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WOLVES

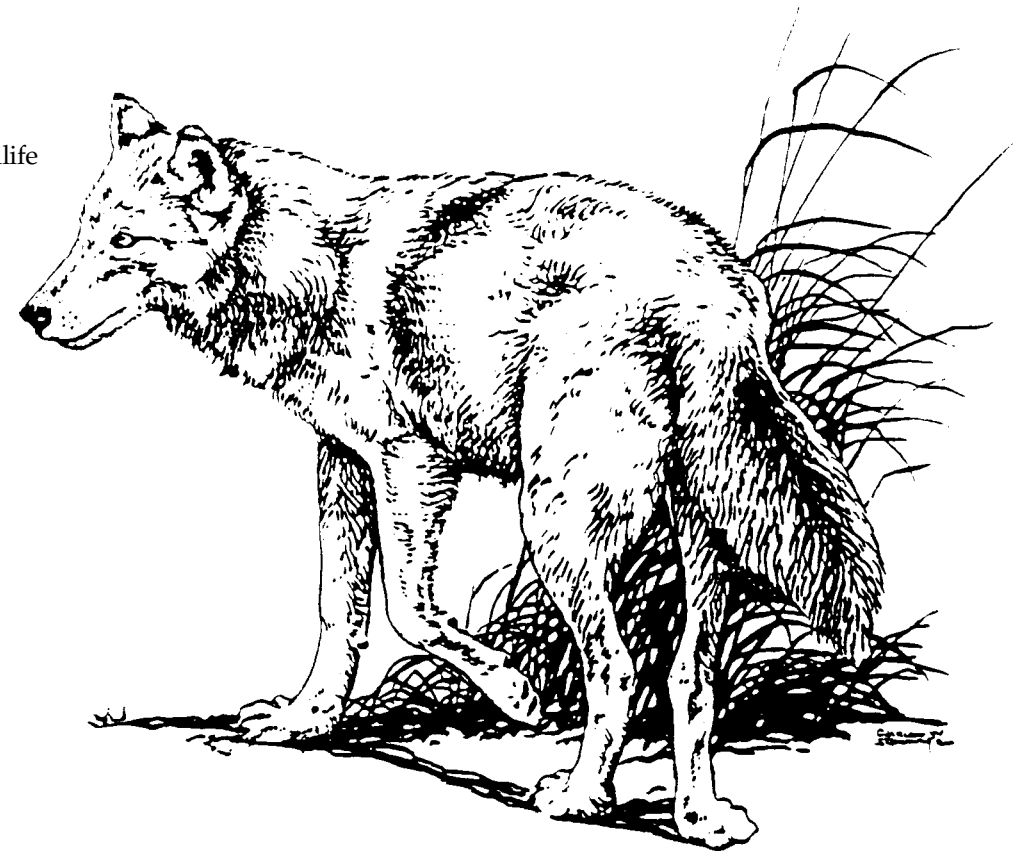


Fig. 1. Adult gray wolf, *Canis lupus*

Damage Prevention and Control Methods

Exclusion

Net wire fences.

Electric fences.

Cultural Methods

Proper disposal of dead livestock carcasses.

Do not allow calving or lambing on remote, wooded pastures.

Pen small flocks of sheep at night or bring near buildings.

Frightening

Livestock guarding dogs.

Flashing lights and siren devices.

Toxicants

None are registered.

Trapping

No. 4, 14, 114, or 4 1/2 Newhouse leghold traps, No. 4 or 7 McBride traps, Braun wolf trap.

Thompson 4xx or 5xx snares, Gregerson No. 14 wolf snare.

Trapping seasons for legal fur harvest.

Shooting

Use predator calls or voice howling to lure wolves into rifle range.

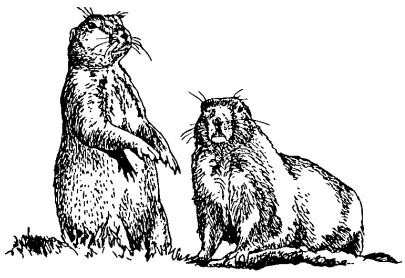
Aerial hunting from a helicopter or fixed-wing aircraft.

