Final

ENVIRONMENTAL ASSESSMENT

PREDATOR DAMAGE MANAGEMENT ON FEDERAL PUBLIC LANDS IN ARIZONA

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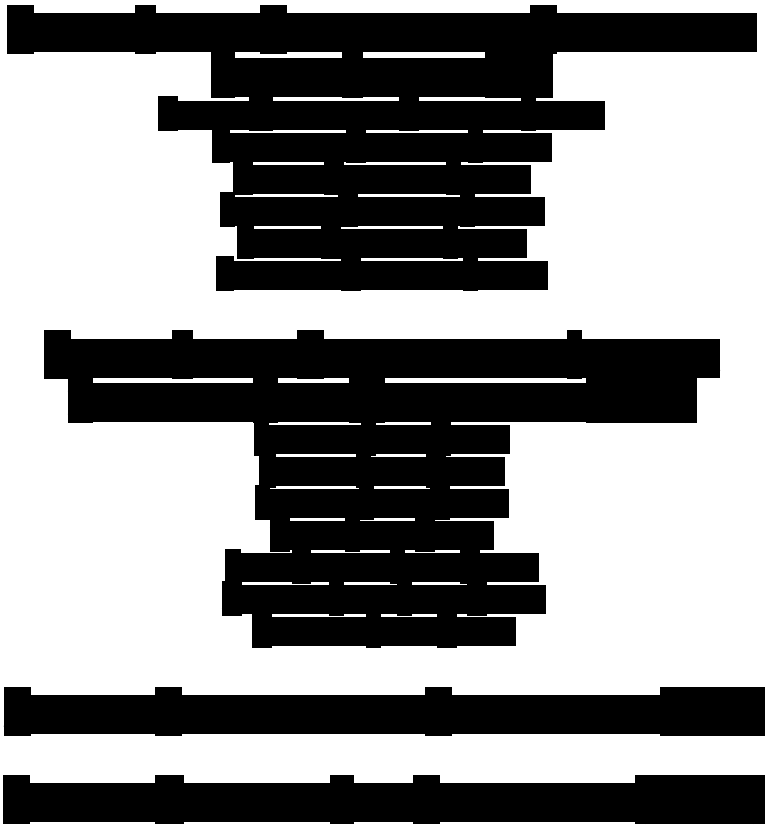

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INTRODUCTION

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 Animal Damage Control (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)(7 CFR 372.5(c), 60 Fed Reg. 6,000-6,003, 1995). We have decided to prepare this EA to facilitate planning, interagency coordination, and the streamlining of program management, and to clearly communicate with the public the analysis of cumulative impacts.

WS is the Federal program authorized to manage animals that damage livestock, 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 on federal public lands in Arizona. 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 Proposition 201 (codified as Arizona Revised Statutes 17-301-D in 1995), predator damage management methods available for use on federal public lands in Arizona have been limited. Any predator damage management conducted by WS in the State 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

[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.

WS's 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;
- Development and improvement of strategies to reduce economic losses and threats to the public 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;
- 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 (PDM) related to the protection of livestock, property, designated wildlife species, and to protect public safety, on federal public lands administered by the [redacted] within the state of Arizona. Prior to this time, WS PDM actions on lands administered by the [redacted] within the state were analyzed in NEPA documents specific to individual [redacted]. This EA supercedes all of the previous NEPA documentation covering WS PDM activity on those lands.

Since the passage of Proposition 201 in Arizona, the use of leghold traps, snares, and toxicants for wildlife damage management is limited only to private and [redacted]l lands in the state, except for situations involving human health and safety, wildlife disease surveillance, scientific research, wildlife relocation. WS abides by state laws as a matter of policy. Thus, the only methods available for WS to use in PDM actions for livestock or wildlife protection on [redacted] lands in the state are nonlethal methods, aerial hunting, and ground-based shooting.

Within the State as a whole, WS conducted some level of PDM activity on properties whose total area was only 3.4% of the total area of the State in FY 1997. PDM activity on [redacted] lands has been very limited in recent years — in FY 1997, WS PDM occurred on only 3.8% of the FS land and on 1.5% of the [redacted] land in the State. On many of the individual properties under agreement, WS expects to spend only a few hours or days each year in a specific location trying to resolve a particular problem.

