Final

ENVIRONMENTAL ASSESSMENT

PREDATOR DAMAGE MANAGEMENT IN WESTERN COLORADO

Prepared by:

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INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife which increases the potential for conflicting human/wildlife interactions. In addition, some segments of the public strive for protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The ADC[1] Final Programmatic Environmental Impact Statement (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (USDA 1994):

> "*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well*."

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions are categorically excluded from the requirement to prepare an environmental assessment (EA)(7CFR 372.5(c), 60 Fed Reg. 6,000-6,003, 1995). To evaluate and determine if there may be any potentially significant impacts to the human environment from the proposed program, WS elected to prepare this EA.

WS is the Federal program authorized to manage animals that damage livestock and other agricultural and natural resources, facilities, or that cause threats to public health and safety. WS authority comes from the Animal Damage Control Act of 1931, as amended (46 Stat. 1486; 7 USC 426-426c) and the Rural Development, Agriculture, and Related Agencies Appropriation Act of 1988. This EA documents the analysis of potential environmental effects of the proposed and planned damage management in Western Colorado, hereinafter referred to as the analysis area. This analysis relies mainly on existing data contained in published documents and the ADC programmatic EIS (USDA 1994) to which this document is tiered.

With the passage of Colorado State Constitutional Amendment 14, Predator Damage Management (PDM) methods available for use in Colorado have been limited. The program will use methods in compliance with state law unless or until such law has been superseded by federal law and policy.

Any predator damage management conducted by WS in the analysis area would be undertaken in compliance with relevant laws, regulations, policies, orders and procedures. Notice of the availability of this document was published in local newspapers, consistent with the agency's NEPA procedures, and sent to parties that requested to be notified, to allow interested parties the opportunity to obtain and comment on this document.

WS Program

WS mission is to provide leadership in wildlife damage management for the protection of America's agricultural, industrial and natural resources, and safeguard public health and safety. This is accomplished through:

- Close cooperation with other Federal and State agencies
- Training of wildlife damage management professionals;

[1]As of August 1, 1997, the Animal Damage Control (ADC) Program name was changed to Wildlife Services (WS). All references to ADC are considered synonymous to WS.

- Development and improvement of strategies to reduce economic losses and threats to publics from wildlife;
- Collection, evaluation and distribution of information on wildlife damage management;
- Cooperative wildlife damage management programs;
- Informing and educating the public on how to reduce wildlife damage and;
- Providing data and a source for limited-use management materials and equipment, including pesticides. (USDA 1989)

Purpose

This EA analyzes planned and future predator damage management related to the protection of livestock, property, designated wildlife species, and to protect public safety, on public and private lands within the analysis area. The analysis area encompasses approximately 31.5 million acres in western Colorado, including all lands within Alamosa, Archuleta, Chaffee, Conejos, Costilla, Delta, Dolores, Eagle, Garfield, Grand, Gunnison, Hinsdale, Jackson, La Plata, Lake, Mesa, Mineral, Moffat, Montezuma, Montrose, Ouray, Pitkin, Rio Blanco, Rio Grande, Routt, Saguache, San Juan, San Miguel, and Summit counties (Figure 1-1).

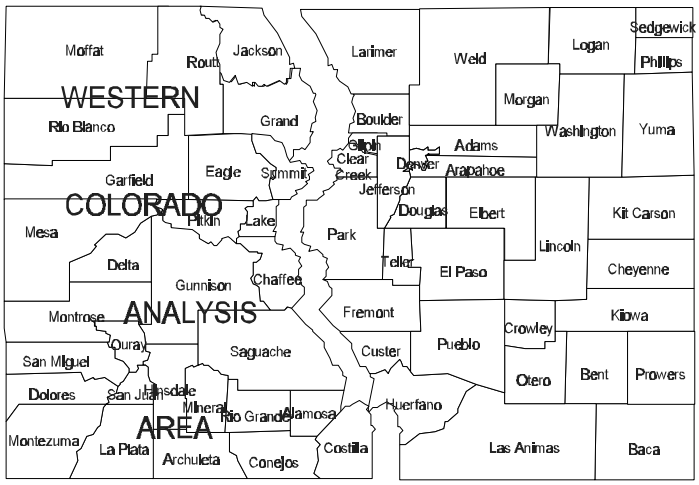

Figure 1-1. The Western Colorado Analysis Area of the Colorado Wildlife Services Program.

WS has PDM agreements to work on an estimated 6.7 million acres, or about 21% of the analysis area as of October 1996. However, WS only operates on a portion of these agreements in any one year -- in FY 1995, PDM was conducted by WS on properties and grazing allotments totaling about 2.5 million acres which is about 8% of the land area of the analysis area. The analysis area encompasses Federal lands under the administration of the [redacted], as well as State, American Indian Tribal, county and private lands. On many of the individual properties under agreement, WS spends only a few hours each year in a specific location trying to resolve a particular problem.

Within the analysis area, cattle and domestic sheep are permitted to graze on Federal lands at various periods during the year, with most livestock grazing on [redacted] lands in the summer, and on [redacted] administered lands in the spring, fall, and winter. Much of the livestock protected by WS grazes on some combination of [redacted], State and private lands.

Currently, WS conducts damage management for the protection of livestock on Federal lands in the analysis area under a total of 11 different EAs prepared by the respective land management agencies. This EA will replace the current EAs that cover WS predator damage management on all or portions of the [redacted]. Likewise, this EA will replace the current EAs for conducting WS wildlife damage management on lands within the [redacted]. This EA is intended to supersede these existing EAs, to cover needs for PDM that may arise

on [redacted] lands not previously covered by EAs, and to expand the scope of analysis to address similar WS wildlife damage management to protect additional resources (i.e., property, public health and safety, and designated wildlife species).

1.1 Need for Action

The need for action is based on the need to protect livestock, property, wildlife, and public health and safety from damage caused by predators. WS has been authorized and directed by Congress to provide this service (Animal Damage Control Act of 1931, as amended; Rural Development, Agriculture, and Related Agencies Appropriation Act of 1988). In a recent District Court decision (U. S. District Court of Utah, Civil No. 92-C-0052A, Southern Utah Wilderness Alliance et al. v. Thompson, H. et al., Forest Supervisor), the court ruled that, " . . . *the agency need not show that a certain level of damage is occurring before it implements an ADC program*." The court further ruled that, "*Hence, to establish need for an ADC, the forest supervisors need only show that damage from predators is threatened*." WS accepts this standard as appropriate for establishing need in the analysis area.

1.1.1 Summary of the Proposed Action

The proposed action is to allow WS to use the full range of predator damage management methods as allowed by law. An integrated approach would be implemented which would allow the use of all appropriate techniques and methods, used singly or in combination, to meet requester needs for PDM on private, state, federal (e.g., [redacted]), or tribal lands in Western Colorado. Currently authorized methods include: frightening devices (propane exploders, siren-strobe light devices, etc), calling and shooting, aerial hunting, denning, traps, snares, M-44s, trained dogs, and DRC-1339 (for control of depredating common ravens (*Corvus corax*), American crow (*Corvus brachyrhynchos*) and black-billed magpies (*Pica pica*)). Interpretation of Colorado State Constitutional Amendment 14 by the Colorado State Legislature (Senate Bill 97-052) has restricted the use of leghold and body-gripping traps, snares and all toxicant uses (M-44 devices, the denning gas cartridge) for mammalian predator damage management by WS. These methods may now only be used on private land under certain conditions and are prohibited on public land. Work Plans would be developed and reviewed annually in cooperation with federal land management agencies and the appropriate state agencies (e.g., [redacted]) to address specific activities and restrictions required to safely conduct wildlife damage management on public lands. WS PDM on [redacted] would be conducted in accordance with national level Memoranda of Understanding (MOUs) with each agency. WS would be authorized to initiate corrective and/or preventive damage management in response to requests by owners/managers of affected livestock or other resources, or wildlife agency requests using lethal and/or nonlethal methods permitted under Federal and State laws and in accordance with local work plans. (See Chapter 3 for a more detailed description of the current program and the proposed action).

1.1.2 Wildlife Damage Management to Protect Livestock

Contribution of Livestock to Colorado's Economy

Colorado agriculture generated nearly $4.1 billion in crops and livestock products in 1993 (Colorado Agricultural Statistics Service (CASS 1995a). Livestock production, primarily cattle and sheep, is one of the most significant agricultural products and industries, and accounted for about 70.5% of all agricultural cash receipts in 1993 (CASS 1995a).

Livestock production contributes significantly to the economy of the counties and communities in western Colorado. In 1992 (the latest year for which published data are available by county), about 36.6% of the beef cattle and 45.4% of the sheep in the State were in the analysis area (Table 1-1). Livestock inventories vary throughout the year, but January 1992 livestock inventories for counties in the analysis area included an estimated 330,000 beef cows and 330,000 sheep and lambs, with an estimated value of $239 million (CASS

1995a). The calf, lamb, and wool crops from these cattle and sheep are estimated to be worth about $120 million annually[2].

Scope of Livestock Losses

Cattle and calves are most vulnerable to predation at calving time and less vulnerable as they get older and larger (Shaw 1977; Horstman and Gunson 1982). Because calving occurs at lower elevations in late winter and early spring, vulnerability of cattle to mountain lions (*Felis concolor*) and black bears (*Ursus americanus*) is reduced. Calves remain vulnerable to these predators during the spring through autumn when they are grazed in higher elevation areas that typically have more suitable habitats for mountain lions and bears. Sheep and lambs remain vulnerable to predation throughout the year, particularly from coyotes, and to mountain lions and bears whenever they spend time in habitats of these species (Henne 1977, Nass 1977, 1980, Tigner and Larson 1977, O'Gara et al. 1983, Shaw 1987). Domestic dogs are also responsible for significant predation on sheep and lambs throughout the year (CASS 1995b). Lambs are sometimes vulnerable to red fox (*Vulpes vulpes*) predation in the spring, primarily at the lower elevations. Both bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) prey on young lambs and kid goats and occasionally attack young calves (Phillips et al. 1996). Ravens, crows, and black-billed magpies sometimes attack newborn lambs and calves, and adult cows and ewes that are temporarily incapacitated during the birth process (Wade and Bowns 1982). They peck the eyes and soft tissues causing injuries that either result in death or result in the animal having to be destroyed.

Bears and mountain lions (Mysterud 1977, Shaw 1987) are occasionally responsible for catastrophic incidents or large losses of sheep and lambs, sometimes called "surplus killing" when only selected tissues or parts are consumed or the carcasses are not fed on at all. Bears or mountain lions may also frighten an entire flock of sheep as they attack, resulting in a mass stampede. This sometimes results in many animals suffocating as they pile up on top of each other in a confined area, such as along thick willow growth in the bottom of a drainage or in corrals or night pens. During the summer of 1995, 2 such "pileup" incidents occurred in a similar area in Idaho (M. Collinge, State Director, APHIS-WS, Idaho, pers. comm.). One of these incidents was caused by a mountain lion attack and resulted in the confirmed death of 67 lambs and 14 ewes. The other incident was caused by a black bear, resulting in a minimum of 150 confirmed sheep and lambs killed.

Many studies have shown that coyotes can inflict high predation rates on livestock. Coyotes accounted for 93% of all predator-killed lambs and ewes on nine sheep bands in shed lambing operations in southern Idaho and did not feed on 25% of the kills (Nass 1977). Coyotes were also the predominant predator on sheep throughout a Wyoming study and essentially the only predator in winter (Tigner and Larson 1977).

Sheep and lamb losses to predators in Colorado totaled an estimated 35,500 head valued at nearly $2.2 million in 1994; 26,000 head valued at over $1.9 million in 1995; and 30,000 head valued at more than $2.5 million in 1996 (CASS 1995b; CASS 1997). The proportion of these losses that occurred in the analysis area in 1994, 1995, and 1996 was about 93%, 92%, and 84%, respectively (CASS 1995b; CASS 1996; CASS 1997). Thus, estimated losses of sheep and lambs to predators in the analysis area were 33,000 valued at $2.1 million in 1994, 24,000 valued at $1.8 million in 1995, and 25,000 valued at $2.1 million in 1996.

[2]Estimated from data for 1994 contained in CASS (1995a). Assumes 96% calf crop, 450 lb. average weight for calves at the time of sale, and $.69/lb. for calves; 82% lamb crop, 100 lb. average weight of lambs at the time of sale, and $.62/lb; Statewide wool crop of 4,607,000 lbs., 45.4% of wool crop was from analysis area (Table 1-1),average wool price of $.72/ lb.

Table 1-1. Beef Cattle and Sheep Inventories By County in the Western Colorado Analysis Area as of January 1, 1992. Latest county data available was for 1992. (Source: Colorado Agricultural Statistics 1995a)

County	Beef Cows	% of Statewide Total	Sheep and Lambs	% of Statewide Total
Alamosa	5,871	0.65%	5,670	0.78%
Archuleta	3,551	0.39%	1,367	0.19%
Chaffee	(NR[1])	(NR[1])	156	0.02%
Conejos	25,043	2.78%	20,015	2.74%
Costilla	5,478	0.61%	3,698	0.51%
Delta	23,274	2.59%	9,186	1.26%
Dolores	3,515	0.39%	(NR[1])	(NR[1])
Eagle	11,206	1.24%	9,790	1.34%
Garfield	18,855	2.09%	25,617	3.51%
Grand	11,710	1.30%	327	0.04%
Gunnison	17,252	1.92%	(NR[1])	(NR[1])
Hinsdale	1,214	0.13%	0	0.00%
Jackson	23,572	2.62%	868	0.12%
La Plata	16,710	1.86%	6,812	0.93%
Lake	582	0.06%	(NR[1])	(NR[1])
Mesa	26,347	2.93%	18,728	2.56%
Mineral	(NR[1])	(NR[1])	0	0.00%
Moffat	16,163	1.80%	90,518	12.40%
Montezuma	17,190	1.91%	2,877	0.39%
Montrose	23,921	2.66%	49,599	6.79%
Ouray	5,633	0.63%	1,341	0.18%
Pitkin	1,891	0.21%	138	0.02%
Rio Blanco	21,447	2.38%	30,662	4.20%
Rio Grande	9,942	1.10%	14,047	1.92%
Routt	15,463	1.72%	20,820	2.85%
Saguache	18,032	2.00%	14,489	1.98%
San Juan	0	0.00%	0	0.00%
San Miguel	5,544	0.62%	4,641	0.64%

Summit	(NR[1])	(NR[1])	(NR[1])	(NR[1])
TOTAL	329,409	36.6%	331,370	45.4%

[1]Not Reported -- CASS did not report this number because it would have disclosed data for individual operations.

WS confirms[3] some of the losses that occur on cooperating ranches and farms. Table 1-2 shows the numbers and values of confirmed losses that occurred in FY 1995. Additional limited loss information is obtained when technical assistance requests are received. That information for FY 1995 is presented in Table 1-3.

Table 1-2. Livestock Losses Confirmed By WS in the Western Colorado Analysis Area During FY 1995.

	Lambs	Sheep	Cattle	Calves	Other[1]	Dollar Value
Coyotes	706	216	1	40	156	$93,475
B. Bear	195	153	1	4	3	$35,711
Mt. Lion	130	41	0	4	7	$17,165
Red Fox	25	0	0	0	44	$2,326
Bobcat	2	0	0	0	0	$150
Feral/FR[2] Dogs	0	31	0	0	4	$3,615
Raccoons	0	0	0	0	34	$220
Golden Eagles	5	0	0	0	0	$335
Ravens	1	0	0	0	0	$65
Total	1,064	441	2	48	248	$153,062

[1]Other livestock includes domestic ducks, geese and turkeys; and foals, goats, llamas and poultry.
[2] Feral and/or free-ranging (FR)

Table 1-3. Livestock losses Reported to WS in the Western Colorado Analysis Area During FY 1995 (data from technical assistance requests; these were losses that may or may not have been included in the losses confirmed by WS personnel shown in Table 1-2).

	Lambs	Sheep	Cattle	Calves	Other[1]	Dollar Value
Coyotes	163	28	0	0	3	$17,120
B. Bear	79	42	0	0	0	$12,285
Mt. Lion	58	15	0	0	1	$7,115

[3]Confirmed losses are those verified by WS personnel by observation and inspection of the carcasses. Procedures for determining the species responsible are described in Wade and Bowns (1982).

	Lambs	Sheep	Cattle	Calves	Other[1]	Dollar Value
Golden Eagle	25	0	0	0	0	$1,600
Total	325	85	0	0	4	$38,120

[1]Other livestock includes goats and a foal.

Predator losses accounted for 33% and 40% of the total death loss reported during 1995 and 1996, respectively. The other causes of death loss were weather, disease, poisonous plants, lambing complications, old age, theft, other, and unknown causes (CASS 1996; CASS 1997).

The National Agricultural Statistics Service (NASS 1996) reported that 3,500 calves (representing 5.8% of total reported death loss to all causes) and 400 adult cattle (0.9% of total reported death loss to all causes) were lost to predators in Colorado in 1995. NASS loss data specific to the analysis area are not available. Therefore, it is assumed that 37% of these losses occurred in the analysis area based on the fact that approximately 37% of the cattle in the State are present in the analysis area as shown in Table 1-1. Thus, estimated cattle and calf losses to predators for the analysis area during 1995 were probably about 150 and 1,300, respectively, valued at more than $500,000 based on data in (NASS 1996).

Connolly (1992a) determined that only a fraction of the total predation attributable to coyotes is reported to or confirmed by WS. WS employees do not try to find every head of livestock reported to be killed by predators, but do investigate most complaints to determine whether or not predation has occurred, and if so, what species was responsible. Table 1-2 provides information on the livestock in the entire analysis area confirmed by WS as predator losses in FY 95. This information represents only a small percentage of the total losses, but does provide information on what types of predator losses occurred in the analysis area.

Although it is impossible to accurately determine the amount of livestock PDM saves from predation, it can be estimated. Scientific studies have revealed that in areas without some level of PDM, losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3% of the total number of head, respectively (Henne 1977, Munoz 1977, O'Gara et al. 1983). Conversely, other studies have indicated that sheep and lamb losses are generally lower where PDM is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981). Although these studies were not specifically designed to determine the difference in losses that occur with vs. without PDM on the properties studied, they are the best information available for estimating such a difference. In evaluating cost effectiveness of PDM, the ADC programmatic EIS concluded that benefits, in terms of avoided sheep and lamb losses plus price benefits to consumers, are 2.4 times the cost of providing WS PDM services for sheep protection in the 16 western states (USDA 1994). That analysis did not address the value of calf protection which is a component of WS PDM services in the analysis area.

Predation on livestock can have a significant economic impact on livestock producers. Without effective damage control efforts to protect livestock, research suggests that predation losses would be higher (Nass 1977, 1980, Howard and Shaw 1978, Howard and Booth 1981, O'Gara et al. 1983).

Livestock Losses on Public Lands

Comments received during public involvement indicated a greater interest in whether there is need for PDM on public lands managed by the [redacted]. The only data available to address this issue are data showing losses confirmed by WS personnel on [redacted] lands. Those data for Fiscal Year 1995 are presented in Table 1-4 and show that losses to predators on federal public lands do occur.

It must be emphasized that the losses in Table 1-4 only represent a relatively small proportion of the losses that probably occurred on [redacted] lands because, as discussed previously in this section, WS generally confirms only a fraction of the losses that occur (Connolly 1992a). The data also do not provide a measure of the number and value of losses that would occur *without* PDM.

Table 1-4. Livestock losses to predators confirmed by WS personnel on cooperating [redacted] grazing allotments in the Western Colorado WS analysis area in Federal Fiscal Year 1995. These were only a portion of the losses that occurred (WS only confirms a portion of actual losses). These were losses that occurred with the WS program in place and do not indicate losses avoided by PDM.

Type of Public Land	Predator Species	Number Lost by Livestock Class -- FY 1995				Total $ Value
		Sheep	Lambs	Cattle	Calves	
[redacted]	Coyote	10	117			$10,775
	Bobcat		2			$150
	Mt. Lion	3	6			$740
	Bl. Bear	77	95			$15,962
	TOTAL	90	220	0	0	$27,627
[redacted]	Coyote	56	31		2	$9,890
	Mt. Lion	1	9			$755
	Bl. Bear	1	2			$325
	TOTAL	58	42	0	2	$10,970

1.1.3 Wildlife Damage Management to Protect Wildlife

Under certain conditions, predators, primarily coyotes can have a significant adverse impact on deer (*Odocoileus* spp.) and pronghorn antelope (*Antilocapra americana*) populations, and this predation is not necessarily limited to sick or inferior animals (Pimlott 1970, USDI 1978, Hamlin et al. 1984, Neff et al. 1985, Shaw 1977). Connolly (1978) reviewed 68 studies of predation on wild ungulate populations and concluded that in 31 cases, predation was a limiting factor. These cases showed that coyote predation had a significant influence on white-tailed deer (*O. virginianus*), mule deer (*O. hemionus*), pronghorn antelope, and bighorn sheep (*Ovis canadensis*) populations.

Wildlife damage management undertaken to protect livestock could be coordinated to assist in meeting wildlife management objectives set by [redacted], the [redacted] (USFWS) or an American Indian Tribe. Conversely, a lack of wildlife damage management to protect livestock could conceivably result in adverse impacts to some wildlife species (Connolly 1978).

The purpose of this section is not to provide an exhaustive review of all literature on the subject of predation effects on wildlife but to provide a reasonable examination of pertinent information to show whether predation can be a factor that wildlife management agencies could consider for manipulation.

Ungulate Big Game Species

Mule Deer. A number of studies have shown that coyotes can contribute substantially to mortality of mule deer (*Odocoileus hemionus*). Gerlach (1987) reported that 71% and 78% of mule deer fawns died in their first year on the Pinon Canyon Maneuver Site in southeastern Colorado and that coyote predation accounted for 76% of the mortality. Mackie et al. (1976) documented high winter loss of mule deer to coyote predation in north-central Montana and stated that coyotes were the cause of most overwinter deer mortalities. Mule deer fawn survival was significantly increased and more

consistent inside a predator-free enclosure within the Three Bar Wildlife Area in Arizona where hunting and livestock grazing were not allowed; however, the authors suggested that habitat quality could have been an important factor governing the vulnerability of fawns to predation (LeCount 1977, Smith and LeCount 1976). Hamlin et al. (1984) observed that a minimum of 90% summer mortality of mule deer fawns was a result of coyote predation. Trainer et al. (1981) reported that heavy mortality of mule deer fawns during early summer and late autumn and winter was limiting the ability of the population to maintain or increase itself. They concluded that predation, primarily by coyotes, was the major cause of low fawn survival on Steens Mountain in Oregon. They also concluded that coyote removal probably prevented the deer population from declining throughout the period of their study. Bartman et al. (1992) found that the proportion of mule deer fawns dying from coyote predation decreased, and the proportion of fawns dying from malnutrition increased, but overwinter fawn survival did not increase during a coyote removal study in the Piceance Basin of northwest Colorado.

Pronghorn Antelope. A two-year study using radio telemetry on the Pinon Canyon Maneuver Site in southeastern Colorado showed that fawn mortality averaged 84% and that coyote predation accounted for 71% of the known mortality (Firchow 1986). A six-year radio telemetry study of pronghorn antelope in western Utah showed that 83% of all fawn mortality was attributed to predators (Beale and Smith 1973). Major losses of pronghorn antelope fawns to predators have been reported from other radio telemetry studies (Beale 1978, Barrett 1978, Bodie 1978, Von Gunten 1978, Hailey 1979, and Tucker and Garner 1980).

In Arizona, Arrington and Edwards (1951) showed that intensive coyote damage management was followed by an increase in pronghorn antelope to the point where antelope were once again huntable, whereas on areas without coyote control such an increase was not noted. More recent studies on the [redacted] in Arizona indicated that coyote predation on pronghorn antelope fawns was the primary factor causing fawn mortality and low pronghorn densities (Neff and Woolsey 1979, 1980; Neff et al. 1985). Neff et al. (1985) concluded that coyote control on [redacted] was directly responsible for increased fawn survival which allowed the pronghorn herd to increase. Similar observations of improved pronghorn antelope fawn survival and population increase following predator damage management have been reported by Riter (1941) and Udy (1953). Smith et al. (1986) reported that localized coyote population reduction was necessary and cost effective in pronghorn antelope management. Studies by Autenreith (1982) and Barrett (1981) suggest that long-term habitat management through controlled livestock grazing might reduce fawn susceptibility to predation by improving bedding site cover, thus reducing or eliminating the need for PDM. In such situations, the responsible management agency should make this recommendation. However, where the necessary controls on grazing are not practical or otherwise achievable, or where grazing management cannot be expected to achieve the necessary improvement in bedding site cover, the agency may determine that predation must be controlled if the management goal for the particular herd is to be achieved.