Hunting seasons for legal fur harvest.

Other Methods

Use a dart gun to chemically immobilize wolves from a helicopter.

Long-range land-use planning should take into account potential conflicts between wolves and livestock.



PREVENTION AND CONTROL OF WILDLIFE DAMAGE — 1994

Cooperative Extension Division
Institute of Agriculture and Natural Resources
University of Nebraska - Lincoln

United States Department of Agriculture
Animal and Plant Health Inspection Service
Animal Damage Control

Great Plains Agricultural Council
Wildlife Committee

C-123

Identification

Two species of wolves occur in North America, gray wolves (*Canis lupus*) and red wolves (*Canis rufus*). The common names are misleading since individuals of both species vary in color from grizzled gray to rusty brown to black. Some gray wolves are even white. The largest subspecies of the gray wolf are found in Alaska and the Northwest Territories of Canada. Adult male gray wolves typically weigh 80 to 120 pounds (36.3 to 54.4 kg), and adult females 70 to 90 pounds (31.8 to 40.8 kg). Although males rarely exceed 120 pounds (54.4 kg), and females 100 pounds (45.4 kg), some individuals may weigh much more. Gray wolves vary in length from about 4.5 to 6.5 feet (1.4 to 2 m) from nose to tip of tail and stand 26 to 36 inches (66 to 91.4 cm) high at the shoulders (Mech 1970).

Red wolves are intermediate in size between gray wolves and coyotes. Typical red wolves weigh 45 to 65 pounds (20.4 to 29.5 kg). Total length ranges from about 4.4 to 5.4 feet (1.3 to 1.6 m) (Paradiso and Nowak 1972).

Wherever wolves occur, their howls may be heard. The howl of a wolf carries for miles on a still night. Both gray wolves and red wolves respond to loud imitations of their howl or to sirens.

Range

During the 1800s, gray wolves ranged over the North American continent as far south as central Mexico. They did not inhabit the southeastern states, extreme western California, or far western Mexico (Young and Goldman 1944). In the late 1800s and early 1900s, wolves were eliminated from most regions of the contiguous United States by control programs that incorporated shooting, trapping, and poisoning. Today, an estimated 55,000 gray wolves exist in Canada and 5,900 to 7,200 in Alaska. In the contiguous United States, the distribution of the gray wolf has been reduced to approximately 3% of its original range.

Fig. 2. Current range of the gray wolf (light) and red wolf (dark) in North America.

Minnesota has the largest population of wolves in the lower 48 states, estimated at 1,550 to 1,750. A population of wolves exists on Isle Royale in Lake Superior, but the population is at an all-time low of 12 animals. In recent years, wolves have recolonized Wisconsin, the Upper Peninsula of Michigan, northwestern Montana, central and northern Idaho, and northern Washington. A few isolated gray wolves may also exist in remote areas of Mexico.

Current efforts to reestablish gray wolves are being conducted in northwestern Montana, central Idaho, the Greater Yellowstone area, and northern Washington (USFWS 1987). Recovery through natural recolonization is likely in northwestern Montana, central Idaho, and northern Washington. Due to Greater Yellowstone's geographic isolation from areas with established wolf populations, recovery there would likely require the reintroduction of wolves into Yellowstone National Park.

Red wolves originally occurred from central Texas to Florida and north to the Carolinas, Kentucky, southern Illinois, and southern Missouri (Young and Goldman 1944). Years of predator control and habitat conversion had, by 1970, reduced the range of the red wolf to coastal areas of southeastern Texas and possibly southwestern Louisiana. When red wolf populations became low, interbreeding with coyotes became a serious problem. In the mid-1970s, biologists captured the last few red wolves for captive breeding before the species was lost to hybridization. The red wolf was considered extinct in the wild until 1987, when reintroductions began.

Red wolf recovery attempts have been made on Bulls Island near Charleston, South Carolina, and on Alligator River National Wildlife Refuge in eastern North Carolina (Phillips and Parker 1988). The Great Smoky Mountains National Park in western North Carolina and eastern Tennessee is also being considered as a red wolf reintroduction area. The goal of the red wolf recovery plan is to return red wolves to nonendangered status by "re-establishment of self-sustaining wild populations in at least 2 locations within the species' historic range" (Abraham et al. 1980:14).