The only federal land in Arizona on which WS has conducted PDM in recent years is within the [redacted]. As part of the current program in the State, WS could be requested to conduct PDM in other [redacted] land areas including the [redacted].

1.1 Need for Action

The proposed 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 State.

1.1.1 Summary of the Proposed Action

The proposed action is to allow WS to use limited predator damage management methods as allowed by law on [redacted] lands in the State where damage has occurred or is expected to occur and where requests for assistance are received. The proposed action is greatly limited in scope — operational PDM will not be conducted on individual areas totaling more than 7% of the [redacted] lands in the State in any one year, and methods are limited to only those that are allowed by Proposition 201. An integrated approach would be implemented which would allow the use of all legal techniques and methods, used singly or in combination, to meet requester needs for PDM on [redacted] lands in Arizona. As established by Proposition 201, methods allowed to be used on federal public lands are restricted to frightening devices (propane exploders, siren-strobe light devices, etc.), aerial hunting, ground-based shooting, cage traps, and trained dogs. In situations where human health and safety are being protected or where the objectives are related to wildlife disease surveillance, scientific research, or wildlife relocation, state law provides an exemption for use of prohibited methods (leghold traps, snares, and registered toxicant methods). Work Plans would be established 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 predator damage management on federal public lands. WS PDM on [redacted] lands 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 indicated above 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 Need for Predator Damage Management for Protection of Livestock

1.1.2.1 Contribution of Livestock to the Economy

Agriculture generates more than $2.1 billion in annual sales of farm and ranch commodities in Arizona. Livestock production, primarily cattle, hogs, and sheep is one of the primary agricultural industry sectors and accounts for about 40% of total farm commodity cash receipts (AASS 1997).

Livestock production in Arizona contributes substantially to local economies. As of January 1, 1997 there were an estimated 790,000 cattle and calves in the State valued at $458 million. Sheep and lamb inventories totaled 125,000 valued at $12.5 million. Total cash receipts from sales of all livestock products were about $838 million in the State in 1996 (AASS 1997).

1.1.2.2 Scope of Livestock Losses

Many studies have shown that coyotes (*Canis latrans*) 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). Other predators that cause predation on cattle, calves, sheep, and lambs in the State are mountain lions (*Felis concolor*), black bears (*Ursus americanus*), feral or free-roaming dogs (*Canis familiaris*), bobcats (*Lynx rufus*), and occasionally gray fox (*Urocyon cinereoargenteus*), and raccoons (*Procyon lotor*). Research on two study areas in Arizona showed that cattle (nearly all calves) comprised about 30% of lion diets which indicates depredation on livestock by lions can be substantial (Shaw 1981).

Cattle and calves are most vulnerable to predation at calving time and less vulnerable as they become

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 and black bears is reduced. 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). This killing of livestock causes economic hardships to livestock owners. Without effective predator damage management to protect livestock, predation losses would be higher (Nass 1977, 1980, Howard and Shaw 1978, Howard and Booth 1981, O'Gara et al. 1983).

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.

Connolly (1992a) determined that only a fraction of the total predation attributable to coyotes is reported to or confirmed by WS. He also stated that based on scientific studies and recent livestock loss surveys from the NASS, WS only confirms about 19% of the total adult sheep and 23% of the lambs actually killed by predators. WS Specialists usually are unable to locate all predator kills reported by ranchers due to time constraints, but rather make attempts to verify sufficient losses to determine that a problem exists which requires management action.

Although it is impossible to accurately determine the amount of livestock saved from predation by PDM, it can be estimated. Scientific studies reveal 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%, respectively (Henne 1977, Munoz 1977, O'Gara et al. 1983). Conversely, other studies indicate that sheep and lamb losses are much lower where PDM is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978; Howard and Booth 1981).

1.1.2.3 Loss of Livestock to Predators on [redacted] Lands

Livestock losses to predators on [redacted] lands in Arizona have been confirmed by or reported to WS in recent years. Table 1-1 shows the numbers and total value of sheep, lambs, cattle and calves reported by cooperating producers to have been lost to coyotes and other predators on such lands in the State in calendar year 1996, the latest year for which such data are available. Many public land livestock producers in the State do not experience substantial predation or are able to protect their livestock themselves. Predation losses can also be sporadic from year to year on individual grazing allotments or ranches.