The studies discussed above do not necessarily *prove* that coyote predation is a limiting factor on mule deer and pronghorn populations in any part of the analysis area, but provide an indication that it *may* be limiting some populations in some situations. Controlling predation may not lead to desired increases in ungulate populations if other factors are also limiting. Thus, a management agency would need to consider many factors in deciding whether PDM should be pursued. The need for PDM to protect or enhance other wildlife species would be determined by the agency with management authority over those species, and the decision to conduct PDM for such a purpose would also rest with that agency.

Threatened and Endangered Species

PDM may at times be needed to protect T&E species. For example, black-footed ferret reintroductions have been adversely affected by coyote predation. Of 40 ferrets released in a reintroduction effort on the [redacted], 20 were documented to have been killed by coyotes ([redacted]). The [redacted] decided to implement PDM using a combination of electric fencing and aerial hunting of coyotes. Great-horned owls (*Bubo virginianus*) and golden eagles have killed radio-collared ferrets, and other species identified as potential predators include badgers (*Taxidea taxus*), bobcats (*Lynx rufus*), foxes (*Vulpes sp.*), prairie falcons (*Falco mexicanus*), and ferruginous hawks (*Buteo regalis*) (USFWS 1988). WS has been requested to assist in conducting PDM for T&E species protection in other parts of the country and could be requested to do so under the current program. When such actions are requested by the [redacted] or another federal agency, the responsibility for NEPA compliance rests with that agency. However, WS could agree to meet the responsibility for NEPA compliance at the request of the other federal agency.

Clearly, under some circumstances, predator damage management may be useful in achieving specific wildlife management objectives. If predator damage management is undertaken in the analysis area specifically to protect wildlife, it would be at the request of [redacted] or an American Indian Tribe to meet their management objectives.

1.1.4 Wildlife Damage Management to Protect Public Safety

The [redacted] has lead responsibility for responding to complaints of black bears or mountain lions causing a nuisance or public safety concern. WS provides assistance in responding to these types of incidents when requested by the [redacted].

Black bears may occasionally pose a potential threat when they habituate to urban or residential locations, or recreation areas such as campgrounds or picnic areas. The [redacted] responds to most such instances by live capturing bears in culvert traps and relocating them.

Although rare, mountain lion attacks on humans in the western U.S. and Canada have increased markedly in the last two decades, primarily due to increased mountain lion populations and human use of mountain lion habitats (Beier 1992). Two attacks on humans, one of which was fatal, occurred in July of 1997 in Colorado. A mountain lion-caused fatality near Idaho Springs Colorado occurred in 1991 and emphasized the need for awareness. In FY 95, WS responded to one incident in the analysis area where a mountain lion attacked and injured a human.

Coyotes sometimes create human safety threats when they spend time on airport runways. Although there have not yet been any reported incidents of coyotes being struck by departing or landing aircraft in the analysis area, such incidents have occurred at airports in other areas. WS has responded to a number of requests from airports in Colorado where the presence of coyotes on runways was considered a potential public safety hazard.

Although such occurrences are rare, coyotes occasionally threaten the safety of young children and even adults in areas where subdivisions have encroached into wildlife habitat areas. A 3-year-old girl was killed by a coyote in Glendale, California in 1981 and officials documented attacks on four other children aged 13 months to 5 years old, and on three adults in the same county over the period 1975 - 1981 (Howell 1982). Carbyn (1989) documented 14 attacks by coyotes on children in two Canadian and one U.S. National Park (Yellowstone) during a three-year period. In Los Alamos, NM, three children were attacked by one or more coyotes that were coming into a residential area on a frequent basis in 1995 ([redacted], WS, Albuquerque, NM, pers. comm.). This is generally only a problem when the coyotes lose their fear of humans and learn that they can find food in urban settings. The primary recommendation in these situations is for residents to fence their yards or properties to exclude coyotes, to avoid feeding coyotes, to eliminate readily available food and water sources, and

to harass ones that are seen coming around houses or into neighborhoods. Sometimes, however, coyotes maintain their boldness and must be removed to reduce the safety threat to a satisfactory level. After the Glendale, CA child's death, city and county officials trapped 55 coyotes in an 80-day period from within one-half mile of the home where the child was killed, an unusually high number for such a small area (Howell 1982). Coyote attacks on humans are not expected to be a major problem in the analysis area but could result in requests for assistance under the current program.

Other problems caused by predators that relate to human health and safety are nuisance problems such as noises, odors, and structural damage to personal possessions that can occur when animals take up residence under or in, or frequent areas in close proximity to, human dwellings. Typical species that cause this type of problem are skunks (*Mephitis sp.*; *Spilogale putorius*; *Conepatus leuconotus*) and raccoons (*Procyon lotor*), but any species can become a nuisance under certain circumstances.

WS occasionally is requested to conduct limited PDM actions to reduce the risk of disease transmission to people and domestic animals (e.g., rabies). Species for which WS could be called upon to conduct such actions in Colorado include coyotes, striped skunks (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), raccoon, and feral/free-ranging domestic dogs and cats. WS also may assist state health officials in obtaining blood samples from carnivore species for purposes of monitoring plague and potentially other wildlife-borne diseases.

1.2 Relationship of this EA to Other Environmental Documents

ADC Programmatic EIS. WS has issued a final EIS (USDA 1994) and Record of Decision on the National APHIS-ADC program. This EA is tiered to that EIS.

[redacted]. The [redacted] requires that each [redacted] prepare a [redacted] for guiding long range management and direction. The decision made from this document would need to be consistent with the [redacted] for the [redacted].

[redacted] **for Predator Damage Management.** The [redacted] has eight EA's covering PDM in all or parts of four of the [redacted] in the analysis area ([redacted]). Predator damage management will continue under these documents until superseded by a new decision document resulting from this environmental assessment.

[redacted]. The [redacted] currently uses [redacted] to guide management on lands they administer. [redacted] generally replace older land use plans known as management framework plans. Any decision made as a result of this EA process will be consistent with guidance in these [redacted] regarding WS activities. All of the current EA's and decisions related to WS work on [redacted] lands are consistent with current [redacted]. If a change in an [redacted] is deemed appropriate by [redacted] and WS to better facilitate accomplishment of the respective agency missions, amendment of an [redacted] may be considered.

[redacted] **for Wildlife Damage Management.** Within the [redacted] in the analysis area ([redacted]) the [redacted] has 3 EA's covering PDM in all or portions of the [redacted] ([redacted]). Predator damage management will continue under these documents until they are superseded by a new decision document.

1.3 Decision to be Made

Based on agency relationships, Memoranda of Understanding (MOUs) and legislative direction, WS is the lead agency for this EA, and therefore responsible for the scope, content and decisions made. The [redacted], along

with the [redacted], had input during preparation of this EA to ensure an interdisciplinary approach in compliance with NEPA and agency mandates, policies and regulations.

Based on the scope of this EA, the decisions to be made are:

Should WS current program of predator damage management be continued in the analysis area (the no action alternative)?

If not, how should WS fulfill its legislative responsibilities in the analysis area?

Might the proposal have significant impacts requiring preparation of an EIS?

1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.4.1 Actions Analyzed. This EA evaluates wildlife damage management to protect livestock, crops, property, wildlife, and human health and safety from damage caused by coyotes, black bears, mountain lions, bobcats, gray fox, red fox, raccoon, striped skunk (*Mephitus mephitus*), and various bird predator species such as common ravens and golden eagles, and other predator species within the Western Colorado analysis area.

1.4.2 Wildlife Species Potentially Protected by WS. WS could assist if [redacted], at some point in the future, determines a need for PDM to achieve management objectives for species under their management jurisdiction. NEPA analysis of any predator damage management for species under the jurisdiction of another federal agency (for example migratory birds, and federally protected endangered or threatened species) will be the responsibility of the authorized federal agency.

1.4.3 American Indian Lands and Tribes. Presently, one Tribe has an *Agreement for Control* with WS in the analysis area for wildlife damage management. Cooperative PDM programs with Indian Tribes could be conducted under the current program and the analysis contained in this EA will apply to such programs.

1.4.4 Period for Which this EA is Valid. This EA will remain valid until WS and other appropriate agencies determine that new needs for action or new alternatives having different environmental affects must be analyzed. At that time, this analysis and document will be supplemented pursuant to NEPA. Review of the EA will be conducted each year by WS to ensure that the EA and the analyses contained herein are still appropriate.

1.4.5 Site Specificity. This EA analyzes potential impacts of PDM and addresses WS PDM activities on all lands under Cooperative Agreement, Agreement For Control or WS Work Plans in the analysis area. It also addresses the impacts of PDM on areas where additional agreements with WS may be negotiated in the reasonably foreseeable future. Because the proposed action is to continue the current program, and because the current program's goal and mandate is to provide service when requested within the constraints of available funding and manpower, it is conceivable that additional PDM efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such expanded efforts as part of the current program. The EA emphasizes significant issues as they relate to specific areas whenever possible; however, the issues that pertain to predator damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard ADC Decision Model (Slate et al. 1992) and ADC Directive 2.105 describe the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual PDM actions addressed by WS in the State (See USDA

1994, Chapter 2 and Appendix N for a more complete description of the ADC Decision Model and examples of its application). Decisions made using the model will be in accordance with any mitigations and standard operating procedures described herein and adopted or established as part of the decision.

1.4.6 Summary of Public Involvement Efforts

Issues related to the proposed action were initially developed through a multiagency process involving WS, the [redacted]. Notice of the proposed action and availability of the Pre-Decision EA was placed in several major newspapers within the analysis area. Comment letters were received and were analyzed to identify any substantive new issues or alternatives not addressed.

1.5 Authority and Compliance

1.5.1 Authority of Federal[4] and State Agencies in Wildlife Damage Management in Colorado

1.5.1.1 WS Legislative Authority

The primary statutory authority for the WS program is the Animal Damage Control Act of 1931, as amended, which provides that:

> *"The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory or privately owned lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jackrabbits, brown tree snakes and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, furbearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals; and to conduct campaigns for the destruction or control of such animals. Provided that in carrying out the provisions of this Section, the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions."*

Since 1931, with the changes in societal values, WS policies and its programs place greater emphasis on the part of the Act discussing "bringing (damage) under control," rather than "eradication" and "suppression" of wildlife populations. In 1988, Congress strengthened the legislative authority of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act States, in part:

> *"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be*

[4]A more detailed discussion of WS legal authorities and key legislation pertinent to wildlife damage management can be found in Chapter 1 of the ADC FEIS (USDA 1994).

available immediately and to remain available until expended for Animal Damage Control activities."

1.5.1.2 [redacted]

In Colorado, management of black bear, mountain lion and furbearer species is the responsibility of the [redacted] as it pertains to hunting and trapping (Colorado Revised Statutes (CRS) Title 33). However, under current regulations the responsibility for managing depredating bears, mountain lions, coyotes, bobcats, wolves (*Canis lupus*), foxes, raccoons, opossums (*Didelphus virginiana*), and striped skunks is the responsibility of [redacted] (CRS 35-40-101).

Under the provisions of CRS 33-3-104, the State of Colorado is liable for damages to real or personal property caused by bears and mountain lions. That statute provides that monetary compensation be paid to landowners suffering from livestock depredation by black bears or mountain lions.

Under the provisions of CRS 33-3-106, landowners, lessees or any other person may obtain a permit to take any wildlife species causing damage to property. This law also authorizes any concerned person, without a permit, to trap, kill, or otherwise dispose of bears, mountain lions, or dogs in situations when it is necessary to prevent them from inflicting death or injury to livestock or human life.

1.5.1.3 [redacted]

[redacted].

1.5.1.4 [redacted]

[redacted]

1.5.1.5 [redacted]

[redacted]

1.5.1.6 Amendment 14 -- An Initiative Measure Amending Article XVIII of the Constitution of the State of Colorado

This initiative prohibits or severely restricts the use of leghold traps, body-gripping traps, snares, and poisons to take wildlife in the State of Colorado. Exceptions include (1) use by municipal departments of health for the purpose of protecting human health or safety; (2) use to control wild or domestic rodents, except for beaver or muskrat; (3) use of nonlethal traps and snares for research, falconry, relocation, or for medical treatment; (4) use on private property used for agricultural production by private landowners, lessees, or their employees for no more than 30 day period per year and so long as the owner can present onsite evidence that ongoing damage to livestock or crops has not been alleviated by the use of nonlethal or lethal control methods which have not been prohibited. This measure restricts lethal methods used for PDM on public lands in the current program to aerial and ground based shooting, use of trail, decoy, or pursuit dogs, and use of cage traps. Interpretation of Amendment 14 by Senate Bill 97-052 has restricted WS use of leghold traps, snares, and toxicants to limited situations on private land only. Cage-type traps may be used to capture black bears (e.g., culvert traps and the Beck Cage Trap), mountain lions and small nuisance carnivores such as raccoons, skunks, and foxes.

1.5.2 Compliance with Federal Laws

Several Federal laws regulate WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act. Environmental documents pursuant to NEPA must be completed before work plans, consistent with the NEPA supported decision, can be developed and implemented. Before 1993, each [redacted] prepared NEPA documents analyzing WS actions. This resulted in different requirements and procedures for different agencies and areas, and did not analyze wildlife damage management on lands under other ownership or jurisdiction. This EA, with WS as the lead agency, is the first time that all land classes under Cooperative Agreements, Agreements for Control and WS Work Plans will be analyzed in a comprehensive manner in the analysis area.

WS also coordinates specific projects and programs with other agencies. The purpose of these contacts is to coordinate any predator damage management that may affect resources managed by these agencies or that may affect other areas of mutual concern. Federal agencies that request WS assistance to protect resources outside the species discussed in this EA are responsible for NEPA compliance.

Endangered Species Act (ESA) Under the ESA, all Federal agencies are charged with a responsibility to conserve endangered and threatened species and to utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts consultations with the USFWS, as required by Section 7 of the ESA, to ensure that, "*Any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . .* " (Sec.7(a)(2)).

Migratory Bird Treaty Act The Migratory Bird Treaty Act (MBTA) provides the USFWS regulatory authority to protect birds that migrate. The law prohibits any "*take*" of these species, except as permitted by the USFWS. A recent Justice Department litigation position is that MBTA permit requirements do not apply to federal agencies.

Bald and Golden Eagle Protection Act This law provides special protection for bald (*Haliaeetus leucocephalus*) and golden eagles. Similar to the MBTA, it prohibits any "*take*" of these species, except as permitted by the USFWS.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods used by WS in the analysis area are registered with and regulated by the EPA and the CDA. All WS use of pesticides is carried out in compliance with labeling requirements.

National Historical Preservation Act (NHPA) of 1966 as amended The NHPA and its Implementing regulations (36 CFR 800) require federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. Activities described under the proposed action do not cause major ground disturbance or other adverse impacts on historic resources and are not undertakings as defined by the NHPA.

1.5.3 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"*

Environmental Justice has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Executive Order 12898 requires Federal agencies to make Environmental Justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. A critical goal of Executive Order 12898 is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. Environmental Justice is a priority both within USDA/APHIS and WS. APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA.

WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by APHIS-WS are regulated by the EPA through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the CDA, by MOUs with Federal land managing agencies, and by ADC Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used following label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1994, Appendix P). The WS operational program properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

2.0 CHAPTER 2: ISSUES

INTRODUCTION

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues used to develop mitigation measures and standard operating procedures in Chapter 3, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the current program (the "no action" alternative) in Chapter 3.

2.1 List of Issues Analyzed in Detail in Chapter 4

Representatives from the lead (WS) and cooperating agencies ([redacted]) and from the USFWS identified a number of issues for analysis. The following issues were deemed substantive to this EA and were analyzed in detail:

- Impact of the WS predator damage management program on target species populations (i.e., coyote, mountain lion, black bear, etc.).
- Impact of WS predator damage management on nontarget species populations, including Threatened, Endangered and sensitive species.
- The potential for WS coyote take to cause increases in rodent, rabbit, and other prey species populations to the point that detrimental effects on vegetation resources occur.
- Impact of WS predator damage management activities on public use of public lands.
- Humaneness and Selectivity of WS predator damage management methods.

A description of the issues is contained in the following discussion:

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

2.2.1 Impact of the WS predator damage management program on target species populations (i.e., coyote, mountain lion, black bear, fox, etc.).

One issue is the concern for WS PDM to adversely affect populations of target species, which, for purposes of this EA are primarily coyotes, mountain lions, and black bears. Maintaining viable populations of all species is a concern of the public and of biologists within the state and federal land and wildlife management agencies, including WS. Scoping during the ADC FEIS process revealed that some persons believe PDM interrupts the "balance of nature" and this should be avoided. Others believe that the "balance" has shifted to favor generalist species, including predators. Some were concerned that big game populations have decreased or have been kept at lower than desired levels because of predation. To address these concerns, the effects of each Alternative on populations of each target species are examined.

2.2.2 Impact of WS predator damage management on nontarget species populations, including Threatened, Endangered and Sensitive Species.

Another major issue of concern is whether WS PDM activities adversely affect populations of nontarget species and, particularly, whether those activities jeopardize the continued existence of Threatened and Endangered

(T&E), [redacted] designated "Sensitive" species, or [redacted]-designated Species of Special Concern (including "At Risk" species). In accordance with the Endangered Species Act, an evaluation is made to determine if WS actions might adversely affect any listed T&E Species or species officially proposed for listing. Although not required by law to do so, WS has also evaluated potential impacts on [redacted] designated "Sensitive" species, and on USFWS designated candidate species (i.e., species for which information exists to support proposals for listing, but which have not yet been formally proposed) and "Species of Special Concern". That evaluation is summarized in Chapter 4. Impacts on other nontarget species that do not fall within any of the above "special status" categories and that have been taken by WS in the analysis area are also evaluated. "Take" of nontargets includes captures in which the animal is released unharmed (e.g., from traps or snares) and those that are killed by WS methods. For purposes of analyzing potential adverse impacts on populations, only those nontargets killed are assumed to be pertinent, with the exception of federally listed species for which any "take" as defined by the ESA would be pertinent. To address this concern, past and potential lethal take of nontarget species is examined in relation to estimated populations. Consultations with the USFWS as required by Section 7 of the ESA have been conducted to address potential adverse impacts on T&E species that might be affected by WS PDM actions.

2.2.3 The potential for WS coyote take to cause increases in rodent, rabbit, and other prey species populations to the point that detrimental effects on vegetation resources occur.

Another concern sometimes raised is that WS killing of coyotes might result in increased populations of rodents, rabbits, or other prey species populations that could lead to adverse effects on agricultural crops and rangeland vegetation resources. This issue is closely related to the first issue stated above and is analyzed in detail for each alternative.

2.2.4 Impact of WS predator damage management activities on recreational use of public lands.

Concerns are sometimes voiced that WS PDM activities might detrimentally affect the ability of the public to safely use public lands for recreation and other purposes such as fuel wood cutting. Some individuals believe their recreational experiences on public lands are impaired by knowing that any lethal PDM actions are occurring on such lands. Worries have been expressed that members of the public or their pets using public land areas might be harmed by leghold traps or M-44 devices or that they or their pets might be inadvertently shot during aerial hunting operations.

2.2.5 Humaneness and Selectivity of predator damage management methods.

Some people are concerned that WS lethal PDM methods are inhumane and that such methods are unselective. Humaneness, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. Selectivity is related to the issue of humaneness in that greater selectivity results in less perceived suffering of nontarget animals. The issue of humaneness has two aspects in relation to the need for PDM:

1. Animal welfare organizations are concerned that some methods used to manage wildlife damage and wildlife populations in general expose animals to unnecessary pain and suffering. Research suggests that with some methods, such as restraint in leghold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that had been chased by dogs for about five minutes as those restrained in traps (USDA 1994). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

2. Humaneness, as perceived by the livestock industry and pet owners, requires that domestic animals be protected from predators because humans have bred the natural defense capabilities out of domestic animals. It has been argued that man has a moral obligation to protect these animals from predators (USDA 1994). Predators frequently do not kill larger prey animals quickly, and will often begin feeding on them while they are still alive and conscious (Wade and Bowns 1982). Many livestock producers who perceive the apparent suffering endured by livestock damaged in this way find this to be unacceptable.

Thus, the decision-making process involves tradeoffs between the above two aspects of humaneness. An objective analysis of this issue must consider not only the welfare of a wild animal caught in a leghold trap or snare, but also the welfare of the domestic animals that may be maimed and/or killed if the leghold trap were not being used. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology. Additionally, to insure the most professional handling of these issues and concerns, WS has numerous policies established giving direction toward the achievement of the most humane PDM program possible.

WS has improved the selectivity of management devices through research and development of pan-tension devices and other device modifications such as breakaway snares. Research is continuing with the goal of bringing new findings and products into practical use. Until such time as new findings and products are found to be practical, a certain amount of animal suffering will occur if PDM objectives are to be met in those situations where nonlethal control methods that have no adverse impacts on other wildlife are not practical. Furthermore, if it were possible to quantify suffering, it is possible that the actual net amount of animal suffering would be less under the proposed action (or any other alternative involving the use of lethal methods) than under no PDM since suffering of livestock preyed upon by predators would be reduced if the action is successful.

WS personnel in the analysis area are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology. Mitigation measures/standard operating procedures used to maximize humaneness are listed in Chapter 3.

2.3 Issues Not Considered in Detail with Rationale

2.3.1 WS Impact on Biodiversity

No WS wildlife damage management is conducted to eradicate a wildlife population. WS operates according to international, Federal and State laws and regulations enacted to ensure species diversity and viability. Any reduction of a local population or group would be temporary because migration from adjacent areas and/or reproduction generally can be expected to replace the animals removed within the same year. The impacts of the current WS program on biodiversity are not significant nationwide, statewide, or in the analysis area (USDA 1994). The WS take of any predator species is a very small proportion of the total estimated population as shown by the analysis in Chapter 4.

2.3.2 Livestock Losses Should Be an Accepted Cost of Doing Business -- A Threshold of Loss Should be Reached Before Providing PDM service.

Some persons feel that livestock producers should expect some level of loss as a cost of doing business, and that WS should not initiate any control actions until economic losses reach some predetermined "threshold" level. Although some losses of livestock and poultry can be expected and tolerated by livestock producers, WS has a legal responsibility to respond to requests for wildlife damage management, and it is program policy to aid each requester to minimize losses. If damage management efforts are not initiated soon after a damage problem is detected, damage may sometimes escalate to excessive levels before the problem is solved. WS uses the Decision Model (Slate et al. 1992) discussed in Chapter 3, page 3-2 to determine an appropriate strategy.

In the Southern Utah Wilderness Alliance, et al. v. Thompson, H., Forest Supervisor et al., the United States District Court of Utah denied plaintiffs' motion for a preliminary injunction. In part, the court found that a forest supervisor needs only show that damage from predators is threatened to establish a need for wildlife damage management (United States District Court of Utah, Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion, such as percentage of loss of a herd to justify the need for WS action.

2.3.3 No wildlife damage management at taxpayer expense; wildlife damage management should be fee based

Some persons feel that wildlife damage management should not be provided at the expense of taxpayers or that it should be fee based. WS was established by Congress as the agency responsible for providing wildlife damage management to the people of the United States. Funding for WS comes from a variety of sources in addition to federal appropriations. Such nonfederal sources include State general appropriations, local government funds (county or city), livestock associations, Indian tribes, and private funds which are all applied toward program operations. Federal, state, and local officials have decided that WS should be conducted by appropriating funds. Although not required by law, the Colorado WS program currently requests cooperative local government or private funding to cover about 50% of the program's cost (not including administrative overhead) of providing the services of a WS employee. Thus, wildlife damage management services are, in essence, "fee based" to a relatively high degree for a federal program. Additionally, wildlife damage management is an appropriate sphere of activity for government programs, since wildlife management is a government responsibility. A common argument for publicly funded wildlife damage management is that the public should bear responsibility for damage to private property caused by public wildlife.

2.3.4 The indiscriminate killing of coyotes often disturbs stable coyote populations, thus encouraging opportunist animals far more likely to kill livestock.

Annual mortality in coyote populations is known to range from 19-100% with 40-60% mortality most common. In an EIS on mammalian predator damage management (USDI 1979), studies of coyote survival rates were analyzed and the following conclusions were made:

> Typical annual survival rates are only 45% to 65% for adult coyotes. High mortality rates have also been shown in four telemetry studies involving 437 coyotes that were older than 5 months of age; 47% of the marked animals are known to have died. Mortality rates even among "unexploited" coyote populations were reported to be between 38-56%. Thus, most coyote populations, even those that are not subjected to control activities, are not stable. In studies where reported coyote mortality was investigated, only 14 of 326 recorded mortalities were due to WS activities.

