestock grazing pastures, and providing alternative pasture away from active wolf dens to reduce livestock and wolf encounters. These efforts have reduced conflicts in some situations but there are so many variables involved in each situation that at this time none of the many techniques we have tried have been proven widely effective. Cumulatively however, our efforts have prevented or stopped enough livestock depredations, without removing wolves, so that the wolf population has continued to expand. Lastly, by working directly with other agencies, organizations, and livestock producers (e.g. loaning radio telemetry receivers so they can closely monitor wolves near their livestock) we are building the relationships that will facilitate flexible and successful long-term management of wolves in the United States.

Further and updated information about the Service-led interagency wolf recovery program can be obtained at:

<http://mountain-prairie.fws.gov/wolf/annualrpt00/>

Information on NWRC-led development of non-lethal methods for managing predation can be found at:

<http://www.aphis.usda.gov/ws/nwrc/depdep2.htm>

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