Table 1-1. Reported Livestock Losses to Predator Species on [redacted] Lands in Arizona in 1996. Data are from WS Management Information System. Values are as reported by producers; values per head may vary due to differing values based on breed of livestock.

Land Class	Class of Livestock	Predator Species	# Reported Lost	Total Value of Losses
[redacted]	Adult Cattle	Black Bear	1	$800
	Calves	Coyote	15	$7,500
		Mountain Lion	115	$53,100
[redacted]	Adult Cattle	Black Bear	1	$800
		Mountain Lion	3	$2,800
	Calves	Coyote	4	$2,500
		Black Bear	10	$5,000
		Mountain Lion	148	$75,000
		TOTAL	293	$147,500

WS confirms a portion of the losses that occur on cooperating ranches. Table 1-2 shows losses confirmed by WS on [redacted] lands during federal fiscal year 1997.

Table 1-2. Confirmed Livestock Losses to Predator Species on [redacted] Lands in Arizona in FY 1997. Data are from WS Management Information System. Values are as reported by producers; values per head may vary due to differing values based on breed of livestock.

Land Class	Class of Livestock	Predator Species	# Confirmed by WS	Total Value of Losses
[redacted]	Calves	Mountain Lion	11	$5,500
		Coyote	4	$1,600
[redacted]	Calves	Mountain Lion	38	$17,600
		Black Bear	1	$500
		Coyote	2[1]	$550
		TOTAL	56	$25,750

[1]One of these calves was only injured with cost estimated at $50.

Persons concerned about WS PDM programs frequently assume WS-confirmed losses represent total predation losses experienced by livestock producers. However, WS's field specialists do not attempt to locate every head of livestock reported by ranchers to be killed by predators, but rather to verify sufficient losses to determine that a problem exists that requires management action. Losses *reported* by producers are therefore more apt to be representative of true losses (see section 2.3.7 for more information supporting this conclusion).

Land status in many areas of the State is intermingled with some ranch units comprised of a mix of federal, state, and private land. At times, predators travel from adjacent federal lands to prey on livestock on private lands. In such situations, PDM on the federal land areas is often necessary to resolve damage problems.

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.

Predator damage management on federal public lands could be undertaken to assist in meeting wildlife management objectives set by the [redacted]. Such management could be coordinated with livestock protection efforts in areas where both types of resources occur and are being affected by predation.

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 [redacted] 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. 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 [redacted] 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 [redacted] of northwest Colorado.

Studies evaluating effectiveness of predator control in improving mule deer abundance are limited. 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). Studies demonstrating effectiveness of predator control in improving white-tailed deer (*O. virginianus*) abundance are more prevalent. Guthery and Beasom (1977) demonstrated that after coyote control, white-tailed deer fawn production was more than 70% greater after the first year, and 43% greater after the second year in their southern Texas study area. Stout (1982) increased white-tailed deer production on three areas in Oklahoma by 262%, 92% and 167% the first summer following coyote damage management, an average increase of 154% for the three areas.

Pronghorn Antelope. 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.

A two-year study using radio telemetry on the [redacted] 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).

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.

Wild Sheep. Bighorn sheep (*Ovis canadensis*) and, in particular, desert bighorn sheep (*O. c. mexicana*), have been known to be preyed upon by a variety of predator species such as wolves, coyotes, mountain lions, lynx, bobcats, and eagles (Wishart 1978). Mountain lions, in particular, have caused declines in populations of bighorn sheep (Wehausen 1996). In general, predator control is not considered necessary to enhance bighorn populations (Wishart 1978). However, in situations where efforts are being made to establish a population, or where a population has declined to low numbers and the objective is to increase them, predation, particularly by mountain lions, can prevent or slow the achievement of objectives. In such cases, the [redacted] might request assistance in removing mountain lions or other predators. Field studies are underway in some areas of the country to investigate the use of DNA analysis to maximize the selectivity of mountain lion capture so that the take of nonoffending lions is avoided (E. Rominger, New Mexico Department of Game and Fish, pers. comm. 1997), and WS is assisting in these efforts.