Dispersal of "surplus" young coyotes is the main factor that keeps coyote populations distributed throughout their habitat. Such dispersal of subdominant animals removes surplus animals from higher density areas and repopulates areas where artificial reductions have occurred. Two studies (Connolly et al. 1976, Gese and Grothe 1995) investigated the predatory behavior and social hierarchy of coyotes, and determined that the more dominant (alpha) animals were the ones that initiated and killed most of the prey items. Connolly et al. (1976) concluded that the proclivity of individuals to attack seemed related to their age and relationship with conspecifics. The coyotes that attacked sheep most frequently were 2-year-old males and females paired with these males. Gese and Grothe (1995) concluded from observing wild coyotes that the dominant pair was involved in the vast majority of predation attempts. The alpha male was the main aggressor in all successful kills, even when other pack members were present. Thus, it would appear that removal of local established territorial coyotes actually removes the individuals that are most likely to kill livestock and can result in the immigration of young coyotes that are less likely to kill livestock. One commentor cited a study by Connor (1995) which suggested that some WS employees are not very successful in removing dominant territorial coyotes. However, that study involved coyotes at the Hopland Research and Extension Center in California that had already been captured once for radio telemetry purposes and were thus substantially

more difficult to capture (G. E. Connolly 1997, pers. comm.). In a review of the study and its conclusions, R. Timm (Superintendent and Extension Wildlife Specialist, Hopland Research and Extension Center; letter dated April 15, 1996 to C. Coolahan, State Director, WS, CO) disagreed with Connor's conclusions, citing "noise" (i.e., confounding factors or unaccounted variables) in the data used, and expressed the opinion that WS efforts "usually reduced the amount of coyote-caused loss which we would have otherwise experienced on our research sheep flock". In general, experienced WS personnel are comparatively proficient at removing dominant pairs.

In a study in New Mexico, Windberg et al. (1997) found no statistically significant difference between territorial and transient coyotes in the proportion of each type that consumed Angora goats. They concluded that management measures to protect livestock during periods of exposure of highly vulnerable kid goats or lambs may be best directed at local coyote populations rather than at particular cohorts or individuals. Their study supports the belief that removal of coyotes from a local population without regard for age or territoriality is advisable in many situations and would not result in a worsening of predation problems.

2.3.5 Impacts on other wildlife species populations caused by low-level flights during aerial hunting.

One concern sometimes expressed is that aerial hunting might disturb other wildlife species populations to the point that their survival and reproduction might be adversely affected. State game agencies use low-level fixed-wing airplane and helicopter flights routinely to census big game populations. Aerial hunting by WS is primarily conducted in winter when snow cover allows for greater visibility of target animals and their tracks. Deer, elk, and pronghorn antelope are occasionally seen and/or flushed during aerial hunting operations. However, WS avoids pursuing or harassing them.

A number of studies have looked at responses of various wildlife species to aircraft overflights. USDI (1995) reviewed studies on the effects of aircraft overflights on wildlife. The report revealed that a number of studies have documented responses by certain wildlife species that suggest adverse impacts could occur. Few if any studies have proven that aircraft overflights cause significant adverse impacts on populations, although the report stated it is possible to draw the conclusion that impacts to wildlife populations are occurring. It appears that some species will frequently or at least occasionally show adverse responses to even minor overflight occurrences. In general, it appears that the more serious potential impacts occur when overflights are *chronic*, i.e., they occur daily or more often over long periods of time. Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. WS aerial hunting operations occur in relatively remote rangeland areas where tree cover is at most scattered to allow for visibility of target animals from the air.

Some examples of species or species groups that have been studied with regard to this issue and WS determination of potential impacts from aerial hunting overflights are as follows:

- Colonial Waterbirds. Kushlan (1979) reported that low level (390 feet followed by a second flight at 200 feet) overflights of 2-3 minutes in duration by a fixed-wing airplane and a helicopter produced no "drastic" disturbance of tree-nesting colonial waterbirds, and, in 90% of the observations, the individual birds either showed no reaction or merely looked up. WS aircraft are unlikely to be flown over such species in the analysis area because aerial hunting occurs in upland areas, primarily away from any riparian areas. Even if an overflight of a nesting colony occurred, it is apparent that little or no disturbance would result.

- Greater Snow Geese. Belanger and Bedard (1989, 1990) observed responses of greater snow geese (*Chen caerulescens atlantica*) to man-induced disturbance on a sanctuary area and estimated the energetic cost of such disturbance. They observed that disturbance rates exceeding two per hour reduced goose use of the sanctuary by 50% the following day. They also observed that about 40% of the disturbances caused interruptions in feeding that would require an estimated 32% increase in

nighttime feeding to compensate for the energy lost. They concluded that overflights of sanctuary areas should be strictly regulated to avoid adverse impacts. WS aerial hunting flights rarely, if ever, occur over wetland areas and in no way would involve chronic or repeated flights over such areas. Thus, disturbance of migrating snow geese or any other waterfowl should be minimal to nonexistent.

- Mule Deer. Krausman et al. (1986) reported that only 3 of 70 observed responses of mule deer to small fixed-wing aircraft overflights at 150 to 500 feet above ground resulted in the deer changing habitats. The authors felt that the deer may have been accustomed to overflights because the study area was near an interstate highway which was followed frequently by aircraft. Mule deer are frequently seen from WS aircraft and are sometimes temporarily disturbed as evidenced by their running and avoidance behavior. However, it is apparent that adverse effects from this type of disturbance are minimal. WS aerial hunting personnel frequently observe deer and antelope standing apparently undisturbed beneath or just off to one side of aircraft. In areas exposed to periodic low-level aircraft activity, animals seem to acclimate to WS aircraft to the point that disturbance is unapparent (L. Vetterman, Regional Aircraft Manager, WS, pers. comm. 1996). To the extent that localized coyote removal reduces predation on deer and antelope fawns and other wildlife species, benefits to such species could outweigh potential adverse impacts.

- Mountain Sheep. Krausman et al. (1983) reported that, of 32 observations of the response of mountain sheep (*Ovis canadensis*) to low-level flights by small fixed-wing aircraft, 60% resulted in no disturbance, 81% in no or "slight" disturbance, and 19% in "great" disturbance. The authors concluded that flights less than 150 feet above ground can cause mountain sheep to leave an area. WS does not conduct aerial hunting in typical higher elevation mountain sheep habitat. If wild sheep are observed, the pilot avoids pursuit or harassment.

- Bison. Fancy (1982) reported that only 2 of 59 bison (*Bison bison*) groups showed any visible reaction to small fixed-wing aircraft flying at 200 - 500 feet above ground. The study indicated bison are relatively tolerant of aircraft overflights. Thus, in the rare event that wild bison are encountered by WS aircraft, impacts from disturbance should be minimal.

- Raptors. Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period. Their results also showed similar nesting success between hawks subjected to such overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but showed that ferruginous hawks (*Buteo regalis*) are sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, and neither were they alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that 5 species of hawks, 2 falcons, and golden eagles were "incredibly tolerant" of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and never limiting to productivity. These studies indicate that overflights by WS aircraft should have no significant adverse impacts on nesting raptor populations.

Aerial hunting is an important method of target coyote take in the analysis area -- in FY 1995, 23.9 hours of helicopter and 499.2 hours of fixed-wing hunting were expended with 193 of those hours spent flying [redacted]. As shown in section 1.0, WS conducted PDM activities on areas under agreement that

totaled only 8% of the analysis area in FY 1995. Therefore, more than 90% of the land area of the analysis was not subjected to any aerial hunting by WS. Put in perspective, the amount of aerial hunting that occurred in the analysis area was the equivalent of only 80 minutes of low-level flight per 10 mi.^{2} during all of 1995 on the 8% of the analysis area that comprised areas under agreements worked. On the [redacted] lands, aerial hunting time for the entire year averaged only 55 minutes per 10 mi.^{2} of area worked for PDM, and only 7% of the federal public land in the area was worked for PDM by WS. Thus, more than 93% of the [redacted] land in the analysis area was not subjected to WS aerial hunting.

Based on the above information and analysis, it is reasonable to conclude that WS aerial hunting flights should not cause any significant adverse impacts to nontarget wildlife populations.

2.3.6 Appropriateness of manipulating wildlife for the benefit of hunters or recreation.

Some individuals feel it is not appropriate to manipulate one wildlife species for the benefit of another wildlife species, or for the benefit of hunters or recreation. This is a matter of individual perception and perspective. The jurisdiction for managing most resident wildlife in the State rests with the [redacted] which, under state law, can request WS assistance in achieving its management objectives. American Indian Tribes have jurisdiction for management of resident wildlife species on tribal lands and could also request such assistance. WS would not conduct PDM specifically for wildlife protection unless requested by an agency or tribe with such management authority.

2.3.7 Appropriateness of using rancher-supplied data to quantify livestock losses.

Some individuals feel that ranchers often intentionally overestimate the extent of their livestock losses in order to justify more control work. Pearson (1986), however, reported on several studies that indicated little or no bias occurred in ranchers reporting loss, and Shelton and Klindt (1974) found that some ranchers underestimated their losses due to some husbandry practices. Schaefer et al. (1981) investigated sheep predation and determined that: 1) producers correctly assessed the cause of livestock death more than 94% of the time, and 2) the results of two types of loss surveys yielded similar results. Although loss reporting for any given individual ranch could be erroneous, these studies suggest that livestock producers as a group tend to either underestimate predation losses or report such losses with reasonable accuracy.

2.3.8 Relocation (rather than killing) of problem wildlife.

A common suggestion provided for government PDM programs is that problem predators should be live-captured and relocated instead of killed. Relocation may be appropriate in some situations (i.e., if the problem species' population is at very low levels, there is a suitable relocation site, and the additional travel and personnel costs of relocation can be met.) However, those species that often cause damage problems (i.e., coyotes, red fox, black bears, mountain lions) are relatively abundant in much of the suitable habitat in the analysis area, and translocation is not necessary for the maintenance of viable populations. Furthermore, so few bears and mountain lions would be taken by WS PDM actions in the analysis area in any one year (less than 10 for mountain lions and less than 40 for black bears) that relocation would not contribute significantly to enhancing local populations. Relocation of predators implicated in livestock depredation may result in future depredations if the predator encounters livestock again, and [redacted] does not generally allow relocation of such animals. [redacted] may decide, on a case-by-case basis to relocate nuisance bears and lions.

The American Veterinary Medical Association (AVMA), the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission, particularly for small mammals such as raccoons or skunks (Center for Disease Control 1990). Although relocation is not necessarily precluded in all cases, it would in many cases be logistically impractical and biologically unwise.

2.3.9 WS removal of coyotes exacerbates the livestock depredation problem because coyote population reduction results in greater reproduction.

This argument was raised in Southern Utah Wilderness Alliance v. Thompson (U.S. District Court of Utah 1993) and addressed by Connolly (1992b) during that court case. What happens in an unexploited coyote population bears little relevance to the situation in the analysis area or in most other areas of the western U.S. Coyote populations in the analysis area are subject to mortality not only from WS, but also from private trappers and hunters as well as ranchers protecting their stock. In the absence of a Federal WS program, private fur harvest and coyote damage control efforts would still likely be carried out by some other entity. The *status quo* for coyote populations in Colorado is human-caused mortality in the range of 20,000 to 40,000 coyotes killed per year (statewide) even without a federal WS program. It is expected that private harvest will decline because of the prohibitions and restrictions that have resulted from the passage of State Constitutional Amendment 14.

Although it is well supported that coyote reproduction increases as population size decreases (Connolly and Longhurst 1975), WS is unaware of any data that would substantiate the speculation that unexploited coyote populations pose less risk to livestock than exploited populations. On the contrary, research on lamb and sheep losses with restricted or no PDM indicate that coyote control is effective in reducing losses (see section 1.1.2 and 4.2.7.1). This was supported by a review of the Government Accounting Office (GAO 1990) which concluded that "according to available research, localized lethal controls have served their purpose in reducing predator damage" (GAO 1990).

2.3.10 Cost of providing PDM services for livestock protection compared to the value of livestock losses avoided.

A common concern about government-funded PDM programs is that the value of livestock losses reported to, or verified by, WS is often less than the cost of providing PDM services for the protection of livestock. However, this concern, stated in that way, indicates a misconception of the purpose of PDM for livestock protection, which is not to wait until the value of losses is high, but to *prevent* or *stop* losses in order to minimize them. PDM would reach its maximum potential success if it prevented *all* losses, which would mean the value of losses would be zero. However, in the real world, it is not reasonable to expect zero loss. It is assumed that the actual concern stated above is whether the cost of providing PDM services is equal to or greater than the value of livestock losses *avoided* (thus, the issue has been restated as above).

Connolly (1981) examined the issue of cost effectiveness of federal predator control programs and concluded that public policy decisions have been made to steer the program away from being as cost effective as possible. This is because of the elimination of relatively inexpensive control methods believed to be effective but less environmentally preferable such as toxic baits. Thus, the increased costs of implementing the remaining available methods were to achieve other public benefits besides livestock protection and could be viewed as mitigation for the loss of effectiveness in reducing damage. The ADC EIS, Appendix L, p. 32 stated:

> Cost effectiveness is not, nor should it be, the primary goal of the APHIS WS program. Additional constraints, such as environmental protection, land management goals, and others, are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the APHIS WS program.

Using the best information available, the ADC programmatic EIS concluded that benefits, in terms of avoided sheep and lamb losses plus price benefits to consumers, are 2.4 times the cost of providing WS PDM services for sheep protection in the 16 western states (USDA 1994, p. 4-109). That analysis did not address the value of calf protection which is a substantial component of WS PDM services in many areas of the western U.S. including western Colorado. Data useful for evaluating this issue specific to the analysis area are not available. The

Council on Environmental Quality (CEQ) regulations (40 CFR 1502.23) do not require a formal, monetized cost-benefit analysis to comply with NEPA.

2.3.11 Predator Damage Management in [redacted]

Some individuals feel that PDM should not be allowed or should be heavily restricted in federally designated [redacted]. This issue is related to the issue of impacts on public use of public lands which is addressed in detail in Chapter 4. Circumstances could warrant WS PDM service in a [redacted] in the future for either livestock or human safety protection. However, the need for WS PDM activities in [redacted] in the analysis area has been very limited and is expected to remain a minor part of the program. If PDM in [redacted] becomes necessary, it is expected that it would be limited to isolated requests by the [redacted] for service involving individual depredating black bears or mountain lions, or infrequent situations involving confirmed coyote depredation. Bears and lions are under [redacted] management authority and under [redacted] depredation management authority, and the [redacted] both recognize and accept state jurisdiction over the management of resident wildlife on federal public lands. Individual depredating bears or mountain lions would be taken only as authorized by state law during ongoing depredation situations, or following a history of livestock predation, or after the identification of threats to human safety. In any event, WS PDM will only occur in [redacted] when allowed under the provisions of the specific [redacted] designation and as allowed by federal policies. The need for and restrictions on such actions on [redacted] would be addressed in WS Work Plans prepared by WS in cooperation with each individual [redacted] District to assure that impacts on wilderness values are kept to a minimum.

2.3.12 Effects on Eagles from Using Lead Shot During Aerial Hunting

A concern has been raised that bald and golden eagles could become poisoned by consuming lead shot when they scavenge on coyote carcasses killed during aerial hunting operations. The WS program in Colorado currently uses copper plated lead #4 buckshot or copper plated lead BB shot for aerial hunting. WS has tried various nontoxic steel shot loads in order to mitigate this concern, but found that the harder steel pellets sometimes ricochet posing a risk to the aircraft or to aerial hunting personnel. Damage has occurred to fixed-wing airplanes and one helicopter in the WS program because of ricocheting steel shot. Hayes (1993) reviewed literature and analyses addressing the hazard of lead shot to raptors. Key findings of that review were:

- Eagles are known to scavenge on coyote carcasses, particularly when other food sources are scarce or when food demands are increased.

- In studies that documented lead shot consumption by eagles (based on examining the contents of regurgitated pellets), the shot was associated with waterfowl, upland game bird, or rabbit remains, and was smaller than BB or #4 buckshot used in aerial hunting. Lead levels have been detected in eagle blood samples, but the source of the exposure was unknown. Lead residues have been documented in jackrabbits (*Lepus californicus*), voles (*Microtus sp.*), and ground squirrels (*Citellus sp.*) which can explain how eagles could ingest lead from sources other than lead shot. In one study (Pattee et al. 1981) four of five captive bald eagles force fed noncoated lead shot died and the fifth went blind. Frenzel and Martin (1989) suggested, however, that eagles usually reduce the amount of time that lead shot stays in their digestive systems by casting most of the shot along with other indigestible material. It appears that healthy eagles usually regurgitate lead shot in pellet castings which reduces the potential for lead to be absorbed into the blood stream (Pattee et al. 1981; Frenzel and Martin 1989).

- WS personnel examined 9 coyotes shot with copper plated BBs to determine the numbers of shot retained by the carcasses. A total of 59 shot pellets were recovered, averaging 6.5 pellets per coyote. Of the 59 recovered pellets, 84% were amassed just under the surface of the hide opposite the side of the coyote that the shot entered, many exhibited minute cracks of the copper plating, and two shot

pellets were split. The fired shot were weighed and compared with unfired shot and were found to have retained 96% of their original weight. Eagles generally peel back the hide from carcasses to consume muscle tissue. Because most shot retained by coyotes tend to end up just under the hide, it would most likely be discarded with the hide. Any shot consumed would most likely still have the nontoxic copper plating largely intact, reducing the exposure of the lead to the digestive system. These factors, combined with the usual behavior of regurgitation of ingested lead shot indicate a low potential for toxic absorption of lead from feeding on coyotes killed by aerial hunting.

- Bald eagle populations appear to be increasing in the contiguous 48 states and have met or exceeded recovery goals in several states. Golden eagle populations appear to be healthy. Breeding Bird Survey Data indicate a general increasing trend in breeding populations of both golden and bald eagles in North America since 1966 (Sauer et al. 1997). Thus, eagle populations do not appear to be significantly adversely affected by toxicity problems.

The above analysis indicates adverse effects on eagles from scavenging on coyotes killed by aerial hunting are unlikely. The USFWS did not identify this as a concern in the 1992 formal Section 7 consultation and B.O., which covered potential adverse effects on bald eagles from WS PDM methods, including aerial hunting.

3.0 CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 Alternatives Analyzed in Detail

1) Alternative 1 - Continue the Current Federal PDM Program. This is the Proposed Action as described in Chapter 1 and is the "No Action" alternative as defined by the Council on Environmental Quality for analysis of ongoing programs or activities.

2) Alternative 2 - No Federal WS PDM. This alternative consists of no federal PDM.

3) Alternative 3 - Technical Assistance Only. Under this alternative, WS would not conduct any direct operational PDM activities in the analysis area. If requested, affected producers would be provided with technical assistance (i.e., self-help) information only.

4) Alternative 4 - Nonlethal PDM Only. This alternative would not allow any lethal PDM by WS.

5) Alternative 5 - Nonlethal Required Before Lethal Control. This alternative would not allow any lethal PDM by WS until nonlethal methods have been tried and found to be inadequate in each depredation situation.

6) Alternative 6 - Corrective Control Only When Lethal PDM Methods are Used. This alternative would require that livestock depredation or other resource damage by predators must be occurring before the initiation of lethal control. No preventive lethal control would be allowed.

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 ALTERNATIVE 1 - Continue the Current Program (the Proposed Action and the "No Action Alternative)

The No Action alternative is a procedural NEPA requirement (40 CFR 1502.14(d)), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with CEQ's definition (CEQ 1981).

A succinct description of the proposed action was presented in Chapter 1. The discussion that follows contains further information intended to foster understanding of the proposed action.

Overview

The No Action alternative would continue the current WS Integrated Wildlife Damage Management (IWDM) program for the protection of livestock, property, crops, wildlife and human health and safety from damage caused by predators in the analysis area. The current predator damage management (PDM) program is a collection of cooperative programs with other Federal, State and local agencies, and private individuals and associations (described in Chapter 1). The program in the analysis area conducts technical assistance and preventive (in response to anticipated or historical loss) and corrective (in response to current loss or hazard) operational PDM on private, [redacted], State Trust, or Tribal lands under MOU, Cooperative Agreements or Agreements for Control, Annual Work Plans, or other type of agreement instrument. All WS PDM is based on interagency relationships, which require close coordination and cooperation because of overlapping authorities. Interpretations by the Colorado State Legislature regarding State Constitutional Amendment 14, have restricted the methods available for use by WS under the current program.

On Federal lands, WS Work Plans describe the WDM that would occur. Currently, 10 separate Environmental Assessments meet NEPA compliance for WS WDM on Federal lands within the analysis area. During the WS annual planning process with the [redacted], plans are prepared which describe and delineate where WS WDM would be conducted and what methods would be used. Before WDM is conducted by WS on private lands, *Agreements for Control on Private Property* are signed with the landowner or administrator that describe the methods to be used and the species to be managed. Management is directed toward localized problem predator populations or groups and/or individual offending animals, depending on the circumstances.

WDM is only conducted in designated [redacted] when allowed by the legislation designating the area or under regulations developed by the [redacted]. WDM in these designated areas is only, and is expected to continue to be, a very minor part of the current program.

Under the current program, WDM for the protection of wildlife is not addressed in existing EAs. WDM for the protection of wildlife may be conducted at the request of the [redacted], an American Indian Tribe, or, for example, in the case of T&E species protection, the [redacted]. The agency with management authority would then be responsible for determining the need for such actions and WS could assist them contingent upon available funding and personnel. These types of projects have not been requested in recent years but could be conducted under the current program. The decisions on methods to be used and the timing of their application would be made in coordination with the wildlife management and land management agencies.

Integrated Wildlife Damage Management

During more than 70 years of resolving wildlife damage problems, WS has considered, developed, and used numerous methods of managing damage problems (USDA 1994, P. 2-15). The efforts have involved the research and development of new methods, and the implementation of effective strategies to resolve wildlife damage.

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. IWDM is the implementation and application of safe and practical methods for the prevention and control of damage caused by wildlife based on evaluation of local problems and the informed judgement of trained personnel. The WS Program applies IWDM, commonly known as Integrated Pest Management (IPM) (ADC Directive 2.105), to reduce damage through the ADC Decision Model (Slate et al. 1992) described in the FEIS. The model represents the thought process used by WS personnel in deciding courses of action for specific wildlife damage problems. A complete discussion of the ADC decision model is presented in USDA (1994).

The philosophy behind IWDM is to implement effective management techniques in a manner that is as cost-effective as possible while minimizing potentially harmful effects on humans, target and nontarget species, and the environment. IWDM draws from the largest possible array of options to create a combination of techniques appropriate for the specific circumstances. IWDM may incorporate cultural practices (i.e., animal husbandry), habitat modification, animal behavior (i.e., scaring), local population reduction, or any combination of these, depending on the characteristics of the specific damage problems. In selecting management techniques for specific damage situations consideration is given to:

- Species responsible
- Magnitude of the damage
- Geographic extent of damage
- Duration and frequency of the damage
- Prevention of future damage (lethal and nonlethal techniques)

The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.

The IWDM strategies that WS employs consist of:

- Technical Assistance Recommendations (implementation is the responsibility of the requestor): WS personnel provide information, demonstrations, and advice on available wildlife damage management techniques. Technical assistance includes demonstrations on the proper use of management devices (propane exploders, cage traps, etc.) and information on animal husbandry, habitat management, and animal behavior modification. Technical assistance is generally provided following an on-site visit or verbal consultation with the requestor. Generally, several management strategies are described to the requestor for short and long term solutions to damage problems, and these strategies are based on the level of risk, need, and practical application. Technical assistance may require substantial effort by WS personnel in the decision making process, but the actual management is the responsibility of the requester.

- Direct Control Assistance (activities conducted or supervised by WS personnel): Direct control assistance is implemented when the problem cannot effectively be resolved through technical assistance and when Cooperative Agreements provide for WS direct control assistance. The initial investigation defines the nature and history of the problem, extent of damage, and the species responsible for the damage. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted pesticides are proposed, or the problem is complex requiring the direct supervision of a wildlife professional. WS considers the biology and behavior of the damaging species and other factors using the ADC decision model (Slate et al. 1992). The recommended strategy(ies) may include any combination of preventive and corrective actions that could be implemented by the requestor, WS, or other agency, as appropriate. Two strategies are available:

    1. **Preventive Damage Management.** Preventive damage management is applying wildlife damage management strategies before damage occurs, based on historical damage problems. As requested and appropriate, WS personnel provide information and conduct demonstrations or take action to prevent these historical problems from recurring. For example, in areas where substantial lamb depredation has occurred on lambing grounds, WS may provide information about guarding dogs, fencing or other husbandry techniques, or be requested to conduct lethal PDM. With the restrictions imposed by Amendment 14, increased preventive damage management may become necessary to mitigate reduced effectiveness in resolving livestock depredation problems.

    2. **Corrective Damage Management**. Corrective damage management is applying wildlife damage management to stop or slow down an ongoing loss problem. As requested and appropriate, WS personnel provide information and conduct demonstrations or, with the appropriate signed agreement, take action to prevent additional losses from recurring. For example, in areas where lamb depredation is occurring, WS may provide information about guarding dogs, fencing or husbandry techniques, or conduct operational damage management to stop the losses.