Habitat

Gray wolves occupy boreal forests and forest/agricultural edge communities in Minnesota, northern Wisconsin, and northern Michigan. In northwest Montana, northern Idaho, and northern Washington, wolves inhabit forested areas. In Canada and Alaska, wolves inhabit forested regions and alpine and arctic tundra. In Mexico, gray wolves are limited to remote forested areas in the Sierra Madre Occidental Mountains.

The last areas inhabited by red wolves were coastal prairie and coastal marshes of southeastern Texas and possibly southwestern Louisiana. These habitats differ markedly from the diverse forested habitats found over most of the historic range of red wolves.

Food Habits

Mech (1970) reported that gray wolves prey mainly on large animals including white-tailed deer, mule deer, moose, caribou, elk, Dall sheep, bighorn sheep, and beaver. Small mammals and carrion make up the balance of their diet. During the 1800s, gray wolves on the Great Plains preyed

mostly on bison. As bison were eliminated and livestock husbandry established, wolves commonly killed livestock.

Red wolves in southern Texas fed primarily on small animals such as nutria, rabbits, muskrats, and cotton rats (Shaw 1975). Carrion, wild hogs, calves, and other small domestic animals were also common food items.

General Biology, Reproduction, and Behavior

Gray wolves are highly social, often living in packs of two to eight or more individuals. A pack consists of an adult breeding pair, young of the year, and offspring one or more years old from previous litters that remain with the pack. The pack structure of gray wolves increases the efficiency of wolves in killing large prey. Red wolves may be less social than gray wolves, although red wolves appear to maintain a group social structure throughout the year.

Each wolf pack has a home range or territory that it defends against intruding wolves. Packs maintain their territories by scent marking and howling. On the tundra, packs of gray wolves may have home ranges approaching 1,200 square miles (3,108 km^2). In forested areas, ranges are much smaller, encompassing 40 to 120 square miles (104 to 311 km^2). Some wolves leave their pack and territory and become lone wolves, drifting around until they find a mate and a vacant area in which to start their own pack, or wandering over large areas without settling. Extreme movements, of 180 to 551 miles (290 to 886 km), have been reported. These movements were probably of dispersing wolves. The home ranges of red wolves are generally smaller than those of gray wolves. Red wolf home ranges averaged 27.3 square miles (71 km^2) in southern Texas (Shaw 1975).

Wild gray wolves usually are sexually mature at 22 months of age. Breeding usually takes place from early February through March, although it has been reported as early as January and as late as April. Pups are born 60 to 63 days after conception, usually during April or May. Most litters contain 4 to 7 young.

Courtship is an intimate part of social life in the pack. Mating usually occurs only between the dominant (alpha) male and female of the pack. Thus, only 1 litter will be produced by a pack during a breeding season. All pack members aid in rearing the pups.

Dominance is established within days after gray wolf pups are born. As pups mature, they may disperse or maintain close social contact with parents and other relatives and remain members of the pack.

Little is known about reproduction in red wolves, but it appears to be similar to that of gray wolves. Red wolves may breed from late December to early March. Usually 6 to 8 pups are produced.

Damage and Damage Identification

The ability of wolves to kill cattle, sheep, poultry, and other livestock is well documented (Young and Goldman 1944, Carbyn 1983, Fritts et al. 1992). From 1975 through 1986 an average of 21 farms out of 7,200 (with livestock) in the Minnesota wolf range suffered verified losses annually to wolves (Fritts et al. 1992). In more recent years, 50 to 60 farms annually have been affected by wolf depredations in Minnesota. Domestic dogs and cats are also occasionally killed and eaten by gray wolves.

In many instances, wolves live around livestock without causing damage or causing only occasional damage. In other instances, wolves prey on livestock and cause significant, chronic losses at individual operations. In Minnesota, wolf depredation on livestock is seasonal, most losses occurring between April and October, when livestock are on summer pastures. Livestock are confined to barnyards in the winter months, and therefore are less susceptible to predation.