Wildlife management agencies need to consider many factors in deciding whether PDM should be conducted to enhance a particular population of a game species. In situations where a herd has declined because of some natural disaster and is unable to increase because of other limiting factors that cannot be managed such as drought, predator control can be beneficial in maintaining the remaining herd so that it is able to recover when habitat conditions improve. The studies discussed above suggest that predation could be limiting some big game populations in some situations. It must be emphasized, however, that predator control cannot be expected to reverse declines of big game populations that have resulted from unabated habitat deterioration (Connolly 1978). The need for PDM to protect or enhance populations of game species on federal public lands in the State, and the decision to conduct such actions, are the responsibility of the [redacted]. WS has assisted the [redacted] in controlling coyote predation on pronghorn antelope fawns in several areas of the state in the past. Those areas were the [redacted]. Recent communications from the [redacted] indicate they may request coyote PDM to enhance pronghorn populations in the [redacted] resource area in northwest Arizona.

Threatened and Endangered Species

PDM may at times be needed to protect T&E species. For example, black-footed ferret (*Mustela nigripes*) 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

(USDI 1995). 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*) (USDI 1988). The Arizona WS program has assisted in black-footed ferret recovery by collecting coyote blood samples used to monitor canine distemper in the vicinity of ferret release sites. WS has been requested to assist in conducting preventive 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 State specifically to protect wildlife, it would be at the request of [redacted], or other appropriate managing authority to meet their management objectives.

1.1.4 Predator 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 may provide assistance in responding to these types of incidents on [redacted] lands as well as on lands of any other types of ownership in the State when requested by the [redacted].

Black bears may occasionally pose a threat when they habituate to urban or residential locations, or recreation areas such as campgrounds or picnic areas. The [redacted] may respond to such instances by live capturing bears in culvert traps and relocating them. Black bears have also been responsible for several near fatal maulings of humans in Arizona in recent years. WS could be requested to assist in the capture of bears that are nuisances or are threats to human safety. It is [redacted] policy to euthanize bears or other predators that have attacked or that exhibit a strong tendency to attack humans.

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). Although no such attacks have been documented in Arizona in recent years, several incidents involving aggressive behavior toward humans have occurred ([redacted], pers. comm., 1998).

Coyotes sometimes create human safety threats when they spend time on airport runways. One incident occurred in which a plane struck a coyote at [redacted] airport and several near misses have occurred at [redacted]. WS has responded to a number of requests from airports in Arizona 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. Two attacks on children resulting in minor injuries occurred in the State in 1997. The [redacted] has attributed these attacks to feeding of coyotes by residents in the area ([redacted], pers. comm., 1998). 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. Baker and Timm (1998) discussed circumstances surrounding 53 cases of attacks on humans in California of which 21 resulted in injuries. They concluded that certain signs of coyote behavior in urban

areas such as increased taking of pets, observance of coyotes in daylight hours, and chasing of joggers and bikers generally precede attacks on humans and can indicate the need for preventive control strategies. In [redacted], 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. Baker and Timm (1998) concluded that the use of leghold traps to capture and euthanize a few coyotes in an area was the best and longest-lasting way to deter further human-coyote problems in a local population of coyotes. After the [redacted], 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 on federal public lands in the State 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 Arizona include coyotes, striped skunks (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), raccoon, and feral/free-ranging domestic dogs and cats. WS also may assist [redacted] in obtaining blood samples from carnivore species for purposes of monitoring plague and potentially other wildlife-borne diseases. These types of actions could be conducted on [redacted] lands.

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-WS program. This EA is tiered to that EIS.

[redacted]

[redacted]

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] were given opportunity to provide 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's current program of predator damage management on federal public lands be continued in Arizona (the no action alternative)?

If not, how should WS fulfill its legislative responsibilities on federal public lands in Arizona?

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, raccoons, striped skunks and other predator species on federal public lands in Arizona.

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 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.

1.4.4 Site Specificity. This EA analyzes potential impacts of WS PDM activities on all federal public lands that might fall under WS Work Plans in Arizona. A statewide basis for analysis was chosen because the State is the smallest administrative unit of the Arizona WS program. The proposed action is to continue the current program, the goal of which is to provide service on a case-by-case basis when requested within the constraints of available funding and manpower. 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. Furthermore, the scope of the proposed action as described herein is extremely limited -- no more than 7% of federal public lands would receive any level of PDM conducted by WS in any one year, and lethal methods of take have been severely limited by Proposition 201. These limitations further enhance the predictability of environmental consequences of PDM activities no matter where such activities are conducted. Thus, determination of environmental consequences in more localized areas can be adequately made with a statewide basis of analysis, rendering further, more site-specific analyses unnecessary. 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. For wildlife protection activities requested by the [redacted], that agency will analyze site specific impacts on a case-by-basis through its Environmental Assessment Checklist process in compliance with Department policy and NEPA.