Predator Damage Management Methods

A number of methods are available for consideration in predator damage situations.

Nonlethal Methods

Livestock producer practices consist primarily of nonlethal preventive methods such as animal husbandry, habitat modification, and animal behavior modification. Livestock husbandry and other management techniques are implemented by the livestock producer. Producers are encouraged to use these methods, based on the level of risk, need, and professional judgement on their effectiveness and practicality (USDA 1992). Livestock producer practices recommended by WS or already in use by many producers include:

- **Animal husbandry methods**. These generally involve modifications to the level of care or attention given to livestock which may vary depending on the age and size of the livestock. Animal husbandry practices include but are not limited to techniques such as herders, shed lambing, confinement calving, and carcass removal. Most larger rangeland sheep producers use herders in Colorado which assist in reducing depredation problems. Close confinement of cattle during calving is sometimes practical for small operations but, as a rule, is not practical on large rangeland operations which are the primary mode of calf production for which WS receives requests for PDM. Carcass removal usually is not feasible on extensive pasture and range operations (Wade 1982).

- **Guarding animals.** Guard dogs can be effective in reducing predation on sheep or goats in many situations (Coppinger et al. 1988; Green et al. 1984), and WS has an information bulletin available to producers who are interested in this method (Green and Woodruff 1993). Many sheep producers use guard dogs in Colorado -- a 1994 survey by NASS indicated that 30 percent of Colorado sheep producers employed guard dogs to control predator losses (CASS 1995b). Data reported by Andelt (1995) indicate the owners of 65% of the sheep in the state used guard dogs in 1993. Producers in Colorado using guarding dogs lost an average of 0.4% of their ewes and 1.2% of their lambs to coyote predation whereas producers without guarding dogs lost 0.8 - 1.5% of their ewes and 4.7 - 9.6% of their lambs (Andelt 1992). Producers in Colorado estimated that each guarding dog saved an average of $3,216 of sheep from predators annually (Andelt 1992). Fourteen of 21 Colorado sheep producers surveyed indicated that guard dogs reduced their reliance on other predator control methods (Andelt 1992). Thus, guard dogs are an important and effective component of PDM for sheep producers in Colorado. They require a considerable degree of commitment and effort on the part of producers to be effective. However, the effort is likely worthwhile because producers surveyed by Andelt (1992) indicated that dogs >9 months of age saved more time in sheep management than the amount of time spent feeding and working with each dog. Other considerations in deciding whether to use guard dogs are that they appear to be prone to mortality (Green and Woodruff 1993), some guard dogs chase and sometimes kill other wildlife besides predators (Timm and Schmidt 1989), and some have been known to conflict with recreational users on public lands by showing aggressive behavior toward or attacking humans (D. Roth, USFS, pers. comm.).

  Llamas have also been advocated as effective livestock guarding animals. Franklin and Powell (1994) surveyed 145 producers who use guard llamas in the U.S. and indicated that 80% rated them as “effective” or “very effective”. Their survey results indicated that an advantage of llamas over guard dogs is that llamas can be sustained with similar forage and/or feed required by ungulate livestock. Another is that they do not require any special training and generally only require a few days to adjust to a flock of sheep whereas dogs

must be reared from puppyhood with sheep. Thus, a producer can determine rather quickly whether a llama is an effective guardian. Some disadvantages of llamas are that they sometimes carry paratuberculosis (Johne's disease) which may be transmissible to native ungulates or domestic livestock (Wildlife Management Institute 1995). This disease involves a chronic wasting of the intestinal tract and associated lymphoid tissues, and there is no known cure. Another is that they can be susceptible to mountain lion predation (W. Andelt, pers. comm., 1997) and, therefore, might not be effective guardians where lion depredation is prevalent.

- **Habitat modification**. This practice alters habitat to attract or repel certain wildlife species away from damage sites, or to separate livestock from predators. Habitat modification practices could be encouraged when practical, based on the type and extent of the livestock operation. For example, clearing brushy or wooded areas in or adjacent to lambing or calving pastures may be appropriate to reduce available cover for predators. Habitat alteration may not be recommended if it has substantial negative impacts on other species of wildlife. This option is generally not available for public land areas.

- **Animal behavior modification**. This refers to tactics that alter the behavior of wildlife and reduce predation. Animal behavior modification may use scare tactics or fencing to deter or repel animals that cause loss or damage to livestock or property. Some but not all devices used to accomplish this are:

  - Predator-proof fences
  - Electronic guards
  - Propane exploders
  - Pyrotechnics

  These techniques can be effective in certain circumstances, but are generally only practical on small pasture situations, or, as in the case of the electronic guard, in situations where livestock are closely herded as is most often the case in many [redacted] sheep grazing allotments. Scaring devices, when effective, are usually so for only a short period of time before predators become accustomed and learn to ignore them. However, a prototype Electronic Guard in pastured sheep provided an average of 53 nights of protection (2 or less losses) in 10 trials, and a newer version provided an average of 91 nights of protection in 5 trials (Linhart 1983; Linhart et al. 1984). Propane exploders, another scaring device, are not practical under large rangeland pasture situations because of the large expanses of land involved, and they can also be disturbing to other wildlife besides target predators and to recreational users on public land areas when they happen to be nearby. Predator proof fencing is effective but generally cost-prohibitive in most situations. Many sheep producers, however, already employ *predator-resistant* net wire fencing. It serves to not only contain sheep but helps to discourage predator ingress into production areas. Coyotes or other predators that make it through, over, or under such fences often leave evidence at their points of entrance that helps to facilitate their capture and/or removal with lethal means. Fences adequate to stop predator movements can also restrict movements of game animals and other wildlife (Wade 1982). In large rangeland pasture situations predators would likely be enclosed with livestock by construction of predator proof fencing. This means depredations would likely occur anyway requiring the implementation of predator removal methods to resolve depredation problems. Also, coyotes have been known to pass through, over, or under even very aggressive fence designs, including high-tensile wire electric fencing. Once inside such fenced areas, coyotes do not generally leave and can cause depredations (Dr. V.W. Howard, NMSU, pers. comm. 1996).

Lethal Methods

Most nonlethal methods are only practical for use by livestock producers, and are not practical for use by WS personnel under the current program. This is because they require continuous, year-round or at least seasonal commitments and attention to make them effective in those situations where they are practical. WS field personnel are too few in number (10 - 14 statewide) to implement and maintain the nonlethal methods described above on the more than 800 cooperating ranches and farms in the State. Therefore, most operational activities of WS involve conducting lethal PDM where nonlethal strategies are not practical or have not been effective.

1. Leghold and cage traps, neck snares (when used with "stops"), and foot snares, when used in conjunction with euthanasia, are lethal methods that are used by WS for preventive and corrective damage management only where signed *Agreements For Control On Private Property* or *Agreements For Control On Nonprivate Property* are in place. Neck snares without stops are generally lethal devices when used for PDM. With the exception of cage traps, the use of these devices has been severely restricted by State Constitutional Amendment 14. Leghold traps are set in limited numbers in selected locations where tracks and other signs indicate coyotes or, in more limited circumstances, other target carnivores such as bobcats and red or gray fox, have been and will return. Scent lures are used to attract target species to the sets. When the target animal visits the set to investigate the scent, it generally steps on the trap pan which triggers the trap springs to close the jaws of the trap on the animals leg. WS uses pan-tension devices to exclude nontarget animals that weigh less than the target species, except in limited situations in which their use would preclude capture of the target species. The Colorado WS program uses traps with padded jaws which are perceived by most persons as being more humane. Traps are secured either by a chain and stake driven into the ground or by a chain and "drag" which hangs up in brush soon after the captured animal leaves the trap site. The target animal is held until the WS employee returns to check the trap. In most cases, the target animal is euthanized by shooting. Leghold traps can also be used in "blind set" locations where target animals are predicted to travel. Scent attractants are generally not used in these situations. Disadvantages of leghold traps are that they can capture nontarget animals and many members of the public perceive them as inhumane.

   Neck snares are primarily set in spots where coyotes or other target animals are expected to pass under net wire fences or on trails through narrow pathways in brush or in arroyos and narrow draws. The target animal is generally caught by the neck and dies relatively quickly by strangulation. Where pastures are enclosed by net wire fences, access points by coyotes that have dug under such fences can be readily identified, and snares can be used to selectively take depredating individuals. Disadvantages of neck snares are that some target animals are not killed quickly and nontarget species are sometimes caught and killed. The Colorado WS Program currently uses the Kelley snare (or equivalent) which appears to be superior in quickly killing coyotes (Phillips 1996).

   Foot snares are set for target mountain lions and bears and use tension devices so that lighter weight nontarget animals cannot generally trip them and be caught. Because black bears and mountain lions frequently return to kill sites, WS employees are generally highly successful in capturing offending animals by setting foot snares set next to fresh kills. Foot snares are generally checked daily because of their limited use.

   Cage traps are not practical for coyote capture because coyotes are generally too wary to enter them. Cage traps are sometimes practical for lion capture when foot snares are not

appropriate or legal to use, and culvert traps (a kind of cage trap) or the Beck cage trap ([redacted], pers. comm.) are sometimes used for capturing black bears.

Since coyotes are numerous throughout the analysis area, they are rarely if ever relocated and released because habitats in other areas are generally already occupied by resident coyotes. Translocation of wild mammals is discouraged by WS policy (ADC Directive 2.501) because of stress to the relocated animal and poor survival rates due to intraspecific strife with established resident animals of the same species, and because of difficulties in adapting to new locations or habitats. Relocation of captured problem mammals is also opposed by the American Veterinary Medical Association, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists because of the risk of disease transmission among wild mammals.

2. Ground-based shooting is selective for target species and may be used in conjunction with the use of spotlights and/or night vision equipment, decoy dogs, and predator calling. Shooting with rifles or shotguns is used to manage predator damage problems when lethal methods are determined to be appropriate. The animals are killed as quickly and humanely as possible.

3. Hunting dogs are used to trail and capture certain problem predators such as mountain lions, black bears, and bobcats. Dogs are also trained and used for coyote damage management to alleviate livestock depredation (Rowley and Rowley 1987, Coolahan 1990). Trained dogs are used primarily to locate coyotes and dens, to pursue coyotes to assist aerial hunting, or to decoy problem coyotes into shooting range.

4. Denning is the practice of locating coyote or red fox dens and destroying the pups by fumigation of the den with the gas cartridge or by excavation of the den and euthanasia of the pups (see the gas cartridge under chemical methods). Denning is only useful during the spring and early summer for a few months following the birth of pups. Denning has been shown to be highly effective in reducing or stopping lamb losses to adult pairs of coyotes during pup rearing (Till and Knowlton 1983). Effective den hunting generally requires good tracking conditions, and, although it is important in resolving certain individual coyote and red fox damage situations, it is not a major method of take in the analysis area. For example, in FY 1995, 50 coyote and red fox dens were taken. The use of denning gas cartridges has been severely restricted by State Constitutional Amendment 14.

5. Aerial hunting, the shooting of coyotes from fixed-winged aircraft or helicopters, is used on all lands where authorized and determined to be appropriate. Aerial hunting consists of visually sighting target animals and shooting them from the aircraft. Aerial hunting is virtually 100% selective for target species and is an important method of take for coyotes in the program. Aerial hunting during winter on summer sheep range 3-6 months prior to the arrival of sheep can be effective in reducing lamb losses to coyotes, and can reduce the amount of corrective PDM required during summer (Wagner 1997). Because of restrictions on ground capture methods and M-44s established by Amendment 14, increased use of aerial hunting for corrective and preventive damage management may become necessary to mitigate reduced effectiveness in resolving livestock depredation problems.

Chemical Management Methods:

All chemical pesticides used by WS are registered under FIFRA and administered by the EPA and CDA. WS personnel that use restricted use pesticides are certified as pesticide applicators by CDA

and are required to adhere to all certification requirements set forth in FIFRA and Colorado state pesticide control laws and regulations. The use of these chemical methods has been severely restricted by State Constitutional Amendment 14.

The following chemical methods may be used for PDM in the proposed action:

1. Sodium cyanide in the M-44 device. The M-44 cyanide ejector is a selective device for use in reducing wild canid (coyote, red fox, gray fox and feral dog) predation (EPA Reg. No. 56228-15), and also for protecting endangered species and for certain public health uses (Thomas 1986, Connolly 1988). The M-44 operating mechanism is a spring-loaded plunger. When a target canid pulls up on the device, the plunger is released and bursts or "pops" through a plastic capsule containing one gram of powdered sodium cyanide, propelling the powder into the animal's mouth. No explosive components are involved which is a common misconception among some persons unfamiliar with the device. M-44s are used for certain types of preventive and corrective PDM involving wild canid predators. WS personnel comply with the EPA label and 26 use restrictions (see USDA 1994, Appendix Q).

   Sodium cyanide is used for many purposes in the United States, including agricultural, pharmaceutical, mining applications, and for industrial dyes. Sodium cyanide is odorless when completely dry, but emits an odor when dampened, is strongly alkaline, and rapidly decomposes in the environment. In 1989, about 215 million pounds of sodium cyanide were used in North America, of which the WS Program nationwide used about 0.0001% (Knudson 1990). Sodium cyanide is freely soluble in water and is a fast acting nonspecific toxicant inhibiting cellular respiration. Low concentrations of cyanide have been detected and are frequently found in normal human blood (Feldstein and Klendshof 1954).

2. The gas cartridge is registered as a fumigant by the EPA (EPA Reg. No. 56228-21) and is comprised of 35% charcoal and 65% sodium nitrate. When ignited, the cartridge produces large amounts of carbon monoxide, a colorless, tasteless gas, which kills animals in the den. This technique is used where livestock killing can be attributed to food procurement for young (Till and Knowlton 1983, Till 1992), or to euthanize pups that are discovered in dens when adult parent coyotes have been removed in direct control operations.

4. DRC-1339 (3-chloro-4-methylbenenamine hydrochloride) is a slow acting avian toxicant that is rapidly metabolized and/or excreted. Because of the rapid metabolism of DRC-1339 in the body, it poses little risk of secondary poisoning to nontarget animals (Cunningham et al. 1979, Schafer 1981, Knittle et al. 1990). This compound is also unique because of its relatively high toxicity to most pest birds but low-to-moderate toxicity to most raptors and almost no toxicity to mammals (DeCino et al. 1966, Palmore 1978, Schafer 1981). Eagles are highly resistant to DRC-1339 -- tests with captive eagles showed they will survive 100 mg/kg doses which is about 6 - 20 times the lethal dose for ravens (Larsen and Dietrich 1970).

   DRC-1339 is registered with the EPA (EPA Reg. No. 56228-29) to control crows, ravens and magpies that prey on newborn livestock or on the eggs or young of wildlife species needing special protection. The DRC-1339 is incorporated into either whole egg or small meat baits (Larsen and Dietrich 1970). The feeding habits of the birds are observed before placing any treated baits in an area to reduce the risks to nontarget animals. Corvids (ravens, crows, magpies) are opportunistic feeders and by determining when and where the birds are feeding, the baits can be found more quickly and easily, thereby reducing the risks

to nontarget animals. Selective damage management can be applied because corvids learn to exploit a readily available food source and they will continue to focus on that source until the availability declines. DRC-1339 has not been used in recent years in the analysis area for protection of livestock but could be if the need arises.

A quantitative risk assessment approach to evaluating potential impacts of WS use of chemical methods concluded that no adverse effects are expected from use of any of the above chemicals (USDA 1994, Appendix P).

3.2.2 ALTERNATIVE 2 - No Federal WS Predator Damage Management

This alternative would consist of no federal involvement in PDM on private, state, local government, or tribal lands in the State -- neither direct operational management assistance nor technical assistance to provide information on nonlethal and/or lethal management techniques would be available from WS. Information on future developments in nonlethal and lethal management techniques that is generated by WS research branch would not be available to producers unless WS National Wildlife Research Center continued in operation and research results were disseminated by the Cooperative Extension Service and/or by state agencies. Producers would be left with the option to conduct their own predator damage control efforts. Producers, state agency personnel, or others could conduct PDM activities including the use of traps and snares, shooting, and any nonlethal methods they deem effective, under restrictions imposed by Amendment 14 and the interpretations established by the State Legislature.

3.2.3 ALTERNATIVE 3 - Technical Assistance Only

This alternative would not allow WS operational PDM on private, state, local government, or tribal lands in the State. WS would only provide technical assistance and make recommendations when requested. Producers, state agency personnel, or others could conduct PDM activities including the use of traps and snares, shooting, and any nonlethal methods they deem effective, under restrictions imposed by Amendment 14 and interpretations established by the State Legislature. Methods and control devices could be applied by persons with little or no training and experience although training and instruction provided by WS could mitigate this concern to a degree. Many producers are not able to devote the time necessary to become proficient in using lethal PDM methods. Lower experience levels, and thus proficiency, of persons conducting PDM could mean more effort and expenditures would be required to achieve the same level of problem resolution, and could result in greater impacts on nontarget species. Private persons would not be bound to follow mitigation measures that WS personnel must follow to avoid adverse impacts to T&E and sensitive species.

3.2.4 ALTERNATIVE 4 - Nonlethal PDM Only

This alternative would allow no use of lethal methods by WS as described under the proposed action. Producers, state agency personnel, or others could conduct PDM activities including the use of traps and snares, shooting, and any nonlethal methods they deem effective, under restrictions imposed by Amendment 14 and the interpretations established by the State Legislature.

A 1994 survey by NASS indicated that 36 percent of Colorado sheep producers employed specific nonlethal management or husbandry practices to control predator losses (CASS 1995b). Thirty percent reported using guard dogs, 20 percent utilized predator resistant fencing, and 10 percent used nonlethal frightening methods. Andelt (1992) reported that about 1/3 of sheep producers using guard dogs indicated that the use of dogs did not reduce their reliance on other predator control techniques or on predator control agencies. Therefore, nonlethal methods are an important part of the mix of current strategies used for meeting PDM needs in the State, but have not kept losses low enough to satisfy many producers.

3.2.5 ALTERNATIVE 5 - Nonlethal Control Required Before Lethal

This alternative would allow no use of lethal methods by WS as described under the proposed action until nonlethal methods have been employed in a given damage situation and found to be ineffective or inadequate. No preventive lethal control would be allowed. Producers and state agencies would still have the option of implementing their own lethal control measures without a requirement that nonlethal methods be conducted first. Amendment 14 and interpretations by the State Legislature have severely restricted the use of leghold and body gripping traps, snares, and chemical management methods for PDM. As stated in the description of Alternative 4, 36 percent of Colorado sheep producers employed specific nonlethal management or husbandry practices to control predator losses (CASS 1995b). Therefore, this alternative is not far removed from the current program in that nonlethal methods are already an important part of the mix of strategies used for meeting PDM needs in the State.

3.2.6 ALTERNATIVE 6 - Corrective Control Only When Lethal PDM Methods are Used

This alternative would require that livestock losses or other resource damage by predators must be presently occurring, or must have occurred recently enough to predict that the loss or damage will continue to occur in the near future, before any lethal PDM methods could be used. This alternative would not allow preventive lethal control actions (i.e., lethal control actions taken in anticipation of losses or damage in situations where losses have not occurred yet during the current production season or at the current location where the damage is expected). The difference between this alternative and Alternative 5 is that nonlethal methods would not necessarily be required to have been implemented in specific damage situations before implementing corrective lethal control. Producers and state agencies would still have the option of implementing their own lethal control measures.

3.3 Alternatives Considered But Not Analyzed in Detail With Rationale

Several alternatives were considered but not analyzed in detail. These were:

3.3.1 Compensation for Predator Damage Losses

The Compensation alternative would require the establishment of a system to reimburse persons impacted by all predator damage. The [redacted] currently compensates livestock producers and property owners for damage caused by mountain lions or black bears. No program for compensation of damage by other predators currently exists. This alternative was eliminated from further analysis because no federal laws currently exist to authorize WS to take such action. Under such an alternative, WS would not provide any direct control or technical assistance. Aside from lack of federal legal authority, analysis of this alternative in the FEIS indicates that the concept has many drawbacks (USDA 1994):

- It would require larger expenditures of money and manpower to investigate and validate all losses, and determine and administer appropriate compensation.
- Compensation would most likely be below full market value. It is difficult to make timely responses to all requests to assess and confirm losses, and many losses could not be verified.
- Compensation would probably reduce incentive to livestock owners to limit predation through improved animal husbandry practices and other management strategies.
- Not all producers would rely completely on a compensation program and lethal control of predators would most likely continue as permitted by state law.
- Compensation would not be practical for reducing threats to human health and safety for situations in which that is the primary need for PDM.

- Compensation programs cannot address problems where predation is a limiting factor on other desirable wildlife species that management agencies or tribes wish to increase.

Despite these limitations, the State could establish additional compensation programs for depredation losses which could potentially reduce requests for WS PDM service.

3.3.2 Bounties

Bounty systems involve payment of funds for killing predator species that cause economic losses. WS does not support this concept because:

- WS does not have the authority to establish a bounty program.
- Bounties are generally not as effective in controlling damage.
- Circumstances surrounding take of animals are completely unregulated.
- No process exists to prohibit taking of animals from outside the damage management area for compensation purposes.

3.3.3 Eradication and Long Term Population Suppression

An eradication alternative would direct all WS program efforts toward total long term elimination of coyotes and perhaps other predator species within large defined areas or across the entire analysis area.

In Colorado, eradication of native predator species is not a desired population management goal of state agencies. Eradication as a general strategy for managing predator damage will not be considered in detail because:

- WS opposes eradication of any native wildlife species.
- [redacted] and [redacted] oppose eradication of any native Colorado wildlife species.
- Eradication is not acceptable to most members of the public.
- The eradication of a native species or local population would be extremely difficult if not impossible to accomplish. In general, any local population reduction that is achieved through PDM actions is short term and immigration from surrounding areas generally causes repopulation of the area to some extent within several months (this does not mean that the PDM action was not successful in reducing or preventing losses, however).

Suppression would direct WS program efforts toward managed reduction of certain problem populations or groups. In areas where damage can be attributed to predation by localized populations of predators, WS can decide to implement local population suppression as a result of using the ADC Decision Model.

It is not realistic or practical to consider large-scale population suppression as the basis of the WS program. Typically, WS activities in the analysis area would be conducted on a very small portion of the area inhabited by problem species (as discussed in section 1.0).

3.3.4 The Humane Society of the United States (HSUS) Alternative

The HSUS has proposed an alternative that requires: 1) "permittees evidence sustained and ongoing use of nonlethal/husbandry techniques aimed at preventing or reducing predation prior to receiving the services of the ADC Program"; 2) "employees of the WS Program use or recommend as a priority the use of appropriate nonlethal techniques in response to a confirmed damage situation"; 3) "lethal techniques are limited to calling

and shooting and ground shooting, and used as a last resort when use of husbandry and/or nonlethal controls have failed to keep livestock losses below an acceptable level"; and 4) "establish higher levels of acceptable loss levels on public lands than for private lands."

The major components of this proposed alternative by the HSUS have been analyzed in detail in the alternatives contained in this EA and through court rulings. The HSUS alternative would not allow for a full range of IWDM techniques to resolve wildlife damage management problems. In addition, WS is authorized and directed to protect American agriculture and other resources. In Southern Utah Wilderness Society, The Wilderness Society et al. v. Hugh Thompson et al. U.S. Forest Service (U.S. District Court of Utah, Civil No. 92-C-0052A 1993) the court clearly states that, "The agency need not show that a certain level of damage is occurring before it implements an WS program. . . .Hence, to establish need for a WS, the forest supervisors need only show that damage from predators is threatened." Thus, there is judicial precedence indicating that it is not necessary to establish a criterion, such as percentage of loss of a herd to justify the need for WS action. Preventive and corrective control actions are therefore justified by a reasonable determination that damage by predators is threatened. The alternatives selected for detailed analysis in this EA encompass a reasonable range as required by NEPA and include some of the suggestions in the HSUS proposal. Thus, it is believed that inclusion of this alternative would not contribute new information or options for consideration and analysis that are not already being considered in this EA or that are available through IWDM as used by WS.

3.3.5 Lithium Chloride as an Aversive Agent

Lithium chloride has been tested as a taste aversion agent to condition coyotes to avoid livestock, especially sheep. Despite extensive research, the efficacy of this technique remains unproven (Conover et al. 1977; Sterner and Shumake 1978; Burns 1980, 1983; Horn 1983; Burns and Connolly 1980, 1985). Use of lithium chloride in parts of Canada was promoted at one time but has diminished due to reported lack of effectiveness (Conover and Kessler 1994). In addition, lithium chloride is currently unregistered as a pesticide by the EPA or CDA, and therefore cannot legally be used or recommended for this purpose.