Cattle, especially calves, are the most common livestock taken. Wolves are capable of killing adult cattle but seem less inclined to do so if calves are available. Attacks usually involve only one or two cattle per event. Depredation on sheep or poultry often involves surplus killing. In Minnesota, wolf attacks on sheep may leave several (up to 35) individuals killed or injured per night. Attacks on flocks of domestic turkeys in Minnesota have resulted in nightly losses of 50 to 200 turkeys.

Wolf attacks on livestock are similar to attacks on wild ungulates. A wolf chases its prey, lunging and biting at the hindquarters and flanks. Attacks on large calves, adult cattle, or horses are characterized by bites and large ragged wounds on the hindquarters, flanks, and sometimes the upper shoulders (Roy and Dorrance 1976). When the prey is badly wounded and falls, a wolf will try to disembowel the animal. Attacks on young calves or sheep are characterized by bites on the throat, head, neck, back, or hind legs.

Wolves usually begin feeding on livestock by eating the viscera and hindquarters. Much of the carcass may be eaten, and large bones chewed and broken. The carcass is usually torn apart and scattered with subsequent feedings. A wolf can eat 18 to 20 pounds (8.1 to 9 kg) of meat in a short period. Large livestock killed by wolves are consumed at the kill site. Smaller livestock may be consumed at the kill site in one or two nights or they may be carried or dragged a short distance from the kill site. Wolves may carry parts of livestock carcasses back to a den or rendezvous sites. Wolves may also carry off and bury parts of carcasses.

Wolves and coyotes may show similar killing and feeding patterns on small livestock. Where the livestock has been bitten in the throat, the area should be skinned out so that the size and spacing of the tooth holes can be examined. The canine tooth holes of a wolf are about 1/4 inch (0.6 cm) in diameter while those of a coyote are about 1/8 inch (0.3 cm) in diameter. Wolves usually do not readjust their grip in the

throat area as coyotes sometimes do; thus, a single set of large tooth holes in the throat area is typical of wolf depredation. Coyotes will more often leave multiple tooth holes in the throat area.

Attacks on livestock by dogs may be confused with wolf depredation if large tracks are present, especially in more populated areas. Large dogs usually injure and kill many animals. Some dogs may have a very precise technique of killing, but most leave several mutilated livestock. Unless they are feral, they seldom feed on the livestock they have killed.

Wolves are attracted to and will scavenge the remains of livestock that have died of natural causes. Dead livestock in a pasture or on range land will attract wolves and increase their activity in an area. It is important to distinguish between predation and scavenging. Evidence of predation includes signs of a struggle and hemorrhaging beneath the skin in the throat, neck, back, or hindquarter area.

Tracks left by wolves at kill sites are easily distinguishable from those of most other predators except large dogs. Wolf tracks are similar to coyote tracks but are much larger and reveal a longer stride. A wolf's front foot is broader and usually slightly longer than its rear foot. The front foot of the Alaskan subspecies is 4 to 5 inches (10.2 to 12.7 cm) long (without claws) and 3 3/4 to 5 inches (9.5 to 12.7 cm) wide; the rear foot is 3 3/4 to 4 3/4 inches (9.5 to 12.1 cm) long and 3 to 4 1/2 inches (7.6 to 11.4 cm) wide (Murie 1954) (Fig. 3). Track measurements of the eastern subspecies of gray wolf found in Minnesota and Wisconsin are slightly smaller. The distance between rear and front foot tracks of a wolf walking or trotting on level ground varies between 25 and 38 inches (63.5 to 96.5 cm). When walking, wolves usually leave tracks in a straight line, with the rear foot prints overlapping the front foot prints. In deep snow, wolves exhibit a single-file pattern of tracks, with following wolves stepping in the tracks of the leading wolf.

Wolf tracks are similar to the tracks of some large breeds of dogs but are generally larger and more elongated, with broader toe pads and a larger heel pad. Dog tracks are rounder than wolf tracks, and the stride is shorter. When walking, dogs leave a pattern of tracks that looks straddle-legged, with the rear prints tending not to overlap the front prints. Their tracks appear to wander, in contrast to the straight-line pattern of wolf tracks.