1.4.5 Summary of Public Involvement Efforts

Issues related to the proposed action were identified from other environmental documents and from input from the [redacted]. The Pre-Decision EA was sent to known interested parties, and notice of its availability was published in several major newspapers within the State.

1.5 Authority and Compliance

1.5.1 Authority of Federal[2] and State Agencies in Wildlife Damage Management in Arizona

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*

[2]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).

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

1.5.1.2 [redacted]

[redacted]

1.5.1.3 [redacted]

[redacted]

1.5.1.4 [redacted]

[redacted]

1.5.1.5 Proposition 201 -- An Initiative Measure Amending ARS 17-301

Prohibits the use of leghold traps, snares, and poisons to take wildlife on Federal, State, County, or City land in the State of Arizona. Exceptions include protection of human health and safety, wildlife disease surveillance, scientific research, wildlife relocation, aquatic wildlife management, and non-furbearing rodent control.

1.5.1.5 [redacted]

[redacted]

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 federal public lands land under WS Work Plans will be analyzed in a comprehensive manner in the State.

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 policy interpretations as to whether permit requirements of this law apply to federal agencies are pending as of the preparation of this EA.

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 State are registered with and regulated by the EPA and the ADA. 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 ADA, 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

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) 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. That evaluation is summarized in Chapter 4. Impacts on other nontarget species that are not threatened or endangered but that have been taken by WS in the State are also evaluated. "Take" of nontargets includes captures in which the animal is released unharmed 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, or that they or their pets might harmed by PDM methods. Others feel that they are being deprived of the aesthetic experience of viewing or hearing coyotes or other predators because of WS PDM actions.

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 or killed by shooting, 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.

Because of the passage of Proposition 201 and WS policy requiring adherence to state law, lethal PDM methods on federal public lands in Arizona are almost entirely restricted to those that involve shooting. With the exception of cage traps which have extremely limited utility in PDM, no capture or restraining devices will be used on such lands, except in limited circumstances that fall within certain exceptions established by Proposition 201 such as protection of human health and safety, wildlife disease surveillance, scientific research, or wildlife relocation. Despite the substantial limitations imposed on the taking of wildlife in the State, some members of the public nevertheless oppose shooting as a method of killing animals on humaneness grounds. However, 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.

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 State (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. 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. 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 PDM should be conducted by appropriating funds. Although not required by law, the Arizona 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.

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 tendency 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. Connor (1995) 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 on more vulnerable types of livestock such as Angora goats.

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 and spring when cover allows for greater visibility of target animals. 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 State 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.

- Ducks. Conomy et al. (1998a) quantified behavioral responses of wintering American black ducks (*Anas rubripes*), American wigeon (*A. americana*), gadwall (*A. strepera*), and American green-winged teal (*A. crecca carolinensis*) exposed to low-level flying military aircraft in North Carolina. They found that only a small percentage (2%) of the birds reacted to the disturbance and concluded that such disturbance was not adversely affecting the time-activity budgets of the species. Conomy et al. (1998b), found that black ducks habituated more readily to aircraft noise than did wood ducks. Again, 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 wintering 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 State -- in FY 1997, 50 hours of helicopter and 4 hours of fixed-wing airplane hunting were expended. However, the only aerial hunting that occurred on federal public lands was 4 hours of fixed-wing hunting on the [redacted]. As shown in section 1.0, WS conducted PDM activities on areas under agreement that totaled only 3.8% of [redacted] and 1.5% of [redacted] land in the State in FY 1997. WS does not expect to conduct PDM on more than 7% of the federal public lands in the State and expects to conduct no more than 200 hours of aerial hunting on such lands in any one year. Therefore, more than 90% of the public lands in the State would not be subjected to any aerial hunting by WS, even with the highest degree of aerial hunting activity expected under implementation of the proposed action. Put in perspective, the amount of aerial hunting that could occur on federal public lands in the State would be the equivalent of less than 43 minutes of low-level flight per 10 $mi.^2$ on, at most, only 7% of the federal public lands in any one entire year.

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. WS would not conduct PDM specifically for protection of state-managed wildlife on federal public lands unless requested by the [redacted].