3.3.6 Antifertility Agents to Control Coyote Populations

Antifertility agents to inhibit reproduction have been investigated in the past for coyote population control but were not found to be successful enough to recommend for operational use (Balser 1964; Linhart et al. 1968). Field research on the efficacy of coyote denning (removal of coyote pups from dens) in reducing sheep predation led to the hypothesis that the territorial defense behaviors of sterilized mated coyote pairs could be used to keep other sheep-killing coyotes away from lambing grounds (Till 1992; Till and Knowlton 1983). However, Shivik et al. (1996) found that coyotes did not avoid each other in areas where sheep were concentrated, and that at least one resident coyote followed a moving band of sheep into other coyotes' core areas (i.e., territories). Their study suggests that territoriality can break down in areas of high food resources, e.g., a lambing ground, and that the benefits of leaving territorial non-sheep-killing coyotes in such areas may be negligible because they may tolerate other depredating coyotes in their territories. Because their data were limited, they concluded further research is necessary to determine the prevalence of this “trespassing” phenomenon by coyotes in areas occupied by sheep. WS National Wildlife Research Center is investigating field applications of this strategy to determine if it can be useful. Immunocontraception, i.e., the use of vaccines that inhibit reproduction, is a potentially useful concept for coyote population suppression but is in the early stages of research and development (Miller 1995; L. Miller, Wildlife Research Biologist, NWRC, pers. comm. 1996). Environmental concerns with this strategy that still need to be addressed include safety of genetically engineered vaccines to humans and other wildlife. At this time, the methodology is somewhat controversial among wildlife biologists. In any event, no contraceptive agents are currently registered for use on coyotes and are thus not legal for use. Should any become registered in the future, WS could consider them among the methods to be used in the current program. Additional NEPA analyses deemed necessary at that time would be conducted.

3.3.7 Rely on Private Hunters and Trappers to Reduce Depredation on Livestock

It is sometimes postulated that private hunters and trappers could meet PDM needs by removing coyotes and other predators that are killing or would kill domestic livestock. Andelt (1996) in reviewing coyote removal strategies for reducing predation concluded that recreational harvest of coyotes likely has negligible effects on reducing livestock depredations. Furthermore, recreational trapping of coyotes has been stopped in Colorado by the passage of Amendment 14, which means there will most likely be a reduction in private coyote harvest. Private fur takers tend to operate where furbearer populations are high. When the only monetary benefit is fur value, they cannot make a profit by pursuing individual depredating coyotes in local areas where numbers are low. Also, furs are only prime in the winter months and are worthless at the time of year when depredation control is most often needed. Although some private trappers and hunters are highly skilled and use good equipment, many are less skilled and use less adequate equipment (e.g., traps that are too small to adequately hold coyotes), and can sometimes hamper professional PDM efforts by educating coyotes to control methods. They are generally less selective in taking target animals than WS employees. The typical strategy of private fur takers is to harvest the more easily captured animals in a population and to move on to other areas. Thus, offending animals or older and wiser coyotes that are more apt to be livestock depredators (see section 2.4.5) are more likely to be left in areas worked by private fur takers, which means depredation losses would often be about as severe as they would without private fur harvest. Plus, with the passage of Amendment 14, the pool of experienced private coyote trappers will likley diminish because recreational trapping is no longer allowed. For all of these reasons, private recreational harvest is not a reasonable alternative to professional PDM programs.

Under current state law and regulation, livestock producers can use private mountain lion and bear hunters or trappers to resolve depredation problems. However, bears may not be pursued by dogs for sport hunting purposes in Colorado because of a voter initiative passed in 1992. Therefore, the pool of private hunters that would be effective at taking bears (i.e., those with experienced trailing dogs) is probably limited. Private lion hunters are not always available when needed, and it is expected that, because many of the more experienced hunters earn income by guiding client sport hunters, they would be reluctant to take lions outside the sport harvest season which is the only period when they can earn such income. Private lion hunters in CO typically hunt lions when there is snow cover. Therefore, many do not have dogs adept at trailing lions under dry conditions in the summer which is when most depredation problems occur. For these reasons, the exclusive use of private lion and bear hunters/trappers is not a reasonable alternative to government PDM.

3.4 MITIGATION AND STANDARD OPERATING PROCEDURES FOR WILDLIFE DAMAGE MANAGEMENT TECHNIQUES

3.4.1 Mitigation in Standard Operating Procedures (SOPs)

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in Colorado, uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1994). Some key mitigating measures pertinent to the proposed action and alternatives that are incorporated into WS Standard Operating Procedures include:

- The ADC Decision Model which is designed to identify effective wildlife damage management strategies and their impacts.
- Traps and snares are not set within 30 feet of exposed carcasses to prevent the capture of scavenging birds. The exception to this is for the capture of mountain lion and black bear because the weight of these target animals allows foot snare tension adjustments to exclude the capture of smaller nontarget animals such as scavenging birds.

- Leghold trap pan-tension devices and foot snare trigger tension devices are used throughout the program to reduce capture of nontarget wildlife that weigh less than the target species (except in limited situations in which their use would preclude capture of the target species).
- Nontarget animals captured in leghold traps or foot snares are released unless it is determined by the WS employee that they will not survive. Release of large nontarget animals, such as mountain lions and black bears, may be preceded by sedation using chemical immobilizing agents administered by trained and certified WS personnel.
- Conspicuous, bilingual warning signs alerting people to the presence of traps, snares, and M-44s are placed at major access points when they are set in the field.
- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid adverse impacts to T&E species.
- All StateWS employees who use restricted chemicals are trained by program personnel or others who are experts in the safe and effective use of these materials.
- The M-44 sodium cyanide devices, as well as other pesticides, are used following EPA label requirements and in accordance with state and federal laws (see FEIS Appendix Q for label and use restrictions).

Some additional mitigating factors specific to the current program include:

- Management actions would be directed toward localized populations or groups of target predator species and/or individual offending members of those species. Generalized population suppression across the analysis area, or even across major portions of the analysis area, would not be conducted.
- WS uses PDM devices and methods for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1994, Appendix P).

3.4.2 Additional Mitigation specific to the issues

The following is a summary of additional mitigation measures that are specific to the issues listed in Chapter 2 of this document.

3.4.2.1 Effects on Target Predator Species Populations

- PDM activities are directed to resolving coyote and other predator damage problems by taking action against individual problem animals, or local populations or groups, not by attempting to eradicate populations in the entire area or region.
- WS kill is monitored to maintain the magnitude within levels desired or authorized by the State agencies that represent the State's interests in terms of managing or controlling affected species (See Chapter 4).

3.4.2.2 Effects on Nontarget Species Populations Including Threatened and Endangered Species and Sensitive Species

- WS personnel are highly trained and experienced to select the most appropriate method for taking problem animals and excluding nontarget animals.

- Leghold trap and foot snare pan-tension devices are used to reduce hazards to nontarget wildlife that weigh less than the target species (except in limited situations in which their use would preclude capture of the target species).
- Nontarget animals captured in leghold traps or foot snares are released unless it is determined by the WS employee that they will not survive.
- Release of large nontarget animals, such as mountain lions and black bears, may be preceded by sedation using chemical immobilizing agents administered by trained and certified WS personnel.
- WS has consulted with the USFWS regarding potential impacts of current methods on T&E species, and abides by reasonable and prudent measures established as a result of that consultation. For the full context of the Biological Opinion (B.O.) see the ADC FEIS, Appendix F (USDA 1994). WS has initiated or reinitiated formal section 7 consultation on several species not covered by the 1992 B.O. which were the Mexican spotted owl, southwestern willow flycatcher, Mexican gray wolf, jaguar, desert tortoise, and California condor. Of these, the Mexican spotted owl and the southwestern willow flycatcher are listed species in Colorado. Other special status species such as "candidate" species (species for which the USFWS has determined listing may be warranted but which are not yet formally listed), "Species of Special Concern", or "Sensitive Species" as identified by the USFWS or [redacted] that could conceivably be impacted by WS PDM actions are listed as follows with specific mitigating factors, mitigation measures, and standard operating procedures that serve to avoid adverse impacts:

  o Western burrowing owl (*Athene cunicularia hypugea*) (a Species of Special Concern). This species could potentially be taken by the use of den fumigants used to kill coyote or red fox pups in dens. As stated previously, denning gas cartridges are used to a low extent in the analysis area (no more than 50 dens were treated in the entire 49,000 $mi.^2$ of the analysis area in FY 1995). In addition, WS personnel are instructed to treat only active coyote or red fox dens (i.e., that show fresh tracks and signs of use) and to avoid treating burrows that show evidence of owl or other nontarget use. Coyotes and red fox do not generally tolerate other den inhabitants such as owls. Burrowing owls leave noticeable signs of their presence in the form of white droppings at burrow openings they are using. Thus, it is easy to avoid treating an owl burrow. This method may no longer be used on public lands and is severely restricted for use on private land as a result of the passage of State Constitutional Amendment 14.

  o Several raptor species, all Species of Special Concern -- Ferruginous hawk (*Buteo regalis*), northern goshawk (*Accipiter gentilis*), northern gray hawk (*Buteo nitidus maximus*) -- could potentially be taken by leghold traps. However, pan-tension devices that exclude nontarget animals that weigh less than target coyotes are used except for limited situations in which the use of such devices would preclude capture of the target species. In addition, WS policy requires that leghold traps be set no closer than 30 feet to an animal carcass to reduce the chance of capturing nontarget scavenging birds. A similar restriction is in place with use of M-44 devices to reduce risk to scavenging birds. No raptors were taken as nontargets in the analysis area in FY 1995. Thus, risks of nontarget raptor take are low. The use of leghold traps has been severely restricted by State Constitutional Amendment 14.

- o Swift fox (*Vulpes velox*) (federal candidate species) and kit fox (*Vulpes macrotis*) (listed by [redacted] as of "Special Concern"). Pan-tension devices are used on leghold traps set for coyotes which are effective in excluding most kit and swift foxes from capture by that method. Potential impacts on these species are addressed in Chapter 4.

- o Reptile species (lizard, snake, and turtle species listed by [redacted] as species of "Special Concern"). The only PDM method that could potentially affect reptile species is the gas cartridge used for fumigating coyote dens. However, this method is not used extensively in the analysis area by WS -- no more than 50 dens were treated in FY 1995. In addition, WS personnel are instructed to treat only active coyote dens (i.e., that show fresh tracks and signs of use). Coyotes and red fox are generally not tolerant of other den inhabitants such as snakes or other reptiles while they are actively using a den for pup-rearing. Treating only active dens should preclude impacting any sensitive reptile species with denning gas cartridges. The use of this method in Colorado has been severely restricted because of State Constitutional Amendment 14.

3.4.2.3 Impact of Coyote Removal on Prey Populations

- WS PDM activities are directed to resolving problems by taking action against individual problem animals, or local populations or groups. WS has agreements for PDM on about 21% of the land area of the analysis area and generally conducts PDM activities on less than 8% of the land area in any one year. It is anticipated that, under the current program, PDM actions would not be conducted on more than 10% of the land area of the analysis area in any one year in the reasonably foreseeable future. Thus, 90% of the land area of the analysis area, and the associated prey populations, would not be impacted by WS PDM activities.

3.4.2.4 Impact of WS predator damage management activities on recreational use of public lands.

- PDM will be conducted only when and where a need exists and is requested. WS PDM actions under the current program are limited in extent -- for example, WS conducted PDM on less than 17% of [redacted] land and 3% of [redacted] lands during FY 1995.
- Vehicle access will be limited to existing roads unless offroad travel is specifically allowed by the land managing agency.
- WS personnel follow guidelines as specified and agreed upon in WS Work Plans. These plans include delineation of areas where certain methods may not be used during certain time periods.
- PDM in [redacted] would conform to the [redacted].
- Should any of [redacted] existing [redacted] be officially designated as [redacted], PDM would be performed according to [redacted] and appropriate language contained in the [redacted] legislation.

3.4.2.5 Humaneness and selectivity of methods used by WS

- Research continues with the goal of improving the selectivity and humaneness of management devices.
- Leghold traps used in the Colorado WS program are required to have padded jaws to reduce leg injuries on trapped animals.
- Pan-tension devices are used on leghold traps and foot snares to exclude most nontarget animals that weigh less than the target species. An exception is if use of pan-tension devices would preclude capture of the target animal.
- Sodium cyanide used in M-44 devices kills target animals relatively quickly. Although perhaps not perceived as such by some members of the public because it involves the use of a "poison", this method probably results in less perceived suffering than use of capture/restraining devices used to take animals slated for lethal removal.
- WS personnel attempt to kill captured target animals that are slated for lethal removal as quickly and as humanely as possible. In most field situations, a shot to the brain with a small caliber firearm is performed.

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions concerning the issues discussed in Chapter 2. The chapter contains analyses of the environmental consequences of each alternative in relation to the issues discussed in Chapter 2. In addition, it addresses consistency with [redacted] land management plans.

4.1 Alternative Consistency with [redacted]

Actions taken on [redacted] lands must be consistent with [redacted]. In the [redacted], these are termed [redacted] or more commonly "[redacted]." On [redacted] lands, the equivalent documents are called [redacted]. If the selected Alternative is consistent with [redacted] no further action will be necessary by the [redacted] or [redacted] other than to participate in the coordinated development of WS work plans. The [redacted] are responsible for assuring specific actions taken in implementing the decision for this EA are consistent with the pertinent [redacted]. They meet this responsibility by reviewing WS work plans that have been prepared by WS.

Both the [redacted] have found WS PDM actions to be consistent with land management plans in Colorado, even when such activity is not addressed *per se* in the plans, in the completion of previous EAs and approval of WS Work Plans for wildlife damage management. Under the new MOUs with the [redacted], the land managing agencies rely on WS to determine PDM methods. None of the methods used by WS have been previously determined to be inconsistent with land use plans.

The following is a review of the consistency of the alternatives with each [redacted]:

4.1.1 [redacted]

This [redacted] states that "problem animals" will be controlled on a "case-by-case basis in cooperation with other agencies using methods directed at the offending animal." All WS PDM methods are directed at "offending animals" even in preventive control situations in which it is likely that some *nonoffending individuals* of target species in a local population will be removed. Thus, this review of the [redacted] indicates the proposed action and other alternatives involving WS conducting PDM would be consistent. The [redacted] determined that WS PDM actions are consistent with existing [redacted] in decisions rendered on four environmental assessments covering wildlife damage management on the [redacted]. The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals.

4.1.2 [redacted]

The [redacted] in the process of revision at the time of preparation of this EA and the [redacted] is expected to be revised in 1999. The MOU between WS and [redacted] requires [redacted] to provide for animal damage management activities to protect livestock, forest resources, and activities in [redacted]. Therefore, this [redacted] has been asked to make such provisions consistent with the MOU in cooperation with WS. Pending the [redacted] revisions, the [redacted] will determine consistency of WS PDM activities as proposed in WS Work Plans. The [redacted] determined that WS PDM actions are consistent with existing [redacted] in decisions rendered on two environmental assessments covering wildlife damage management ([redacted]). The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted].

4.1.3 [redacted]

The [redacted] briefly addresses wildlife damage management activities by stating that the [redacted] will cooperate by providing mitigation measures to protect national forest resources and that such mitigation measures emphasize protection of public safety, T&E or sensitive species, water quality, and other resource values. PDM activities are also mitigation measures in this context in the sense that they are conducted to protect certain resource values such as livestock grazing and public safety. Therefore, support for PDM by the [redacted] is consistent with this [redacted], as well as with the WS/[redacted] MOU. Other mitigation measures to prevent adverse impacts from PDM on other forest resources, including T&E and sensitive species, are described in this EA. The [redacted] determined that WS PDM actions are consistent with existing [redacted] in decisions rendered on a previous EA covering wildlife damage management (USFS 1992f). The [redacted] has determined that PDM, as proposed under Alternative 1(which now includes M-44 use) and Alternative 2, is consistent with the [redacted] (letter dated May 13, 1997 from [redacted]). A consistency determination by the [redacted] will need to be made during the WS Work Plan process for the [redacted] if Alternative 3, 4, 5 or 6 is selected.

4.1.4 [redacted]

The [redacted] states that animal damage will be managed in cooperation with appropriate agencies and cooperators to prevent or reduce damage to other resources and direct control toward preventing damage. This is consistent with the WS/[redacted] MOU. The [redacted] determined that WS PDM actions are consistent with existing [redacted] in decisions rendered on an environmental assessment covering wildlife damage management on the [redacted] ([redacted]). The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted] Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted].

4.1.5 [redacted]

This [redacted] addresses animal damage control in essentially the same way as the [redacted] and is consistent with the WS/[redacted] MOU. There have been no requests for WS PDM on this forest in recent years but such requests could be received and services provided under the current program or other alternatives, as allowed by the MOU and [redacted] policy. The FS agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted]

4.1.6 [redacted]

There have been no requests for WS PDM on the [redacted] in recent years but such requests could be received and services provided under the current program or other alternatives, as allowed by the MOU and [redacted] policy. The [redacted] for this [redacted] states that animal damage will be managed in cooperation with appropriate agencies and cooperators to prevent or reduce damage to other resources and that control should be directed toward preventing damage or removing only the offending animal. The [redacted] also states that denning or aerial hunting should be allowed only for the purpose of animal damage control and only if specified in the [redacted] WS Work Plan, only if conducted by authorized individuals, and, with regard to aerial hunting, only under permit issued by the State. All WS PDM methods are directed at "offending animals" even in preventive control situations in which it is likely that some *nonoffending individuals* of target species in a local population will be removed. Also, all aerial hunting by WS is authorized by state permit. The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted].

4.1.8 [redacted]

The [redacted] has two [redacted] in place covering the [redacted]. Neither of these [redacted] address or restrict wildlife damage management. In a previous EA ([redacted]) and in previous work plans covering PDM in the [redacted] of this District, the [redacted] found no inconsistencies with the [redacted]. The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted].

4.1.9 [redacted]

The [redacted] has three [redacted] in place covering the [redacted]. The [redacted] and [redacted] do not address or restrict wildlife damage management. The [redacted] does not address WS PDM with the exception of wording in a management action description for the promotion of black-footed ferret recovery which suggests that PDM agreements with APHIS be revised to include stipulations that would preclude "*unacceptable*" losses of nontarget wildlife "*including black-footed ferret.*" Section 4.2.2 in this EA contains analysis of nontarget and T&E species impacts from WS PDM and provides evidence that take of nontarget species is negligible to populations, has not resulted in the take of black-footed ferrets or any other T&E species, and is, therefore, not "unacceptable" from the standpoint of sound wildlife management. In a previous EA ([redacted]) and in previous work plans covering PDM in the [redacted], the [redacted] found no inconsistencies with the [redacted]. The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted].

4.1.10 [redacted]

The [redacted] has two [redacted] in place covering the Grand Junction and Glenwood Springs Resource Areas. Neither of these RMPs address or restrict wildlife damage management. In a previous EA ([redacted]) and in previous work plans covering PDM in the [redacted], the [redacted] found no inconsistencies with the [redacted]. The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted].

4.1.11 [redacted]

The [redacted] has three [redacted] in place covering the [redacted]. None of these address or restrict wildlife damage management. Although no EA currently exists covering PDM in this [redacted], the [redacted] has indicated in a draft EA that PDM actions as proposed herein are consistent with the [redacted]. The [redacted] agrees that PDM as proposed under Alternatives 1, 6 and 7 is consistent with the [redacted]. Alternatives 2, 3, 4, and 5 may not be consistent if PDM needs are not addressed or are met by private individuals; the selection of one of these Alternatives could result in the need for amendment of the [redacted].

4.2 ENVIRONMENTAL CONSEQUENCES

This section analyzes the environmental consequences using Alternative 1 (the current program) as the baseline for comparison with the other alternatives to determine if the real or potential impacts are greater, lesser or the same.

Table 4-5 at the end of this chapter summarizes a comparison of the issues and impacts to each Alternative, both positively and negatively.

The following resource values within the analysis area would not be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, and timber. These resources will not be analyzed further. Potential impacts to range resources from PDM are addressed in the section on prey population impacts.

Social and Recreational Concerns: Social and recreational concerns are discussed throughout the document and they are discussed in the FEIS (USDA 1994). The section on impacts on public use of public lands addresses these concerns.

Cumulative and Unavoidable Impacts: Cumulative and unavoidable impacts are discussed in relationship to each of the key wildlife species and the environmental impacts are analyzed in this chapter. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. Analysis of the WS "take" or kill of each species during FY 95, in combination with other mortality, indicates that cumulative impacts are not significant. It is not anticipated that the program will result in any adverse cumulative impacts to T&E or "sensitive" species, and PDM does not jeopardize public health and safety as shown by a formal risk assessment (USDA 1994, Appendix P).

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. The program in the analysis area produces very negligible impacts on the supply of fossil fuels and electrical energy.

Issues Analyzed in Detail

4.2.1 Impact of the WS predator damage management program on target species populations (coyote, mountain lion, black bear, red fox, raccoon, badger, and raven).

The species evaluated in this chapter were selected for analysis because they are taken by WS in response to livestock predation and public health and safety threats, and may be taken in the future for certain types of wildlife protection or enhancement. The "Magnitude" analysis for this EA follows a process similar to that described in the ADC FEIS (USDA 1994, Table 4-2). Magnitude is defined in the FEIS as ". . . a measure of the number of animals killed in relation to their abundance." Magnitude may be determined either quantitatively or qualitatively. Quantitative analysis is used whenever possible as it is more rigorous and is based on sustainable harvest levels, population estimates and harvest data. Qualitative analysis is based on population trends and harvest data or trends and modeling. Sustainable harvest levels were determined from research studies cited in the FEIS (USDA 1994, Table 4-2). "Other Take" includes the known fur harvest and sport harvest as determined by the [redacted]. "Total Take" is the sum of the WS take (kill) and the "Other Take."

Estimating wildlife population densities is not precise and often dynamic, and professional judgement is required to account for unknowns and variables, such as the ability of habitats to support populations and the extent of recruitment and immigration from surrounding populations. Therefore, assessments are based on conservative rather than liberal population estimates to better ensure that wildlife population impacts are within acceptable levels.

4.2.1.1 Alternative 1 - Continue the current PDM Program: (No Action).

Coyotes are the primary species responsible for damage in the analysis area and are therefore the major target species of the PDM program.

Coyote Population Information

Localized coyote populations could be affected, to one degree or another, by the current predator damage management program. However, the WS program currently has agreements to conduct operational PDM activities on only 21% of the land area of the analysis area. During any one year, WS actually conducts operational PDM activities on only a portion of these ranches -- about 8% of the analysis area was worked in FY 1995. Under the current program WS would likely not operate on more than 15% of the land area in any given year. Thus the impact of coyote removals on the coyote population would at most apply to 15% of the land area of the analysis area.

Average coyote densities are probably higher than historical levels because of the absence of competing or conflicting large predators with which they evolved. Specifically, wolves are thought to have suppressed coyote densities. Schmidt (1986) reported many citations where the removal of dominant wolves in the early years of this century led to increases in coyote abundance. Schmidt (1986) further suggests that coyote distribution has expanded into all areas north of Panama.

Another factor affecting seasonal coyote abundance in the State is the level of private harvest. Sport take and fur harvest of coyotes in Colorado is controlled by the [redacted]. The current sport harvest season for coyotes runs yearlong. Coyotes may be killed at any time to alleviate depredation.

To discuss the impacts of various environmental constraints and external factors on coyote populations and density, it is essential to understand the basic mechanisms that play a role in the coyotes' response to constraints and actions. The species' resilience, its ability to adapt, and its perseverance under adverse conditions is commonly recognized among biologists and rangeland managers.

Coyotes are highly mobile animals with home ranges that vary by sex and age of the animal and season of the year (Pyrah 1984, Althoff 1978, Todd and Keith 1976). The literature on coyote spatial organization is confusing (Windberg and Knowlton 1988, Messier and Barrette 1982). Individual coyotes generally are either territorial (i.e., with territories that are defended to a degree from other coyotes) or transient coyotes that tend to occupy the interstitial areas between territories (Windberg and Knowlton 1988). Transient coyotes are generally younger animals. Coyote population densities will vary depending on the time of year, food abundance, and habitat. Coyote home ranges may vary from 2.0 mi^2 to 21.3 mi^2 (Andelt and Gipson 1979, Gese et al.1988). Each occupied coyote territory may have several nonbreeding helpers at the den during whelping (Andelt 1985, Allen, et al. 1987, Bekoff and Wells 1982). Therefore, each defended coyote territory may have more than just a pair of coyotes. In situations where unusually abundant food sources are available such as cattle feed yard carcass dumps, wintering big game herd areas (e.g., elk at Jackson Hole, Wyoming) and sheep grazing areas, coyotes may congregate or otherwise tolerate other coyotes in their home ranges (Danner and Smith 1980, Camenzind 1978, Shivik et al. 1996). This suggests that coyote territoriality may break down in areas with abundant food sources.