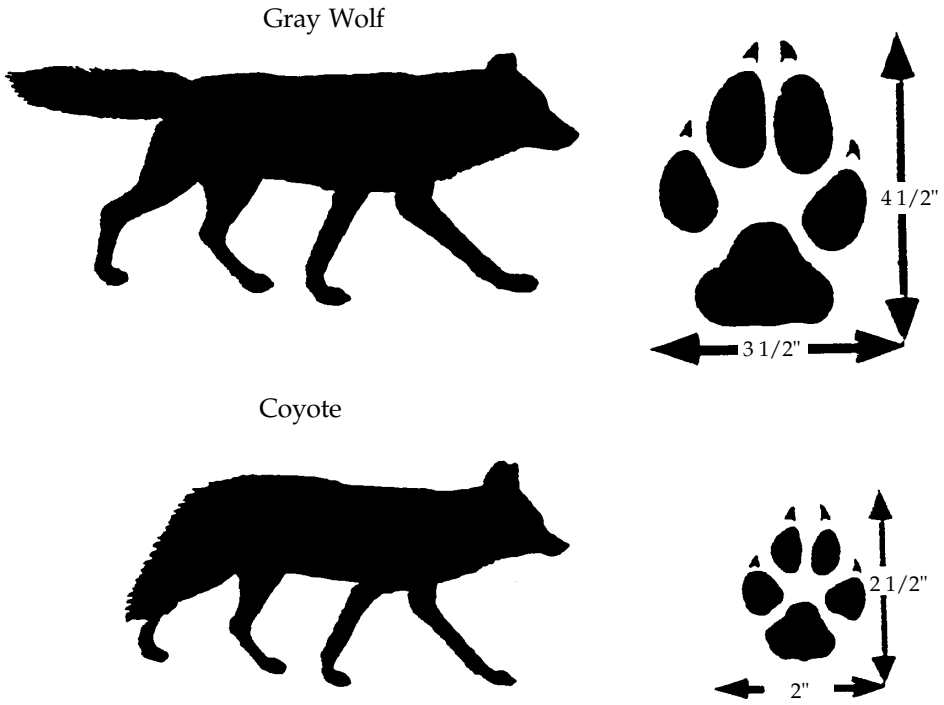


Fig. 3. Gray wolf and coyote silhouettes and track measurements of each.

Scats (droppings) left in the vicinity of a kill site or pasture may be useful in determining wolf depredation. Wolf scats are usually wider and longer than coyote scats. Scats 1 inch (2.5 cm) or larger in diameter are probably from wolves; smaller scats may be from wolves or coyotes. Wolf scats frequently contain large amounts of hair and bone fragments. An analysis of the hair contained in scats may indicate possible livestock depredation. Since wolves feed primarily on big game, their scats are not as likely to contain the fine fur or the small bones and teeth that are often found in coyote scats.

During hard winters, gray wolves may contribute to the decline of populations of deer, moose, and caribou in northern areas (Gauthier and Theberge 1987). Studies in Minnesota (Mech and Karns 1977), Isle Royale (Peterson 1977), and Alaska (Gasaway et al. 1983, Ballard and Larsen 1987) indicate that predation by wolves, especially during severe winters, may bring about marked declines in ungulate populations. It appears that after ungulate populations reach low levels, wolves may exert long-term control over their prey populations and delay their increase.

Legal Status

All gray wolves in the contiguous 48 states are classified as "endangered" except for members of the Minnesota population, which are classified as "threatened." The maximum penalty for illegally killing a wolf is imprisonment of not more than 1 year, a fine of not more than $20,000, or both. The classification of the wolf in Minnesota was changed from "endangered" to "threatened" in April 1978. This classification allows a variety of management options, including the killing of wolves that are preying on livestock by authorized federal or state personnel. In Canada and Alaska, gray

wolves are considered both furbearers and game animals and are subject to sport harvest and control measures regulated by province or state agencies.