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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 (e.g., coyotes, black bears, mountain lions) are relatively abundant in much of the suitable habitat in the State, and translocation is not necessary for the maintenance of viable 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 Arizona or in most other areas of the western U.S. Coyote populations in the State 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 other entities. The *status quo* for coyote populations in Arizona is human-caused mortality in the range of 20,000 to 50,000 coyotes killed per year (statewide) even without a federal WS program.

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

The Arizona WS program addressed the question of whether the value of avoided losses exceeds the cost of PDM service in the Decision issued on a statewide EA for PDM on Nonfederal and [redacted] lands in Arizona (USDA 1996). That analysis indicated the value of avoided losses probably exceeds PDM costs by more than 4 to 1.

2.3.11 Predator Damage Management in Wilderness Areas

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. WS conducted PDM in the [redacted] in FY 1997. Those efforts were in response to confirmed losses of livestock totaling seven calves to mountain lions and one calf to a black bear. Four mountain lions were captured and removed from the [redacted] by WS using trail dogs, and no predators were taken in the [redacted]. Circumstances could warrant WS PDM service in a [redacted] in the future for protection of livestock, wildlife, or for human safety protection. The need for such activity is expected to remain a minor part of the program. Bears and lions are under [redacted] management authority, and the [redacted] and [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 permitted under [redacted]'s administration of ARS Title 17-302 after confirmed depredation on livestock or the identification by the [redacted] of threats to human safety or need for protecting other wildlife species. The methods used to take bears or lions would be the same as those used by sport hunters under the management authority of [redacted]. In any event, WS PDM will only occur in wilderness when allowed under the provisions of the specific wilderness 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] 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 Arizona currently uses steel shot for aerial hunting. Therefore, there is no risk of toxic effects on eagles.

2.3.13 Effects on Nonconsumptive Wildlife Use

WS has received comments on PDM EAs in other areas expressing concern that PDM to enhance populations of other wildlife species such as deer and antelope somehow adversely affects the interests of persons that do not hunt but like to view wildlife. WS recognizes that nonconsumptive use of wildlife is a valuable component of wildlife recreation in the State in addition to consumptive uses, and that some of this nonconsumptive use is in the form of wildlife viewing. It is doubtful that PDM would be needed or ever requested to enhance nonconsumptive uses of wildlife, with the possible exception of T&E species protection. Nevertheless, the EA indicates that PDM services could be provided if requested by the [redacted] to increase ungulate big game populations where predation has been identified as the limiting factor, which could enhance viewing opportunities. Viewing opportunities for predators such as coyotes in these situations would be reduced, however, in the short term, although most predator species are not as easily observed as are ungulate game species. Potential negative impacts on nonconsumptive uses of wildlife would be limited to reduced opportunities to hear or view coyotes in certain areas where local population control was conducted. This impact would not be significant, however, because of the small amount of land area impacted by WS PDM in the State and the low magnitude of WS's impact on the coyote population. Some persons might also feel that opportunities to view other predators such as mountain lions would be reduced by WS PDM actions. However, seeing a mountain lion in the wild is an exceedingly rare occurrence even where there are maximum lion populations because their densities are extremely low in comparison to more viewable species (a high lion population is 7 per 100 square miles); also, mountain lions are generally highly secretive, elusive, and are difficult to view even for experienced wildlife biologists (Logan et al. 1996). As shown in section 4.2.1.1, WS's take of mountain lions in the state is within levels supportable by the population. Since the [redacted]'s management goal for mountain lions is to maintain a viable population in the state, the coordination of all lion take with the [redacted] will assure that significant adverse impacts on nonconsumptive as well as consumptive users of the resource will be avoided. The EA also shows that WS's impacts on other wildlife species are minimal which means impacts on nonconsumptive users would be insignificant.

2.3.14. Effects of PDM on "meso-predator" release, or the increase of small carnivores following coyote removal, which could have negative impacts on bird species populations

This issue implies the belief that WS engages in general population suppression of coyotes across the State, which is not true. Section 4.2.3.1 mentions the phenomenon of increasing small carnivore abundance as a possible natural mitigation against increased rodent and rabbit numbers that might occur in localized areas where coyote numbers are reduced. Meso-predator release in response to WS's coyote removal is unlikely to be significant on federal public lands or on other lands in the State, based on the small proportion of land area upon which WS PDM is conducted (<4%), the relatively low level of coyote removal by WS, which is currently less than 2% of the population (see Table 4-2), and the immigration of coyotes from surrounding areas (see section 2.3.4 for a discussion of why this does not mean PDM is ineffective).