Many authors have estimated coyote populations throughout the west and elsewhere (Hein and Andelt 1995, Gese et al. 1989, Pyrah 1984, Andelt 1985, Camenzind 1978, Knowlton 1972, Clark 1972, USDI 1979). Statewide or regional coyote population estimates for Colorado are not available from state agencies. However, an estimate suitable for purposes of analysis can be made using information on coyote biology and population dynamics and tempering the "reasonableness" of the

estimate by employing field observations of WS personnel. These types of estimates of carnivore populations based on a knowledge of the species, experience, and intuition may be as accurate as those based on more scientific methods (Fritzell 1987).

Determinations of absolute densities for coyote populations are frequently limited to educated guesses (Knowlton 1972). A compilation of density estimates from population studies showed that coyote density can range from 0.1 to 14.3 per mi.^{2} (USDI 1978). Knowlton (1972) estimated coyote densities west wide to average 0.5 to 1.0 per mi.^{2} over a large portion of the coyote's range. Studies in which densities were estimated in Colorado include:

1. Hein and Andelt (1995) estimated that average daily coyote density on the Rocky Mountain Arsenal near Denver, Colorado to be 1.8 per mi.^{2} but that a total population of 73 coyotes actually used the 27 mi.^{2} study area, suggesting a density as high as 2.7 per mi.^{2}.

2. [redacted]) reported a "pre-whelping" (i.e., just before pups are born in the spring) density estimate of 0.73 per mi.^{2} (0.29 coyotes per km.^{2}) at the [redacted] site in southeastern Colorado. The pre-whelping period is generally when populations are at their lowest during the annual cycle.

Coyote populations generally fluctuate annually with minimum populations occurring immediately before the birth of pups (whelping) in the spring, while maximum populations occur immediately after (post-whelping). Andelt (unpublished 1996) estimated coyote numbers in the state to be about 75,000 before whelping and about 200,000 immediately after whelping. These numbers represent average minimum and maximum yearly densities of 0.72 per mi.^{2} and 1.9 per mi.^{2}, respectively. The pre-whelping estimate was based on the [redacted] pre-whelping density estimate of 0.73 per mi.^{2} shown above. The post-whelping estimate was based on a projection calculated under reasonable assumptions of reproductive parameters (sex ratio of 1:1, 50% of females breed, and average litter size of 6 pups). Densities in the analysis area are probably about the same as the statewide average, based on personal observations of WS personnel. Therefore, it is reasonable to assume that the maximum population in the analysis area during a given year is about 93,000. In the interest of being conservative in this analysis, the coyote population in the analysis area is assumed to be only 2/3 of that number or about 63,000.

Coyote Population Impact Analysis

Data on the WS coyote kill for FY 1995 were used for this analysis. Table 4-1 displays the known information about coyote abundance and harvest during FY 1995, as well as projected maximum harvest/take levels that could reasonably be expected in the analysis area in any one year in the future. It is highly likely that State Constitutional Amendment 14 will result in reduced private harvest of coyotes in Colorado because of the measure's prohibition of or severe restriction on use of leghold traps and snares. Even if WS take increased, cumulative harvest will likely decline. WS take would likely not exceed 4,000 in any year under the current program, unless Amendment 14 results in the need to mitigate the loss of or additional restriction on ground capture methods by increasing preventive aerial hunting. Should that occur, then we expect WS take might increase somewhat but not to more than a total of 5,000 coyotes in any one year. This is supported by WS records showing the maximum *statewide* take by WS in any one year since 1990 was 3,753. Current private harvest as reported by the [redacted] was about 9,300 in the analysis area in 1995 and is expected to not exceed 18,000 in any one year in the future.

Connolly and Longhurst (1975) determined that, "If 75% of the coyotes are killed each year, the population would be exterminated in slightly more than 50 years." The authors further state that their model suggests that coyotes through compensatory reproduction can withstand an annual control level of 70%. To further demonstrate the coyote's recruitment (reproduction and immigration) ability, if 75% control occurred for 20 years, coyote populations would regain precontrol densities by the end of the fifth year after control was terminated. Furthermore, immigration, not considered in the Connolly/Longhurst model can result in rapid occupancy of vacant territories (Windberg and Knowlton 1988). While removing animals from small areas at the appropriate time can protect vulnerable livestock, immigration of coyotes from surrounding areas can replace the animals removed (Stoddart 1984).

Table 4-1. Fiscal Year 1995 and Greatest Expected Annual Coyote Take Data for the Western Colorado Analysis Area. Sustainable Harvest = 70%

	FY 1995	With Greatest Expected Future Take
Est. Population[1]	63,000	63,000
WS Take	2,278	5,000
Other Take	9,268	18,000
Total Take	11,546	23,000
WS Kill - % of Population	3.6%	7.9%
Other Take - % of Population	14.7%	28.6%
Total Take - % of Population	18.3%	36.5%

[1]Average during the year -- highest population during the yearly cycle is estimated to be about 93,000 (immediately after whelping).

Using standards established in USDA (1994) to determine the magnitude of total harvest impacts to the population, less than 70% annual removal of the coyote population results in a determination of "low magnitude." The data in Table 4-1 indicate that even under conservative assumptions of population size, current cumulative annual harvest of coyotes in the analysis area is less than 19% of the population. Even if private coyote harvest and WS take more than doubled, the cumulative impact would still be less than 40% of the population killed each year and would still result in a low magnitude impact rating.

Black Bear Population Impacts

Black bears can be found throughout the Rocky Mountains and west coast mountain ranges. Female black bears reach reproductive maturity at approximately 3.5 years (Kohn 1982; Graber 1981). Following a 7-8 month gestation period, they may have one to five cubs (Rogers 1976, Alt 1981, Kolenosky and Strathearn 1987). Juvenile black bear annual mortality ranges between 20 and 70 percent, with orphaned cubs having the highest mortality (Kolenosky and Strathearn 1987). Natural mortality in adult black bears is approximately 10-20 percent (Fraser et al. 1982). Reported densities vary between 0.3 and 3.4 per mi.^{2}, depending on habitat (Rogers 1976). Beck (1991) reported black

bear density to be 1 per 5.6 km.^{2} (1 per 2.2 mi.^{2}) on a 450 km.^{2} (174 mi.^{2}) study area in west central Colorado. In areas where there are significant stands of oakbrush, densities are about 1 bear per mi.^{2}; in forested habitats they are probably about 1 bear per 5 mi.^{2}; in least productive habitats of lodgepole pine and douglas -fir forests, densities are probably around 1 bear per 10 mi.^{2} ([redacted], pers. comm. 1997).

Black bear harvest by sport hunters in western Colorado was 357 in the 1994-95 season as reported by [redacted]. WS killed 31 bears in the analysis area in FY 1995. Bears killed by or under permit from [redacted] for depredation purposes in the analysis area, other than those killed by WS, totaled 109 in 1995. Thus cumulative take from all known sources in the analysis area was nearly 500 in 1995. WS take was thus only about 6% of total take authorized under state law.

Colorado state law vests the responsibility for determining management direction of black bears with the [redacted] (CRS Title 33), and, with respect to depredation management, with the [redacted] (CRS 35-40-101). Therefore, both the [redacted] and the [redacted] represent the collective desires of the people of the State with regard to black bear management. The [redacted] has established in its Long Range Plan that its foremost aim is to protect and enhance the viability of all of Colorado's wildlife species, including black bears ([redacted] 1994). WS take of black bears has been minor compared to sport and other depredation take allowed by the [redacted] and is expected to remain at less than 15% of total take. The [redacted], as the agency with management responsibility, could impose restrictions on sport harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. The Colorado WS program will strive to assure that its activities are in accordance with any management plan developed by the responsible state agencies. This should assure that cumulative impacts on the black bear population are within those desired by the State.

Mountain Lion Population Impacts

The mountain lion has an extensive distribution across North America including Colorado. It is the largest member of the cat family in Colorado, and is known by several other names, including cougar, panther, puma, and catamount. Mountain lions inhabit many habitat types from desert to alpine environments, indicating a wide range of adaptability. They are very closely associated with deer and elk because of their dependence upon these species for food.

Female mountain lions typically breed for the first time between 22 and 29 months of age (Ashman et al. 1983) but initial breeding may be delayed until a territory has been established (Hornocker 1970). Mountain lions breed and give birth year-round but most births occur during late spring and summer following about a 90-day gestation period (Ashman et al. 1983, Seidensticker et al. 1973, Robinette et al. 1961). One to six offspring per litter is possible, with an average of two to three young per litter.

Mountain lion density is primarily dependent on prey availability and the social tolerance for other mountain lions. Prey availability is directly related to prey habitat quality that directly influences mountain lion nutritional health, and reproductive and mortality rates. Studies indicate that as available prey increases, so do mountain lion populations, and since mountain lions are territorial animals, the rate of population increase tends to decrease as mountain lion density increases. As mountain lion population density increases, mortality rates from intraspecific (i.e., between or among members of the same species) fighting and cannibalism also increase, and/or mountain lions disperse into unoccupied or less densely occupied habitat.

Relatively few mountain lions are killed by WS in the analysis area under the current program -- only 7 were killed in FY 1995. It is expected that no more than 25 would be killed by WS in the

analysis area in any one year. Private sport harvest in the area was 248 in 1995 (from [redacted] cougar harvest survey reports). The number of lions killed by or under permit from [redacted] for depredation purposes (i.e., take that did not involve WS) was 25 in 1995. Thus, the total take of lions in the area was 280 in 1995. WS take was less than 3% of the total.

Similar to the situation for black bears, Colorado state law vests the responsibility for determining management direction of mountain lions with the [redacted] (CRS Title 33), and, with respect to depredation management, with the [redacted] (CRS 35-40-101). Therefore, both the [redacted] and the [redacted] represent the collective desires of the people of the State with regard to mountain lion management. As stated previously, the [redacted] has established in its Long Range Plan that its foremost aim is to protect and enhance the viability of all of Colorado's wildlife species, including mountain lions ([redacted] 1994). WS take of mountain lions has been minor compared to sport and other depredation take allowed by the [redacted] and is expected to remain at less than 10% of total take. The [redacted], as the agency with management responsibility, could impose restrictions on sport harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. The Colorado WS program will strive to assure that its activities are in accordance with any management plan developed by the responsible state agencies. This should assure that cumulative impacts on the mountain lion population are within those desired by the State.

Red Fox Population Information and Impacts Analysis

The red fox is common to many areas of the state and is found in open woodlands, pastureland, riparian and agricultural lands, the margins of urban areas, and in mountain meadow, alpine and forest edge areas in Colorado (Fitzgerald 1992). WS target take of red fox is for the purpose of resolving problems of depredation on lambs. In 1995, WS killed 169 target and 1 nontarget red fox. Private hunter and trapper harvest was 788 ([redacted] 1995) bringing cumulative kill to 957.

Published estimates of red fox densities have been as high as 50 per mi^2 (Harris 1977, MacDonald and Newdick 1982, Harris and Rayner 1986) where there was an abundant food supply; in Ontario, population densities were estimated at 2.6 per mi^2 (Voigt 1987). Others reported densities of fox dens at 1 per 3 mi^2 (Sargeant 1972). To be conservative, the red fox population in the analysis area is assumed to be only 0.1 per mi^2 which means the estimated population is about 4,900. An allowable harvest for red fox is 70% (USDA 1994) of the total population or 3,430 per year. Under these conservative assumptions, cumulative take was only about 20% of the population, or about 1/4 of the allowable harvest level. Cumulative impacts were therefore of low magnitude.

Raccoon Population Information and Impact Analysis

The raccoon is a member of the family *Procyonidae* that includes ringtails, and coatis in North America. Raccoons are one of the most omnivorous of animals, feeding on carrion, garbage, birds, mammals, insects, crayfish, mussels, other invertebrates, a wide variety of grains, various fruits, other plant materials, and most or all foods prepared for human or animal consumption (Sanderson 1987). In Colorado, raccoons are most common in lowland riparian habitats, irrigated croplands, and urban areas of the eastern plains and foothills (Fitzgerald 1992). Using the range map in Armstrong (1972), it appears that about 15% of the analysis area is occupied range.

Sanderson (1987) stated that absolute population densities of raccoons are difficult if not impossible to determine because of the difficulty in knowing what percentage of the population has been counted or estimated, and the additional difficulty of knowing the size of the area being used by the raccoons. Twichell and Dill (1949) reported one of the highest densities, with 100 raccoons removed from a winter tree den area on 101 acres of a waterfowl refuge in Missouri during winter. Other

studies have found raccoon densities that ranged from 9.3 per mi^2 to 80 per mi^2 (Yeager and Rennels 1943, Urban 1970, Sonenshine and Winslow 1972, Hoffman and Gottschang 1977, and Rivest and Bergeron 1981). A highly conservative estimate of the raccoon population in occupied range within the analysis area would be a density of 9 per mi^2 or more than 60,000.

The allowable harvest level for raccoons found in USDA (1994) was established at 49% of the total population. WS killed 11 target and no nontarget raccoons in the analysis area during FY 1995. Private take by hunters and trappers was 477, bringing cumulative take to 488. This cumulative take constituted less than a 1% harvest rate under the above conservative assumption of population size. Total harvest could reach about 30,000 per year before any concerns about viability of populations would be raised. The magnitude of impact is low and is expected to remain so.

Badger Population Information and Impact Analysis

Within the analysis area, badgers can cause damage to pasture and agricultural lands, and their burrows can result in damage to agricultural equipment or injuries to livestock. Badgers have also been identified as a potential predator that could adversely affect black-footed ferret reintroductions. WS occasionally takes badgers as a target species, and they are sometimes captured as a nontarget species when attempting to capture coyotes in leghold traps.

Little is known about badger densities other than a few intensely studied populations. Hein and Andelt estimated a minimum density of 0.7 badgers per mi^2 on the Rocky Mountain Arsenal near Denver, Colorado. Andelt (pers. comm. 1997) felt this density was high because of the relatively high prey density on the study area. Lindzey (1971) estimated that the Curlew Valley on the Utah-Idaho border supported 1 badger per mi^2. Messick and Hornocker (1981) believed that the Snake River Birds of Prey Natural Area and adjacent lands in southwestern Idaho supported badger densities of up to 13 per mi^2. Armstrong (1972) shows the entire state of Colorado to be occupied range. For purposes of this analysis we will conservatively assume the badger density to be 0.3 per mi^2 throughout the analysis area, which would allow for a conservative population estimate of about 14,000 badgers.

The ADC FEIS stated that an allowable harvest level was not available for badger populations (USDA 1994). Boddicker (1980), however, suggested that badger populations can safely sustain an annual harvest rate of 30-40%. The [redacted] reported 60 badgers taken by private trappers and hunters in the analysis area during the 1994/95 season. WS killed only 3 badgers in the analysis area during FY 95, all as nontarget animals. Two other nontarget badgers were released after being captured. The combined private trapping harvest and WS harvest of badgers within the analysis area was therefore less than 70 badgers in 1995, or less than 1% of the estimated population. Cumulative harvest/take could increase about 60-fold before reaching the lower end of the suggested range of sustainable harvest levels shown above. Therefore, cumulative impacts on badger populations in the analysis area are expected to remain low.

Raven Population Information and Impact Analysis

The common raven, common crow, and black billed magpie are the most well known species in the family *Corvidae*. The common raven is widely distributed throughout the Holarctic Regions of the world including Europe, Asia, North America and extends well into Central America (Goodwin 1986). Ravens generally are residents, but some wandering and local migration occurs with immature and nonbreeding birds (Goodwin 1986). Immature birds, which have left their parents, form flocks with nonbreeding adults; these flocks tend to roam and are loose-knit and straggling (Goodwin 1986). The raven is an omnivorous species known to feed on carrion, crops, eggs and

birds, small mammals, amphibians, reptiles, fish, and insects (Nelson 1934). Larsen and Dietrich (1970) noted that it is generally acknowledged that ravens are responsible for lamb mortality on spring lambing ranges.

Ravens are seen year-round by WS personnel across the analysis area, suggesting they are very common. Knight and Call (1981) summarized a number of studies on common raven territories and home ranges in the west. Nesting territories ranged in size from 3.62 mi^2 to 15.7 mi^2 in Wyoming and Oregon and home ranges varied from 2.53 mi^2 to 3 - 6 mi^2 in Utah and Oregon. [redacted] found nest densities of one per 1.7 mi^2 in their [redacted], California study.

Data from the Breeding Bird Survey show a steady increase in breeding numbers of ravens nationwide between 1966 and 1994. The annual index approximately doubled in that time period. These data clearly indicate that human caused mortality has not resulted in any declines in raven numbers in either the short or long term in the nation and take by WS under the current program is not expected to reach significant levels. WS take of ravens for PDM has not occurred in the analysis area or in the statewide PDM program in recent years with the exception of 2 ravens shot for depredation purposes during FY 1995 under permit from the USFWS.

It is expected that the level of take for ravens, crows and magpies will remain low in the analysis area under the current program.

4.2.1.2 Alternative 2 - No Federal WS PDM and Alternative 3 - Technical Assistance Only.

Both Alternative 2 and Alternative 3 would result in no WS operational programs and the potential effects would be similar, therefore they will be analyzed together. Some type of PDM would most likely be conducted by livestock producers or by various State or local governmental agencies. The impacts on wildlife populations may vary considerably from those described in Alternative 1 because of the potential for improper or inappropriate selection and use of control methods, emphasis on lethal methods, duplication of effort and possible misuse of pesticides.

A thorough review of the potential impacts of these two alternatives can be found in the ADC FEIS (USDA 1994) in which the biological impacts of the "No ADC" alternative were summarized as follows:

> "Taking of target species would be more variable (i.e., lower for some species in some areas and higher in other areas). However, taking of nontarget species probably would be higher, and for some small populations, could become biologically significant. This would be especially important if the species was threatened or endangered. Species diversity could be significantly affected. The indirect impacts on nontarget species affected through the food chain or by uncontrolled releases of toxicants into the environment also could increase. In some areas, many people could be using chemical methods. Misuse of chemicals could increase and thereby adversely affect certain wildlife populations and public health and safety."

How PDM would be handled without WS can only be speculated, but several probable effects can be identified. State agencies and private individuals would not be subject to the same restrictions and procedures with which WS must comply, such as the requirement to comply with NEPA, certain provisions of the Endangered Species Act, and to coordinate and plan in cooperation with the [redacted]. It is assumed that a State agency such as [redacted] or [redacted] would administer a program, but there would be an interim period while funds were secured and an organization was established where livestock producers would have limited or no assistance and would conduct their

own PDM by whatever means available to them. Any State assumption of PDM could divert resources from other wildlife management activities and State functions. As indicated by USDA (1994), frustration of some livestock producers could lead to illegal pesticide use with unknown adverse impacts on target species populations.

Alternatives 2 and 3 could have greater adverse impact on target species populations than the current program although, in general, the total kill of most predator species would probably not exceed sustainable harvest levels.

4.2.1.3 Alternative 4 - Nonlethal WS PDM Only

Under this alternative, WS would not use any lethal PDM methods. Most nonlethal methods are not practical for WS personnel to use and must be employed by livestock producers or property owners. Therefore, this alternative would be similar to Alternative 3 except that the technical assistance provided would not recommend any lethal methods. WS would be restricted to a few nonlethal methods practical for its personnel to employ such as scaring devices.

WS would no longer kill any target predator species under Alternative 4 which means impacts of WS activities on target species populations would be less than under Alternative 1. However, it is anticipated that many cooperating livestock producers would drop out of the current program because of reduced effectiveness. Private kill of target and nontarget species would probably increase. It is possible that frustration by some of these individuals would lead to illegal pesticide uses with unknown adverse impacts on target species populations. Impacts on target species could be greater, less than, or approximately the same as the current program depending on the level and manner of private PDM. However, it is doubtful that Alternative 4 would result in a total kill of most target predator species that would exceed sustainable harvest levels.

4.2.1.4 Alternative 5 - Nonlethal Required Before Lethal Control

WS PDM under Alternative 5 would be restricted in its use of lethal control methods and would likely have to divert resources away from conducting operational PDM toward verifying and documenting use of nonlethal methods. As a result, WS impacts to target and nontarget species populations would probably be less than those that would occur under the current program.

WS coyote, mountain lion, and black bear take under Alternative 5 could be less than under Alternative 1. It is anticipated that some cooperating livestock producers would drop out of the current program because of reduced effectiveness. Private kill of target and nontarget species would probably increase. It is possible that frustration by some of these individuals would lead to illegal pesticide uses with unknown adverse impacts on target species populations. Impacts on target species could be greater, less than, or approximately the same as the current program depending on the level and manner of private PDM. It is doubtful that Alternative 5 would result in a total kill of most target predator species that would exceed sustainable harvest levels.

4.2.1.5 Alternative 6 - Corrective Control Only When Lethal PDM Methods are Used

Under Alternative 6, lethal control of predators by WS would only be initiated following confirmed ongoing predation of livestock or other resources. This is presently the case for mountain lion and black bear depredation under the current program (Alternative 1).

WS coyote kill under Alternative 6 would be less than under Alternative 1, while mountain lion and black bear take would be the same as Alternative 1. It is anticipated that some cooperating livestock

producers would drop out of the current program because of a real or perceived reduction in effectiveness. Private kill of target and nontarget species would probably increase. It is possible that frustration by some of these individuals would lead to illegal pesticide uses with unknown adverse impacts on target species populations. Impacts on target species could be greater, less than, or approximately the same as the current program depending on the level and manner of private PDM. It is doubtful that Alternative 6 would result in a total kill of most target predator species that would exceed sustainable harvest levels.

4.2.2 Impact of WS predator damage management on nontarget species populations, including Threatened, Endangered and sensitive species.

Table 4-2 shows nontarget animals taken by the WS program in the analysis area during FY 1995. This was the first complete year that the WS Management Information System was used in Colorado and is therefore the only year used for analysis purposes.

Table 4-2. Nontarget animals taken by WS predator damage management activities in the Western Colorado Analysis Area in FY 1995.

Species	Number	Method	Disposition	Total Number Killed	Total Number Released
Badger	3 1 1	Neck snare Neck snare Leghold trap	Killed Freed Freed	3	2
Black bear	1	M-44	Killed	1	0
Bobcat	1	Neck snare	Killed	1	0
Fer./FR[1] cat	1	Cage trap	Freed	0	1
Fer./FR[1] dog	3 1 2 2	M-44 Foot snare Neck snare Leghold trap	Killed Freed Killed Freed	5	3
Gray fox	2 2	M-44 Leghold trap	Killed Killed	4	0
Red fox	1	M-44	Killed	1	0
Jackrabbit	2	Neck snare	Killed	2	0
Mountain lion	1	Neck snare	Killed /[redacted]	1	0
Porcupine	2	Neck snare	Killed	2	0
Rabbits, other	1	Neck snare	Freed	0	1

Raccoon	1 1 1 1	M-44 Neck snare Neck snare Cage trap	Killed Killed Freed Freed	2	2
Striped skunk	2 1	M-44 Neck snare	Killed Killed	3	0
TOTAL	29			22	7

[1] Feral and/or free-ranging

4.2.2.1 Alternative 1. - Continue the Current Program (No Action):

As shown in Table 4-2, lethal nontarget take in the analysis area was low for all species (<25). It is not expected to increase appreciatively under the current program. Because State Constitutional Amendment 14 has severely restricted use of less selective methods (leghold and body gripping traps, snares, or toxicants) more selective methods (aerial hunting, shooting, cage traps and dogs) will probably be used which means that fewer nontargets would be taken by the current program. All of the native species taken are relatively common in the State, and impacts on populations are minor at the level of lethal take imposed by WS. Feral/free-ranging dogs and cats are not part of the mix of native wildlife species, and most wildlife biologists agree that they should not be allowed in wildlife habitat areas because of negative impacts on native wildlife. WS take of feral/free-ranging dogs and cats is minor when compared to the numbers killed by municipal animal control and humane organizations each year. No T&E species or Sensitive species as discussed in Chapter 2 have been taken by WS. The following discussion presents analysis of cumulative impacts on species that are more likely to be taken by WS PDM activities, in the event that they are killed in greater numbers in the future.

Gray Fox Population Information and Impact Analysis

Gray fox inhabit brushy and wooded areas, and have omnivorous feeding habits, eating birds, rabbits, eggs, insects, carrion, fleshy fruits, and grains. Gray fox reach reproductive maturity at about 1 year of age and litters frequently average four pups after a 2-month gestation period (Fritzell 1987). Published estimates of density vary from 3.1 to 5.4 per mi^2 (Fritzell 1987). Gray fox have been reported to live up to 15 years, but annual mortality may be as high as 60% (Seton 1929, Lord 1961).

Occupied gray fox range is primarily restricted to the western 1/3 of the analysis area (Armstrong 1972). No estimates of gray fox populations for Colorado are available. Using the low end of the density estimates for gray fox shown above, a conservative estimate of the gray fox population for the analysis area would be about 50,000. However, in the interest of being conservative for purposes of impacts analysis, it is assumed herein that gray fox density in the area is only one fifth of the lowest published density of 3.1 per $mi.^2$ cited above. Thus, a highly conservative minimum estimate of the gray fox population in the analysis area would be about 10,000.