Red wolves are classified as "endangered" in the United States. This classification restricts control of red wolves to authorized federal or state damage control personnel, who may capture and relocate red wolves that are preying on livestock.

Damage Prevention and Control Methods

Exclusion

Fences may help prevent livestock losses to wolves. Exclude wolves with well-maintained woven-wire fences that are 6 to 7 feet (1.8 to 2.1 m) high. Install electrically charged wires along the bottom and top of woven-wire fences to increase their effectiveness. Several antipredator fencing designs are available (Thompson 1979, Dorrance and Bourne 1980, Linhart et al. 1984).

Cultural Methods

Livestock carcasses left in or near pastures may attract wolves and other predators to the area and increase the chances of depredation. Remove and properly dispose of all dead livestock by rendering, burying, or burning.

Calves and lambs are particularly vulnerable to predators, and cows are vulnerable while giving birth. Confine cows and ewes to barnyard areas during calving and lambing season if possible or maintain them near farm buildings. Hold young livestock near farm buildings for 2 weeks or longer, before moving them with the herd to pastures or rangeland. As newborns mature they are better able to stay with their mothers and the herd or flock, and are less likely to be killed by wolves.

Nighttime losses of sheep to wolves can be reduced by herding the sheep close to farm buildings at night or putting them in pens where possible.

If wolf depredation is suspected, livestock producers should observe their livestock as often as possible. Frequent observation may be difficult in large wooded pastures or on large tracts of open rangeland. The more often livestock are checked, however, the more likely that predation will be discovered. Frequent checks will also help the operator determine if any natural mortality is occurring in the herd or flock, and if any livestock thought to be pregnant are barren and not producing. The presence of humans near herds and flocks also tends to decrease damage problems.

Frightening

Livestock guarding dogs have been used for centuries in Europe and Asia to protect sheep and other types of livestock. The dogs are bonded socially to a particular type of livestock. They stay with the livestock without harming them and either passively repel predators by their presence or chase predators away. Livestock guarding dogs are currently being used by producers in the western United States to protect sheep and other livestock from coyotes and bears. They have been used in Minnesota to protect sheep from coyotes and cattle from wolves. The most common breeds of dogs used in the United States are the Anatolian shepherd, Great Pyrennees, Komondor, Akbash dogs, Kuvasz, Maremma, and Shar Plainintez. Livestock guarding dogs should be viewed as a supplement to other forms of predator control. They usually do not provide an immediate solution to a predator problem because time must be spent raising puppies or bonding the dogs to the livestock they protect. Green et al. (1984) and Green and Woodruff (1990) discuss proper methods for selecting and training livestock guarding dogs and reasonable expectations for effectiveness of guarding dogs against predators. Consult with USDA-APHIS-ADC personnel for additional information.

Strobe light/siren devices (Electronic Guard [USDA-APHIS-ADC]) may be used to reduce livestock depredation up to 4 months. Such devices are probably most effective in small, open pastures, around penned livestock, or in situations where other lethal methods may not be acceptable. They can also provide short-term protection from wolves while other control methods are initiated.

Toxicants

None are registered for wolves in the United States.

Fumigants

None are registered for wolves in the United States.

Trapping

Control of damage caused by wolves is best accomplished through selective trapping of depredating wolves. Another method is to classify wolves as furbearers and/or game animals and encourage sport harvest to hold wolf populations at acceptable levels. The Alberta Fish and Wildlife Division has used this approach successfully in Canada, where gray wolves are classified as furbearers. A similar approach was proposed by the Minnesota Department of Natural Resources in 1980 and 1982 to help control the expanding wolf population in Minnesota, but it was ruled illegal because of the wolf's "threatened" status in Minnesota.

Steel leghold traps, Nos. 4, 14, 114, and 4 1/2 Newhouse or Nos. 4 and 7 McBride are recommended for capturing wolves. Nos. 4 and 14 Newhouse traps and the No. 4 McBride trap are routinely used for research and depredation-control trapping of wolves in Minnesota. Some wolf trappers feel that Nos. 4 and 14 Newhouse traps are too small for wolves. Where larger subspecies of the gray wolf exist, use the No. 4 1/2 Newhouse, No. 7 McBride, or the Braun wolf trap.

Set traps at natural scent posts where wolves urinate and/or defecate along their travel routes. Make artificial scent posts by placing a small quantity of wolf urine, lure, or bait on weeds, clumps of grass, low bushes, log ends, or bones located along wolf travel routes. Place traps near the carcasses of animals killed or scavenged by

wolves, at trail junctions, or at water holes on open range. Set snares (Thompson 4xx or 5xx, Gregerson No. 14) at holes in or under fences where wolves enter livestock confinement areas, or where wolves create trails in heavy cover.

Use traps and snares that are clean and free of foreign odor. Remove grease and oil from new traps and snares, set them outside until slightly rusted, and then boil them in a solution of water and logwood trap dye. Wear gloves when handling traps and snares to minimize human odor. While constructing the set, squat or kneel on a clean canvas "setting cloth" to minimize human odor and disturbance at the site. Traps may be either staked or attached to a draghook. A trap that is staked should have about 4 feet (1.2 m) of chain attached to it. A trap with a draghook should have 6 to 8 feet (1.8 to 2.4 m) of chain attached.

Shooting

Where legal, local wolf populations can be reduced by shooting. Call wolves into rifle range using a predator call or by voice howling.

Aerial hunting by helicopter or fixed-wing aircraft is one of the most efficient canid control techniques available where it is legal and acceptable to the general public. Aerial hunting can be economically feasible when losses are high and the wolves responsible for depredation can be taken quickly. When a pack of wolves is causing damage, it may be worthwhile to trap one or two members of the pack, outfit them with collars containing radio transmitters and release them. Wolves are highly social and by periodically locating the radiotagged wolves with a radio receiver, other members of the pack may be found and shot. The wolves wearing radio collars can then be located and shot. This technique has been used effectively by the Alaska Department of Fish and Game.

Other Methods

In situations where lethal control of depredating wolves may not be authorized (USFWS 1987), aerial hunting by helicopter can be used to dart and chemically immobilize depredating wolves so that they can be relocated from problem areas. Some recent wolf control actions in Montana have used this technique.

Long-range land-use planning should solve most conflicts between livestock producers and wolves. When wolves are present in the vicinity of livestock, predation problems are likely to develop. Therefore, care should be taken in selecting areas for reestablishing wolf populations to assure that livestock production will not be threatened by wolves.

Economics of Damage and Control

Wolves can sometimes cause serious economic losses to individual livestock producers. Minnesota, Wisconsin, and Montana have established compensation programs to pay producers for damage caused by wolves. In recent years, $40,000 to $45,000 has been paid annually to Minnesota producers for verified claims of wolf damage. Control of depredating wolves is often economically feasible, but it can be time-consuming and labor intensive. If wolves can be trapped, snared, or shot at depredation sites, the cost is usually low.

Deer, moose, and other ungulates have great economic and aesthetic value, but wolves have strong public support. Thus, wolf control is often highly controversial. Where wolves are the dominant predator on an ungulate species and prey numbers are below carrying capacity, a significant reduction in wolf numbers can produce increases in the number of ungulate prey (Gasaway et al 1983, Gauthier and Theberge 1987) and therefore sometimes can be economically justified. When control programs are terminated, wolves may rapidly recover through immigration and reproduction (Ballard et al. 1987). Therefore, wolf control must be considered as an acceptable management option (Mech 1985).

Acknowledgments

Information contained in the sections on identification, habitat, food habits, and general biology are adapted from Mech (1970). The manual, *Methods of Investigating Predation of Domestic Livestock*, by Roy and Dorrance was very helpful in developing the section on wolf damage identification. Recommendations for preventing or reducing wolf damage were developed in association with Dr. Steven H. Fritts. We would also like to thank Scott Hygnstrom for reviewing this chapter and providing many helpful comments.

Figure 1 from Schwartz and Schwartz (1981).

Figure 2 adapted from Schwartz and Schwartz (1981) by Jill Sack Johnson.

Figure 3 adapted from a Michigan Department of Natural Resources pamphlet.

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