WS only killed 4 gray fox in the analysis area in FY 1995. Private harvest was only 9 gray fox in 1995 ([redacted] 1995). Cumulative take was only 0.1% of the estimated population. The maximum private harvest in the state since 1982 was about 1,300 (Fitzgerald 1992). It is expected that no more than 100 gray fox would be killed by WS in any one year under the current program, and that, because of Amendment 14, annual private harvest of gray fox will no longer exceed 1,000 (300 less than the maximum annual harvest shown above). This would bring potential cumulative lethal take to 1,100 gray fox per year, or 11% of the estimated population.

The sustainable harvest level for gray fox determined in USDA (1994) is 25% of the total population. Even under the conservative assumptions contained in this analysis, cumulative take in the analysis area would be less than one half of the 25% sustainable harvest level. Thus, the magnitude of cumulative impact for the current program is determined to be low.

Striped Skunk Population Information and Impact Analysis

The striped skunk is the most common member of the *Mustelidae* family. Striped skunks have increased their geographical range in North America with the clearing of forests. However, there is no well-defined land type that can be classified as skunk habitat (Rosatte 1987). Striped skunks are capable of living in a variety of environments, including agricultural lands and in urban areas. Skunks primarily cause odor problems around homes, transmit diseases such as rabies to humans and domestic animals, and sometimes prey on poultry. Skunks are primarily targeted to reduce these types of problems and control actions for this purpose are a minor part of WS activities in the analysis area.

The home range of striped skunks is not sharply defined over space and time, but is altered to accommodate life history requirements such as raising young, winter denning, feeding activities, and dispersal (Rosatte 1987). Home ranges reported in the literature averaged between 0.85 to 1.9 per mi^2 for striped skunks in rural areas (Houseknecht 1971, Storm 1972, Bjorge et al. 1981, Rosaette and Gunson 1984). The range of skunk densities reported in the literature was from 0.85 to 67 per mi^2 (Jones 1939, Ferris and Andrews 1967, Verts 1967, Lynch 1972, Bjorge et al. 1981). Many factors may contribute to the widely differing population densities. Habitat type, food availability, disease, season of the year, and geographic area are only but a few of the reasons (Storm and Tzilkowski 1982).

There are no population estimates or trend information available for striped skunks in the state. Therefore, the lowest reported density estimates from the literature will be used to estimate skunk populations. Using this information, the estimated population in the analysis area is conservatively estimated to be about 40,000 striped skunks.

WS killed no striped skunks as target animals and 3 as nontargets in the analysis area in FY 95. Private harvest was 101 ([redacted] 1995). Thus, cumulative take was 104. A sustainable harvest level has not been determined for striped skunks (USDA 1994). However, cumulative take is only 0.3% of the conservatively estimated population which is believed to be of low impact.

Other Nontarget Species

All other nontarget species taken (as shown in Table 4-2) are either nonnative (e.g., feral/free-ranging dogs and cats) or are common and not classified as threatened or endangered under either state or federal law and are taken in low enough numbers (< 20 per year of each species) that population impacts analysis is unnecessary. Removal of feral and/or free-ranging dogs and cats is considered to be environmentally beneficial because these species are not part of the mix of native wildlife in the analysis area and can themselves have adverse impacts on native wildlife. WS take of these species is minor compared to the numbers euthanized by humane organizations and animal control agencies.

T&E and Sensitive Species

T&E species that are federally listed, or are proposed for listing, as occurring or that could occur in the analysis area are:

Mammals:
- Black-footed ferret (*Mustela nigripes*)

Birds:
- Bald eagle (*Haliaeetus leucocephalus*)
- American peregrine falcon (*Falco peregrinus*)
- Mexican spotted owl (*Strix occidentalis lucida*)
- Whoopingcrane (*Grus americana*)
- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- Eskimo curlew (*Numenius borealis*)

Fish:
- Colorado Squawfish (*Ptychocheilus lucius*)
- Greenback cutthroat trout (*Oncorhynchus clarki stomias*)
- Razorback sucker (*Xyrauchen texanus*)
- Bonytail chub (*Gila elegans*)
- Humpback chub (*Gila cypha*)

Invertebrates:
- Uncompahgre fritillary butterfly (*Boloria acrocnema*)

Plants:
- Clay-loving wild buckwheat (*Eriogonum pelinophilum*)
- Knowlton's cactus (*Pediocactus knowltonii*)
- Uinta Basin hookless cactus (*Sclerocactus glaucus*)
- Ute ladies'-tresses orchid (*Spiranthes diluvialus*)
- Osterhout milkvetch (*Astragalus osterhoutii*)
- Mancos milk-vetch (*Astragalus humillimus*)
- North Park phacelia (*Phacelia formosula*)
- Penland beardtongue (*Penstemon penlandii*)
- Mesa Verde cactus (*Sclerocactus mesaverde)*
- Penland eutrema (*Eutrema penlandii*)
- Dudley Bluff's bladderpod (*Lesquerella congesta*)
- Dudley Bluff's (Piceance) twinpod (*Physaria obcordata*)

WS has consulted with the USFWS regarding potential impacts of current methods on T&E species, and abides by reasonable and prudent alternatives (RPAs) and measures (RPMs) established in the 1992 Biological Opinion (B.O.) that resulted from that consultation. For the full context of the B.O. see the ADC FEIS, Appendix F (USDA 1994). WS has initiated or reinitiated formal section 7 consultation on several species listed as occurring or potentially occurring in the analysis area that were not covered by the 1992 B.O. (Mexican spotted owl and southwestern willow flycatcher). WS will abide by any RPAs or RPMs that are established as a result of that consultation. The above consultations, as well as any future Section 7 consultations that are conducted to evaluate program activities, address the potential for all adverse impacts, which includes all forms of "take" as defined by the ESA.

The only species in the above list that were not covered by the 1992 B.O. or the pending formal section 7 consultation are two plants (Ute ladies'-tresses orchid and Penland eutrema). In the 1992

B.O., the USFWS did not concur with "may affect" determinations for any plant species with regard to WS methods. Therefore, we have determined that PDM activities will have no effect on these two plant species.

Use of DRC-1339 on egg and meat baits for control of ravens, crows and magpies was not covered in the 1992 B.O. Because of potential concerns regarding possible effects on bald eagles, further Section 7 consultation has been initiated for this method, and WS will abide by any RPAs or RPMs that are established to avoid jeopardy. However, potential impacts on eagles from this method are low (USDA 1994, Appendix P; see Chapter 3, section 3.3.2.2 for more discussion). This method has not been used by WS in Colorado but could under the current program.

"Sensitive" species and "Special Status" species are designated as such by federal land managing agencies for purposes of providing special habitat management considerations. In general, they include T&E species, species that are candidates for T&E listing, and species classified as endangered under State law (Colorado Revised Statutes 33-2-105). Special status species that have been designated in the analysis area include the above mentioned T&E and the following federal candidate species:

> Boreal toad (*Bufo boreas boreas*), Mountain plover (*Charadrius montanus*), Swift fox (*Vulpes velox*), Debeque phacelia (*Phacelia submutica*), Parachute beardtongue (*Penstemon debilis*), White River beardtongue (*Penstemon scariosus* var. *albifluvis*), Colorado butterflyweed (*Gaura neomexicana* ssp. *coloradensis*), Sleeping Ute milk-vetch (*Astragalus tortipes*), Graham beardtongue (*Penstemon grahamii*).

Other sensitive species identified by the [redacted] include the tiger salamander (*Ambystoma tigrinum*), northern leopard frog (*Rana pipiens*), American marten (*Martes americana*), and fisher (*Martes pennanti*).

WS PDM actions have not taken or otherwise affected any of these species in the analysis area. WS actions will not affect amphibian species. Potential impacts on martens and fishers are addressed below.

The [redacted] has identified a number of species of "Special Concern" that could occur in the analysis area including 34 bird species (7 of which are federally listed T&E species); 25 mammals (9 bat species, 4 rodent species, the Colorado hog-nosed skunk (*Conepatus leuconotus*), the river otter (*Lutra canadensis*), the grizzly bear (*Ursus arctos*), wolverine (*Gulo luscus*), lynx (*Lynx canadensis*), gray wolf (*Canis lupus*), kit fox, swift fox, and gray fox, and jaguar (*Panthera onca*) (proposed for federal listing); 5 lizards, 10 snakes, and 3 turtle species. WS has not taken any of these species in PDM operations in the analysis area. Coyotes are opportunistic predators and could prey upon any of the rodent, bird, fox, or reptile species if the opportunity arises. Local reduction in coyote numbers by WS PDM activities has the potential to benefit these species but such benefits are unlikely to be significant. Four species of raptors (birds of prey) within this group could conceivably be impacted by WS PDM actions. Mitigation measures already in place to avoid adverse impacts on these species are described in Chapter 3.

Of the above "Special Concern" species, the grizzly bear, wolverine, lynx, gray wolf, kit fox, and gray fox have the potential to be taken by WS PDM capture methods which include traps, snares, and M-44 devices. The grizzly bear and gray wolf have not been confirmed to exist in the State and none are expected to be taken by WS methods.

Fitzgerald (1992) concluded few, if any, wolverines still exist in Colorado and that little evidence exists that lynx still occur in the state. Wolverine habitat consists of boreal forests and tundra and lynx are restricted to boreal forests (Fitzgerald 1992). Habitat for these species is thus limited to the high elevation areas of the State. These types of areas are only a very small proportion of the land area worked on by WS for PDM in the analysis area and no impacts on these species are expected. Should [redacted] confirm the presence of these species, the agency could consult and coordinate with WS to establish safeguards for these species if determined to be necessary.

The American marten is an inhabitant of subalpine spruce-fir and lodgepole pine forests, alpine tundra, and montane forests and occur in most areas of coniferous forest in the higher mountains of Colorado (Fitzgerald 1992). Detailed information on population status is unknown. The fisher is associated with dense mixed deciduous-evergreen forest and seems to avoid large openings in forested areas (Fitzgerald 1992). Fitzgerald (1992) stated that it is unlikely that the fisher has ever existed in the wild in Colorado. PDM methods that could result in incidental take of martens and fishers are the M-44, traps, and snares. WS has rarely used these methods in the higher elevation coniferous forest areas inhabited by these species and has not experienced any incidental take. Passage of Amendment 14 has curtailed the use of these methods on FS lands which contain the majority of marten and fisher habitat in the state. Thus, there is little or no risk of accidental take of these species by WS actions.

The kit fox is listed by [redacted] as being of "Special Concern." The kit fox is common in areas south and west of Colorado and is not federally listed. WS took no kit fox in the analysis area in FY 1995 and take is expected to remain low and insignificant to populations.

The swift fox is a federal candidate species and species of "Special Concern" that is potentially impacted by WS PDM. WS has not experienced take of swift fox in the state or in the analysis area. In addition, the species is shown to occur in only one of the 29 counties in the analysis area (Jackson County), and WS currently has no cooperative program with that county. The USFWS determined that the most immediate threat to survival of the swift fox is from direct predation by coyotes (USDI 1995), and evidence exists that small carnivore abundance typically increases in areas where coyote populations have been reduced (Robinson 1961; Nunley 1977). Thus, local reductions in coyote abundance that occur because of PDM would potentially benefit the swift fox and the kit fox, although this benefit is not likely to be significant considering the small amount of area on which WS conducts PDM in the analysis area (<8%). Although historic PDM methods using toxic baits may have impacted swift fox abundance in certain areas in the past, current PDM by WS does not use such methods and WS PDM method use in the current program, including M-44 use, is highly selective (91-100% as shown in section 4.2.8). As indicated in USFWS (1995), M-44 use has been the primary method responsible for incidental take of kit and swift fox and therefore poses the primary hazard. Private PDM and fur harvest, particularly private use of traps, would be less selective than WS use of such methods. WS believes it is more likely that current PDM actions that reduce coyote abundance in local areas benefits kit fox and swift fox more than the species are harmed by incidental take. Restrictions imposed by Amendment 14 will result in less use of traps, snares, and M-44 devices by WS in the State and more use of methods that are virtually 100% selective for target species (aerial hunting and ground based shooting). Therefore, mitigation measures implemented by WS under the current program should be adequate to prevent significant adverse impacts on swift fox in the analysis area.

4.2.2.2 Alternative 2. -No Federal WS PDM and Alternative 3. - Technical Assistance Only:

Alternative 2 and Alternative 3 would result in no WS operational PDM program. Thus, their impacts on this issue would be similar to each other. No nontarget animals would be captured by

WS under these two Alternatives. However, it must be considered that overall nontarget captures could increase as untrained and less experienced individuals would attempt to conduct control and the impacts would likely be similar to those described in section 4.2.1.2. As indicated by USDA (1994), frustration of some livestock producers could lead to illegal pesticide use with unknown adverse impacts on nontarget species populations. Some T&E or sensitive species may become inadvertently killed by these efforts, especially if the efforts include the illegal use of pesticides. While WS would still be available to advise producers under Alternative 3, compliance with WS advice would be voluntary.

Alternative 2 would probably result in a nontarget take greater than that of Alternative 1, which may further endanger some species or otherwise adversely affect "special concern" species. Alternative 3 would probably result in greater nontarget take than Alternative 1 but less than Alternative 2.

4.2.2.3 Alternative 4 - Nonlethal WS PDM Only

Under this alternative, WS would not use any lethal PDM methods. Most nonlethal methods are not practical for WS personnel to use and must be employed by livestock producers or property owners. Therefore, this alternative would be similar to Alternative 3 except that the technical assistance provided would not recommend any lethal methods. WS would be restricted to a few nonlethal methods practical for its personnel to employ such as scaring devices.

WS would no longer kill any nontarget species with PDM methods under Alternative 4 which means WS impacts on nontarget species populations would be less than under Alternative 1. However, it is anticipated that many cooperating livestock producers would drop out of the current program because of reduced effectiveness. Private kill of target and nontarget species would probably increase. It is possible that frustration by some of these individuals would lead to illegal pesticide uses with unknown adverse impacts on target species populations. Adverse impacts on nontarget species would probably be greater than the current program and Alternatives 5, 6, and 7, depending on the level and manner of private PDM.

4.2.2.4 Alternative 5 - Nonlethal Required Before Lethal Control

Under Alternative 5, WS would be more restricted in its use of lethal control methods and would likely have to divert resources away from conducting operational PDM toward verifying and documenting use of nonlethal methods. As a result, WS impacts to target and nontarget species populations would probably be less than those that would occur under the current program.

WS nontarget kill under Alternative 5 would be less than under Alternative 1. It is anticipated that some cooperating livestock producers would drop out of the current program because of reduced effectiveness. Private kill of target and nontarget species would probably increase. It is possible that frustration by some of these individuals would lead to illegal pesticide uses with unknown adverse impacts on target species populations. Adverse impacts on nontarget species would probably be greater than the current program and Alternatives 6 and 7 and less than Alternatives 2, 3, and 4.

4.2.2.5 Alternative 6 - Corrective Control Only When Lethal PDM Methods are Used

Under Alternative 6, lethal control of predators by WS would only be initiated following confirmed ongoing predation of livestock or other resources. This is presently the case for mountain lion and black bear depredation under the current program (Alternative 1).

WS coyote kill under Alternative 6 would be less than under Alternative 1, while mountain lion and black bear take would be the same as Alternative 1. It is anticipated that some cooperating livestock producers would drop out of the current program because of a real or perceived reduction in effectiveness. Private kill of target and nontarget species would probably increase. It is possible that frustration by some of these individuals would lead to illegal pesticide uses with unknown adverse impacts on target species populations. Adverse impacts on nontarget species would probably be greater than the current program, and less than Alternatives 2, 3, 4, 5 and 7.

4.2.3 The potential for WS coyote take to cause increases in rodent, rabbit, and other prey species populations to the point that detrimental effects on vegetation resources occur.

4.2.3.1 Alternative 1. - Continue the Current Program (No Action).

The relationship between predators and rodent and rabbit populations has been summarized in USDI (1979).

> Rabbit and rodent populations normally fluctuate substantially in several-year cycles. Two hypotheses attempt to explain these cyclic fluctuations: 1) rodent and rabbit populations are self-regulated through behavior, changes in reproductive capacity due to stress, or genetic changes (Chitty 1967, Myers and Krebs 1971), 2) populations are regulated by environmental factors such as food and predation (Pitelka 1957, Fuller 1969).
>
> Keith (1974) concluded that: 1) during cyclic declines in prey populations, predation has a depressive effect and as a result, the prey populations may decline further and be held for some time at relatively low densities, 2) prey populations may escape this low point when predator populations decrease in response to low prey populations, and 3) since rabbit and rodent populations increase at a faster rate than predator populations, factors other than predation must initiate the decline in populations.
>
> Wagner and Stoddart (1972) and Clark (1972) independently studied the relationship between coyote and black-tailed jackrabbit (*Lepus californicus*) populations in northern Utah and southern Idaho. Both concluded that coyote populations seemed to respond to an abundance of jackrabbits. When a broad range of prey species is available, coyotes will generally feed on all species available; therefore coyote populations may not vary with changes in the availability of a single prey species (Knowlton 1964, Clark 1972).

Wagner (1988) reviewed literature on predator impacts on prey populations and concluded that such impacts vary with the locale. In some ecosystems, prey species such as snowshoe hares increase to the point that vegetative food sources are depleted despite predation. In others, e.g., jackrabbits in the Great Basin, coyotes may limit jackrabbit density and evidence indicates food shortages do not occur to limit jackrabbit abundance. Wagner and Stoddart (1972) reported that coyote predation was a major source of jackrabbit mortality and may have caused a decline in jackrabbit numbers in the Curlew Valley in Utah.

In general, it appears that predators prolong the low points in rodent population cycles and spread the duration of the peaks. Predators generally do not "control" rodent populations (Keith 1974, Clark 1972, Wagner and Stoddart 1972). It is more likely that prey abundance controls predator populations. The USDI (1979, p. 128) concluded that "WS Program activities have no adverse impacts to populations of rodents and lagomorphs." The USDA (1994) did not specifically deal with this issue.

Henke (1995) reviewed literature concerning coyote-prey interactions and concluded that short term (≤6 months per year) coyote removal efforts typically do not result in increases in small mammal prey species populations, but that longer term intensive coyote removal (9 months or longer per year) can in some circumstances result in changes in rodent and rabbit species composition which may lead to changes in plant species composition and forage abundance. The latter conclusion was based on one study (Henke 1992) which was conducted in the rolling plains area of Texas that involved one year of pretreatment and two years of treatment. Whether such changes would occur in all ecosystems in general remains to be proven. Assuming that such changes do nevertheless occur in general, the following mitigating factors should serve to minimize these types of environmental impacts:

1. Most PDM actions in the analysis area are not year round but occur for short periods after damage occurs (corrective control situations) or for short periods (90-120 days) at the time of year when benefits are most likely such as the period of time immediately preceding and during calving and lambing in the spring.

2. WS conducts PDM on properties that comprise less than 8% of the analysis area and kills a low percentage (< 5%) of the area population of coyotes in any one year means ecosystem impacts from WS actions should be low in magnitude.

3. Take of other carnivores that prey on rodents and rabbits is too low to indicate any potential for a significant effect. Evidence also exists to suggest other carnivores such as badgers, bobcats, and foxes increase in number when coyote populations are reduced (Robinson 1961, Nunley 1977). Therefore, even if coyote numbers were reduced substantially in a localized area, other species that prey on rodents and rabbits would probably increase in number to naturally mitigate some reduction in coyote predation on those prey species that might occur.

Other prey species of coyotes include white-tailed and mule deer, and pronghorn antelope. Based on the information presented in section 1.1.3, it is clear that local short term predator population reductions can enhance deer and antelope populations. This could be either a beneficial or detrimental effect depending upon whether local deer populations were at or below the capacity of the habitat to support them. However, as stated above, since WS only conducts PDM on less than 8% of the land area of the analysis area and takes less than 5% of the coyote population in any one year, it is unlikely that positive effects on deer or antelope populations would be significant, except in isolated instances. If [redacted] or an Indian tribe requested coyote removal for the purpose of enhancing antelope or deer herds, an increase in local populations would be desired and considered a beneficial impact on the human environment. In those situations, it is likely that coyote control would be ended when herd management goals have been met. In any event, it is unlikely that impacts would be significant in major portions of the analysis area under the current program.

4.2.3.2 Alternative 2 - No Federal WS PDM and Alternative 3 - Technical Assistance Only.

Under this alternative, lethal PDM by WS would not occur and there would be no potential for WS to impact prey species populations. However, private efforts to control predation could mean untrained and less experienced individuals would attempt to conduct control which could lead to impacts described in section 4.2.1.2. As indicated by USDA (1994), such actions combined with potential illegal pesticide use could have unknown adverse impacts on target and nontarget predator species populations. Depending on the level of such activities, the increases in nontarget carnivore populations that generally follow local coyote population reduction, which could naturally mitigate a reduction in predation on rodents and rabbits, would be less likely to occur since private control

efforts would tend to be less selective than WS. While WS would still be available to advise producers under Alternative 3, compliance with WS advice would be voluntary. Thus, although WS would have no potential to impact prey species populations, the impacts of no operational WS could be greater than those of the current program.

4.2.3.3 Alternative 4 - Nonlethal WS PDM Only

Under this alternative, lethal PDM by WS would not occur. Thus WS potential impacts on prey species populations would be less. If producers become frustrated and drop out of the program, private efforts to control predation could result in potential impacts similar to Alternatives 2 and 3.

4.2.3.4 Alternative 5 - Nonlethal Required Before Lethal Control.

Under this alternative, preventive lethal PDM by WS would not occur. Thus WS potential impacts on prey species populations would be less. If producers become frustrated and drop out of the program, private efforts to control predation could result in potential impacts similar to Alternatives 2, 3, and 4 but to a lesser degree.

4.2.3.5 Alternative 6 - Corrective Control Only When Lethal PDM Methods are Used.

Under this alternative, WS PDM would have less potential of impacting prey species populations than the current program because no preventive control would be conducted. The impacts would probably be similar to those under Alternative 5.

4.2.4 Impact of WS predator damage management activities on recreational use of public lands.

4.2.4.1 Alternative 1 - Continue the Current Program (No Action).

Under Alternative 1, wildlife damage management is integrated into other activities on public lands at work plan meetings held between WS and the land management and state agencies. At each meeting, the needs for wildlife damage management are discussed, as well as factors pertinent to PDM decisions, such as changes in the grazing season, planned recreational or other events, logging operations, hunting seasons, and others. WS Work Plans contain provisions, when appropriate, for the establishment of public safety zones around areas of known high use on [redacted] and [redacted] lands, and for restrictions on certain methods during certain periods. These are factored into the ADC Decision Model thought process. With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052, concerns about WS use of leghold traps, snares, and M-44s on public lands in Colorado have been rendered moot because such use has been prohibited. If this situation changes and those methods once again become legal for use on public lands, then WS could employ them on such lands under the current program. Mitigation measures or standard operating procedures that would minimize the risk to public land users include the posting of warning signs at main entrance points into areas where traps, snares and M-44s are in use and smaller but visible warning signs within 25 feet of each M-44 to warn persons to avoid tampering with the devices and to keep pets restrained. Although there has been concern expressed by some individuals that these devices pose an undue hazard to people, no fatal human accidents or instances of permanent impairment involving M-44s have occurred since the devices were registered in 1975. A formal risk assessment of WS methods found no evidence of hazardous exposures to recreationists from any such method, including M-44 use (USDA 1994, Appendix P). Although incidents involving exposures with M-44s have occurred, most have involved persons who were using the devices, and effects on the individuals were not serious or long term and in most cases resulted in no more than short-term irritation.

Over the past several years, no significant conflicts with other public land uses have been identified in the work planning process. The types of mitigation described above have, in effect, been sufficient to preclude conflicts. In actuality, the extent of WS PDM activities on [redacted] lands has been limited. For example, WS conducted no PDM activity on 83% of the [redacted] land nor on 97% of the [redacted] land in the analysis area during FY1995. Under the current program, the amount of public land worked by WS could increase but is expected to continue to be of minor presence on livestock grazing allotments. Aerial hunting on [redacted] lands has been very limited in the analysis area. A total of 192.8 hours of aerial hunting with fixed wing aircraft only occurred on such lands during FY 1995. Put in perspective, this amounts to only 55 *minutes* of aerial hunting *per 10 square mile area per year* on the 7% of such public access lands worked for PDM by WS. The amount of such activity could increase many fold and still be inconspicuous to recreationists. Because of the large expanses of area involved, it is rare for even WS ground crew personnel to actually observe coyotes being shot by aerial hunting operations. Thus, the chance that recreationists might be disturbed by observing such activity is exceedingly low.

Livestock grazing is one of the authorized multiple uses of public lands in addition to recreation. WS PDM assists public land grazers by protecting livestock while they are on public lands and is recognized by [redacted] policy as well as authorized by the ADC Act of 1931 as a legitimate government function on public land areas. PDM activities by WS most often involve only brief amounts of actual time spent by WS personnel on individual grazing allotments. Thus, the chance that presence of WS personnel or vehicles would disturb recreational users in some way is low. Also, most public land grazing allotments worked by WS are not areas of high recreational use, and recreationists are infrequently observed by WS personnel in the course of performing their duties.

Despite the relatively inconspicuous presence of WS PDM activities on public land areas, some persons would continue to believe their use of public lands is being negatively impacted by such activity under the current program.

4.2.4.2 Alternative 2 - No Federal WS PDM Program, and Alternative 3 - Technical Assistance Only.

Under these two alternatives, there would be no potential for the Federal WS program to conflict with recreational or other public uses of public lands. However, as stated in previous sections, private control efforts would probably increase under this alternative, and it is doubtful that the public would detect much of the increased private PDM activity that might occur. With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052, use of leghold and body-gripping traps, snares, and toxicant methods are prohibited for use on public land. Depending on the level of frustration felt by cooperators, private PDM activities could involve illegal use of those methods or other types of illegal pesticide use. The risk to pets or hunting dogs could actually be greater than under the current program.

4.2.4.3 Alternative 4 - Nonlethal WS PDM Only

Under Alternative 4, recreational users of public lands would have no potential to be disturbed or upset by WS lethal PDM activities. However, they may experience conflicts with some nonlethal uses. For example, they may be disturbed by propane exploders, electronic guards, or other noise making scaring devices, or may be chased or bitten by guard dogs that have been employed by cooperators. Similar to Alternatives 2 and 3, private control efforts would probably increase under this alternative if cooperators became frustrated at reduced effectiveness and dropped out of the program. With the passage of State Constitutional Amendment 14 and subsequent interpretations

passed in SB 97-052, use of leghold and body-gripping traps, snares, and toxicant methods are prohibited for use on public land. Depending on the level of frustration felt by cooperators, private PDM activity could involve illegal use of those methods or other types of illegal pesticide use. The risk to pets or hunting dogs could actually be greater than under the current program.

4.2.4.4 Alternative 5 - Nonlethal Required Before Lethal Control.

Under Alternative 5, recreational users of public lands may have less potential to be disturbed or upset by WS lethal PDM activities if it results in a reduction in such activities. However, they may experience conflicts with some nonlethal uses. For example, they may be disturbed by propane exploders, electronic guards, or other noise-making scaring devices, or may be chased or bitten by guard dogs that have been employed by cooperators. Similar to Alternatives 2, 3, and 4 but to a lesser degree, private control efforts would probably increase under this alternative if cooperators became frustrated at reduced effectiveness. With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052 use of leghold and body-gripping traps, snares, and toxicant methods are prohibited for use on public land. Depending on the level of frustration felt by cooperators, private PDM activity could involve illegal use of those methods or other types of illegal pesticide use. The risk to pets or hunting dogs could actually be greater than under the current program.

4.2.4.5 Alternative 6 - Corrective Control Only When Lethal PDM Methods are Used.

Under Alternative 6, WS PDM would only take place after documentation of ongoing depredation on livestock by predators. The potential for WS PDM activities to conflict with the public's use of public land areas would be less than under the current program since WS would not conduct any lethal preventive control actions. Potential impacts on public use of public lands from increased private PDM efforts if cooperators become frustrated because of a real or perceived reduction in effectiveness and drop out of the program are similar to Alternative 5.

4.2.5 Humaneness and Selectivity of WS predator damage management methods.

Selectivity of PDM methods is related to the issue of humaneness in that greater selectivity results in less perceived suffering of nontarget animals. The selectivity of each method is based, in part, on the skill and discretion of the WS employee in applying such methods and also on specific measures and modifications designed to reduce or minimize nontarget captures. The humaneness of a given wildlife damage management method is based on the human perception of the pain or anxiety caused to the animal by the method. How each method is perceived often differs, depending on the person's familiarity and perception of the issue as discussed in Chapter 2, section 2.2.8. The selectivity and humaneness of each alternative are based on the methods employed under that alternative.

Schmidt and Brunson (1995) conducted a public attitude survey in which respondents were asked to rate a variety of wildlife damage management methods on humaneness (1=not humane, 5= humane) based on their individual perceptions of the methods. No further instructions on how to base their scores were given to respondents (Table 4-3).

Table 4-3. Public Attitudes Toward Humaneness of Wildlife Damage Management Methods (from Schmidt and Brunson 1995).

Method	Ranking
Adjusting planting/grazing schedules	4.4
Human guards/livestock herders	4.2
Fencing out wildlife	4
Scare devices	4
Fertility control	4
Guard dogs/animals	3.7
Chemical repellents	3.7
Live traps	3.7
Calling and shooting	2.7
Poisons for predators	2.3
Fumigation or gassing dens	2.1
Foot snares	1.9
Shooting animals from aircraft	1.9
Neck snares	1.7
Leghold traps	1.7

The following discussions of the relative humaneness of each alternative are related to the above data.

4.2.5.1 Alternative 1. - Continue the Current Program.

Table 4-4 shows the relative and overall selectivity of lethal PDM methods as used by WS in the analysis area in FY 1995.

Table 4-4.
Selectivity of Lethal PDM Methods as Used by the WS Program in Western Colorado in Fiscal Year 1995. Numbers are animals killed.

Species	Method								
TARGETS:	**Leghold Trap**	**Cage trap**	**Foot Snare**	**Neck Snare**	**M-44**	**Aerial Hunting**	**Shooting (ground based)**	**Dogs**	**Denning**
Coyote	39	0	0	213	499	1,089	346	78	14
Black Bear	0	0	26	0	0	0	2	3	0
Mt. lion	0	0	3	1	0	0	0	3	0
Red fox	3	0	0	101	33	21	3	0	8
Fer./FR[1] dog	0	0	0	1	0	0	1	0	0
Raccoons	0	11	0	0	0	0	0	0	0
Common raven	0	0	0	0	0	0	2	0	0
TOTAL TARGETS	42	11	29	316	532	1,110	352	84	22
NONTARGETS:									
Badger	0	0	0	3	0	0	0	0	0
Gray Fox	2	0	0	0	2	0	0	0	0
Red Fox	0	0	0	0	1	0	0	0	0
Jackrabbit	0	0	0	2	0	0	0	0	0
St. Skunk	0	0	0	1	2	0	0	0	0
Porcupine	0	0	0	2	0	0	0	0	0
Fer./FR[1] Dog	2	0	1	2	3	0	0	0	0
Black bear	0	0	0	0	1	0	0	0	0
Mountain lion	0	0	0	1	0	0	0	0	0
Raccoon	0	0	0	1	1	0	0	0	0
Bobcat	0	0	0	1	0	0	0	0	0
TOTAL NONTARGETS	4	0	1	13	10	0	0	0	0
% SELECTIVITY[2]	91.3%	100.0 %	96.7%	96.0%	98.2%	100.0 %	100.0 %	100.0 %	100.0%

[1]Feral and/or free-ranging
[2]Target take as a percentage of total lethal take.

The following discussion analyzes the relative selectivity and humaneness of each method used for PDM in the current program:

Leghold Traps and Foot Snares. The survey results in Table 4-3 indicate leghold traps are perceived as less humane than other methods. With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052, use of leghold traps and foot snares has been prohibited on public land and restricted to limited situations on private land. The Colorado WS program currently employs traps with padded jaws to reduce injury. Many traps are also equipped with shock absorbing springs in the chain attached to the anchoring device in order to further reduce injury. Captured animals are euthanized, or in case of a nontarget capture, released if capable of surviving. By policy, WS leghold traps are equipped with pan-tension devices to impede nontarget captures unless the use of the device would exclude the capture of a target animal. Nontarget capture rates for private trappers (non-WS employees) probably contribute to the perception that leghold traps are not selective. However, traps as employed by WS employees are selective to a great degree. This is because of mitigation measures, WS policy restrictions, and the skill that WS employees generally have in selecting trap set locations that have a relatively good chance at catching only target animals. The actual use of leghold traps by WS in the area has been low -- in FY 1995, only 42 target and 4 nontarget animals were captured in leghold traps. Nontargets killed were thus 8.7% of the total number of animals captured, indicating that WS use of leghold traps was 91.3% selective for lethal take of target species (Table 4-4).

Foot snares are employed for mountain lion and bear damage management, and they are generally checked daily. Technological advances such as the use of remote transmitters to signal when a foot snare has been disturbed could allow for easier monitoring of the devices, further increasing humaneness. Additional funds would likely be needed before widespread use of such devices could occur. Foot snares have been used infrequently in the analysis area, but are highly selective for bears and mountain lion when used by WS employees -- in FY 1995, 29 target animals (26 bears and 1 mountain lion) and 1 nontarget (a feral/free ranging dog) animal were captured. Because of the greater weight of target black bears and mountain lion, pan-tension devices can be adjusted to require a much heavier trip weight than those used with leghold traps set for coyotes which contributes to their high degree of selectivity.

Under current state law, the cooperative WS program conducts operations under the [redacted]. These rules require that nonlethal traps and nonlethal snares be checked 3 times per week -- twice, 2 days apart and once, 3 days apart in any 7-day period. Also, cooperators frequently assist WS employees in checking traps to enhance trap check frequency. Because of workload requirements, leghold traps are not used to the extent that they were in the past and this is evidenced by the fact that less than 2% of the analysis area's target take was by this method. Traps require more labor to set and maintain and must be checked more frequently than the more commonly used M-44 device. A more frequent trap check interval could be established if it becomes required by a change in state law or regulation which would require sacrificing efficiency and effectiveness in the interest of increasing humaneness. However, such a requirement would not necessarily reduce animal suffering overall if livestock deaths and injuries from predation increased as a result. Most trap use in the analysis area is limited to corrective control situations in which the offending individual coyotes have eluded other control methods. Ground capture methods must be restricted to leghold traps in areas where guard

dogs are in use to avoid serious injury or death to guard dogs. These methods have been prohibited or severely restricted by State Constitutional Amendment 14.

Neck Snares. Table 4-3 indicates neck snares are not generally perceived as humane. A successful capture of an animal around the neck generally results in a fairly rapid death by strangulation. Occasionally, a snared animal may be captured around the chest or abdomen. Snares are checked as frequently as possible, weather conditions permitting, and cooperators frequently assist in checking snares. The Colorado WS Program currently uses the Kelley snare (or equivalent) which appears to be superior in quickly killing coyotes (Phillips 1996). "Break-away" snares that allow nontarget animals that are much larger than coyotes to escape could be employed pending development of designs that do not compromise effectiveness in holding coyotes. Neck snares were used to take 13% of total target animals taken in FY 1995. As employed in the WS program, neck snares are quite selective for target animals. In 1995, 316 target and 13 nontarget animals were killed by WS use of neck snares in the analysis area indicating the method was 96% selective for lethal take of target species (Table 4-4). Under the [redacted], "lethal snares", which would include WS neck snares, must be checked a minimum of once every 7 days. Use of this method has been severely restricted by State Constitutional Amendment 14.

Aerial Hunting. Aerial hunting is perceived as inhumane by the public (Table 4-3). However, this perception is probably based on confusion with the issue of "fairness" rather than actual pain or suffering because ground-based shooting received a higher rating than aerial shooting even though the end result to the animal is the same (Schmidt pers. comm. 1995). As a method of sport hunting take, aerial hunting would be perceived by most persons, including WS personnel, as being "unfair" and is in fact illegal for such purposes. Whether a method constitutes "fair chase" is not a concern in the ADC Decision Model process. Aerial hunting is chosen by WS whenever possible because it has proven to be 100% selective, is extremely effective in stopping depredation quickly, and is economically affordable. In actuality, aerial hunting results in less anxiety than ground based capture devices because there is no period in which the animal is restrained, and death most often occurs rapidly from one or more gunshots fired in a matter of a few seconds. The use of a "ground crew" provides for a quick follow-up if a wounded animal escapes in thick cover. Aerial hunting not only allows for clear identification of the target species, but it can also be highly selective for offending individuals in certain situations in which areas frequented by such individuals have been determined by ground-based investigations of WS employee. A total of 1,110 target animals (1,089 coyotes and 21 red fox) and no nontarget animals were taken by this method in the analysis area in FY 1995. This represented 44% of target animals killed by WS PDM activities during that time.

Ground Shooting. Shooting from the ground, which includes calling and shooting and shooting during chance observations, is regarded as more humane than restraining type capture devices or even aerial hunting. Both methods are highly selective (100%) in that positive identification of the target predator is made before shots are fired. These methods have been relatively important in the analysis area's PDM program. In FY 1995, 352 target animals, representing 14% of all target animals killed and no nontarget animals were taken by these methods.

Trail and Decoy Dogs. Decoy dogs are sometimes used during coyote damage management to attract target animals to a caller who may then shoot the animal. This use is similar in humaneness and selectivity to calling and shooting methods. For mountain lion and bear damage situations, trail hounds are used to follow the scent trail of the offending animal from the site of the depredation and to tree the animal or bay the target animal until the WS employee arrives. Target animals are generally euthanized by shooting although they can be captured alive using immobilizing drugs and relocated if directed by [redacted]. The use of hounds may be perceived as inhumane, presumably because of anxiety experienced by the predator during pursuit or while being held at bay. Dogs as a

PDM method are highly selective, not only for the offending species but for offending individuals. Usually, if a bear or mountain lion is pursued and then found to be a nontarget (i.e., nonoffending individual), the dogs are restrained and the animal is allowed to escape unharmed. Dogs are not a major method of take in the analysis area although they are extremely important in resolving certain individual problems. In FY 1995, only 84 animals (78 coyotes, 3 bears, 3 mountain lions) were killed with the use of dogs. None of these were nontargets (Table 4-4).

M-44 Device. The M-44 device is perceived by WS employees as humane because it causes a relatively rapid death in approximately 2 minutes (USDA 1994, Appendix P). Respondents were not asked to rate the humaneness of the device in Schmidt and Brunson (1995) because the authors believed the public would not be at all familiar with the concept of how it functions. The question asked of respondents that was closest in relation to the M-44 was whether "poisons for predators" were humane, and the general response was that they were not. M-44s have been an important method of take for coyotes and red fox in the analysis area. In FY 1995, 21% of the target animals taken were by this method. M-44 devices are highly specific to members of the Canidae family, and as employed in the WS program, are highly specific to coyotes (Connolly 1988). In FY 1995, 532 target animals (499 coyotes, 33 red fox), and only 10 nontarget animals were killed by WS use of M-44s in the analysis area, indicating the method was 98.2% selective for lethal take of target species (Table 4-4). With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052, use of M-44s has been prohibited on public land and restricted to limited situations on private land.

Denning. Denning is the practice of finding the den of a target species and asphyxiating the offspring with a gas cartridge. Table 4-3 indicates denning is not generally perceived as humane. However, the use of carbon monoxide is considered a form of euthanasia by the AVMA (AVMA 1986). Again, respondents may have confused their feelings of "fairness" in rating humaneness of the method. However, the method as used is not dissimilar in “humaneness” to the euthanization of millions of unwanted domestic dogs and cats by animal humane organizations in the country each year. Denning is very selective in that positive identification of the species occupying a den is possible. In the analysis area, coyote pups are euthanized in dens that are located after removal of the adults because their chances of survival are extremely low. Denning, which can be effective in stopping depredation by adult pairs of coyotes even without prior removal of the adults, is an important method for resolving individual coyote damage problems, particularly with sheep, in the analysis area. Fifty coyote dens were taken by this method in FY 1995. No nontargets were known to have been taken by the method. With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052, the use of gas cartridges has been prohibited on public land and restricted to limited situations on private land.

DRC-1339. DRC-1339 has not been used for PDM in recent years in the analysis area, but could be used under the current program for controlling raven, crow, or magpie depredation on young livestock. It poses little risk of secondary poisoning to nontarget animals, is relatively high in toxicity to most targeted bird species, but is of low-to-moderate toxicity to most raptors and is almost nontoxic to mammals (USDA 1994, Appendix P). The method is most frequently used in boiled egg baits strategically placed near the area of depredation where it is judged that the depredating ravens will find the baits. The baits are left for no more than 3-5 days and uneaten baits are removed. The method is highly selective for the target species. DRC-1339 causes the buildup of uric acid deposits in the kidneys and blood vessels which results in circulatory impairment. Death in target birds results from uremic poisoning and congestion of major organs. The chemical causes a quiet and apparently painless death and death occurs without convulsions or spasms (USDA 1995). Thus, although respondents in the Schmidt and Brunson survey would probably have rated DRC-1339 as inhumane because it is a “poison”, the chemical actually causes death with little or no pain or

discomfort which makes it a relatively humane method. This method has not been used in the current program but could be if the need arises. With the passage of State Constitutional Amendment 14 and subsequent interpretations passed in SB 97-052, use of this method has been prohibited on public land and restricted to limited situations on private land.

Nonlethal Methods. Nonlethal methods are generally perceived as humane, although increased familiarity with the impacts of the methods may change this perception. Although guard dogs rarely if ever actually kill coyotes, they have been documented to kill deer fawns, chase adult deer and presumably other ungulates (elk and antelope) and can adversely affect wild turkey (*Meleagris gallopavo*) distribution (Timm and Schmidt 1989). Thus, there may be situations on private and public land areas where guard dogs would not be desired because of adverse impacts on such species. Fences adequate to exclude predators would in most cases inhibit movement of other wildlife, particularly ungulate big game species, resulting in restricted migration and possibly death through starvation which would be a nontarget impact that would likely be perceived as inhumane. Electric fences cause presumably painful shocks to animals that encounter them, which might be perceived as inhumane by some persons, although they would likely be viewed as an acceptable alternative to lethal methods. Modifying husbandry practices, such as use of confined lambing and calving, may decrease livestock depredations, but can sometimes result in increased nutritional, disease and parasite problems, and disruption of mother-young bonds which can lead to starvation of young and might result in losses as severe as those that would have occurred due to predation (Wade 1982). Therefore, many "nonlethal" methods have real or potential impacts on animals that would likely be perceived as inhumane if the general public were made aware of them.

The current program uses, recommends, or has available to it the above methods for the resolution of predator damage problems in the analysis area. Noncapture lethal methods (aerial hunting, calling and shooting, shooting, denning, and M-44s) accounted for more than 80% of target predators taken by WS in the analysis area in FY 1995. Restraining type capture methods that can involve injury and anxiety (leghold traps, foot snares and neck snares), accounted for less than 20% of the target animals taken. Thus, the program's current use of lethal PDM methods is dominated by those that are relatively more humane. With the passage of State Constitutional Amendment 14 and subsequent interpretations by the state legislature, use of restraining type capture methods in the current program will be less than that which has occurred previously. The current program is also highly selective and avoids killing substantial numbers of nontarget animals. Only 28 or 1.1% of animals killed by WS during PDM activities in FY 1995 were nontargets. This indicates impacts perceived as inhumane are avoided to a high degree for nontarget species.

Under this alternative, methods viewed by some persons as inhumane would continue to be employed. On the other hand, if the PDM actions used in the current program were successful, fewer livestock and, potentially, game animals would suffer from injuries caused by depredations. Thus, a balance of sorts between the two aspects of humaneness might be achieved under the current program.

4.2.5.2 Alternative 2 - No Federal WS Program, and Alternative 3 - Technical Assistance Only:

These two Alternatives, which would provide no Federal operational WS program, could be argued to be the most humane, as no wildlife would be killed by the Federal government. However, use of leghold traps, snares, and shooting by private individuals and state agency personnel would probably increase even with the restrictions that have been established as a result of Amendment 14. This could result, in the case of private persons, in less experienced individuals implementing such devices with much less selectivity than WS achieves. Greater take and suffering of nontarget wildlife could result. Frustration caused by the inability to reduce losses could lead to illegal use of

chemical toxicants and failure to check traps and snares as often as WS which might result in increased animal suffering.

More livestock could be expected to suffer from injuries caused by depredations under these Alternatives than under the current program. The number of livestock saved from suffering because of predation would decrease while the number of animals killed for PDM could remain the same or even increase depending on the level of private and state agency efforts. Overall animal suffering could actually increase under these alternatives, but the public's perception of humaneness would probably be that less suffering was occurring because they would not be aware of the livestock losses and private PDM activities that would occur without WS PDM.

4.2.5.3 Alternative 4 - Nonlethal WS PDM Only

The humaneness of PDM as perceived by the public would be expected to increase under Alternative 4. However, actual animal suffering would probably either not change much or could even be greater than that which occurs under the current program. As identified in section 4.2.5.1, certain methods that are commonly viewed as "nonlethal," can, in practice, result in lethal effects on other wildlife which could involve suffering. Similar to but to a lesser degree than under Alternatives 2 and 3, some cooperators could be expected to drop out of the program altogether and/or increase their own use of lethal control methods resulting in less experienced individuals implementing such methods with less selectivity and humaneness than WS achieves. Frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants, traps and snares and failure to check traps and snares as often as WS which might result in greater take and suffering of target and nontarget wildlife.

It is probable that the number of livestock animals that would be expected to suffer from predation injuries under this Alternative would be more than under the current program, but less than under Alternatives 2 and 3. Overall animal suffering would probably be less than under Alternatives 2 and 3 but could be greater than the current program depending on how much livestock losses increased.

4.2.5.3 Alternative 5 - Nonlethal Required Before Lethal Control.

The humaneness of PDM as perceived by the public would also be expected to increase under Alternative 5. However, actual animal suffering would probably either not change much or could even be greater than that which occurs under the current program (similar to Alternative 4 but to a lesser degree). As identified in section 4.2.5.1, certain methods that are commonly viewed as "nonlethal," can, in practice, result in lethal effects on other wildlife which could involve suffering. Similar to but to a lesser degree than under Alternatives 2, 3, and 4, some cooperators could be expected to drop out of the program altogether and/or increase their own use of lethal control methods resulting in less experienced individuals implementing such methods with less selectivity and humaneness than WS achieves. Frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants, traps and snares and failure to check traps and snares as often as WS which might result in greater take and suffering of target and nontarget wildlife.

It is probable that the number of livestock animals that would be expected to suffer from predation injuries under this Alternative would be more than under the current program, but less than under Alternatives 2, 3, and 4. Overall animal suffering would probably be less than under Alternatives 2, 3, and 4 but could be greater than the current program depending on how much livestock loss increased because of no preventive PDM and because of delays in implementing lethal PDM while waiting to determine whether nonlethal control is effective.

4.2.5.4 Alternative 6 - Corrective Control Only When Lethal PDM Methods are Used

The perceived humaneness of this Alternative would likely be greater than the perception of the current program, because fewer target and nontarget animals would be killed by WS in the absence of preventive lethal PDM. However, as is probable for Alternatives 2, 3, 4, and 5, some cooperators could be expected to drop out of the program altogether and/or increase their own use of lethal control methods resulting in less experienced individuals implementing such methods with less selectivity and humaneness than WS achieves. Frustration caused by real or perceived reduction in effectiveness could lead to illegal use of chemical toxicants, traps and snares and failure to check traps and snares as often as WS which might result in greater take and suffering of target and nontarget wildlife.

It is probable that the number of livestock animals that would be expected to suffer from predation injuries under this Alternative would be more than under the current program, less than under Alternatives 2 and 3, and about the same as Alternative 4. Overall animal suffering would probably be the same as under Alternative 4.

4.2.6 Summary of WS Impacts

Table 4-5 is a comparison of the alternatives and environmental consequences (impacts). The level of impacts is based on the above analysis and rated as: Neutral, Neu/Low, Low, Low/Moderate, Moderate, Moderate/High, and High. The impacts are also rated in a positive(+) or negative (-) manner, in that, the impacts are based on individual or society's perception of how the impact could affect the environment.

Table 4-5. Issues/Impacts/Alternatives/Comparison

Issues/Impacts	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Coyote Popns.	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)
Black Bear Popns.	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)
Mountain Lion Popns.	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)
Nontarget Species Popns.	Low (-)	Mod./High (-)	Mod./High (-)	Mod./High (-)	Mod. (-)	Low/Mod. (-)
T&E Species	Neu./Low (-)	Mod./High (-)	Mod./High (-)	Mod./High (-)	Mod. (-)	Low/Mod. (-)
Prey Species	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)
Public Land Use	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)	Low (-)
Humaneness[1] and Selectivity	Mod. (+)	Mod. (-)	Mod. (-)	Low/Mod. (-)	Low/Mod. (-)	Low/Mod. (-)

[1] Ratings based on both components of humaneness as related to PDM, i.e., the perceived pain and suffering of predators/nontargets taken vs. perceived pain and suffering of livestock animals whose deaths or injuries from predators are avoided through PDM.

The preceding analyses failed to identify any significant cumulative impacts nor are any significant impacts expected because of PDM conducted by WS in the analysis area program.

APPENDIX A

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APPENDIX B

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