2.3.15. Predator population impacts should be based on population estimates for [redacted] lands.

Estimates of populations on just [redacted] lands are not made because it is neither feasible nor appropriate to try to differentiate predator populations by administrative land management boundaries that are not recognized by the predator species being managed. Analyzing impacts on a statewide basis is more conducive to adequately evaluating cumulative impacts.

2.2.16 Effects on Human Affectionate-Bonds with Individual Animals and on Aesthetic Values of Wild Predator Species.

At times, some individual members of predator species habituate and learn to live in close proximity to

humans. Some people in these situations develop emotional attitudes toward such animals that result in aesthetic enjoyment. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from knowing predator species exist and from observing them or hearing their vocalizations in the wild (e.g., coyote howling). Public reaction to damage management actions is variable because members of the public can have widely different attitudes toward wildlife. Some individuals that are negatively affected by wildlife support removal or relocation of damaging wildlife. Other individuals affected by the same wildlife may oppose removal or relocation. Individuals unaffected by wildlife damage may be supportive, neutral, or opposed to wildlife removal based on personal views.

The pubic's ability to view wild mammals or birds in a particular area would be more limited if the wildlife are removed or relocated. Most predator species tend to avoid humans which means opportunities to develop emotional bonds with individual members of such species are minimal. However, immigration of wildlife from other areas will generally replace the animals removed or relocated during damage management actions so that impacts on aesthetic enjoyment are not long term. In addition, the opportunity to view or feed other wildlife would continue to be available in other parks or areas with adequate habitat.

WS has not received any requests for assistance in resolving nuisance problems caused by predator species on federal public land areas in recent years, and such requests are expected to remain infrequent. If such a request is received, WS will coordinate damage management activities with the appropriate natural resource agencies/officials before any actions are undertaken to provide opportunity for identifying additional aesthetic concerns that may need to be addressed or mitigated. Nevertheless, some persons will probably feel their interests are being adversely affected by removals of individual animals in some situations.

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 on federal public lands in Arizona.

3) Alternative 3 - Technical Assistance Only. Under this alternative, WS would not conduct any direct operational PDM activities on federal public lands in the State. 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 on federal public lands in the State.

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

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 on federal public lands in the State. The current WS PDM program in Arizona is a collection of cooperative programs with other Federal, State and local agencies, and private individuals and associations (described in Chapter 1). The program provides technical assistance and conducts preventive (in response to anticipated or historical loss) and corrective (in response to current loss or hazard) operational PDM on private, [redacted] lands under MOU, Cooperative Agreements or Agreements for Control, Annual Work Plans, or other type of agreement instrument. The scope of this EA, however, only covers that portion of the PDM program that occurs or could occur on federal public lands. All WS PDM is based on interagency relationships, which require close coordination and cooperation because of overlapping authorities.

On federal public lands, WS Work Plans describe the WDM that would occur. During the WS annual

planning process with the [redacted], plans are prepared which describe and delineate where WS WDM can be conducted and what methods can be used. 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 [redacted] or under regulations developed by the [redacted]. WDM in these designated areas is only, and is expected to continue to be, a minor part of the current program.

Under the current program, WDM for the protection of wildlife may be conducted on federal public lands at the request of the [redacted], 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 recommendation or 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 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. APHIS regulations categorically exclude technical assistance from the requirement to prepare an EA or EIS (7 CFR 372.5(c).

- 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.

Predator Damage Management Methods

PDM methods available for use on federal public lands in Arizona have been extremely limited by Proposition 201. Leghold traps, snares, and registered toxicant methods are no longer allowed to be used on such lands except in limited circumstances such as protection of human health and safety, wildlife disease surveillance, scientific research, or wildlife relocation. The methods that are still available are described as follows:

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. 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; Andelt 1992, 1995), and WS has an information bulletin available to producers who are interested in this method (Green and Woodruff 1993). They require a considerable degree of commitment and effort on the part of producers to be effective. WS is aware of only one sheep producer that operates on federal public lands in Arizona; this producer uses guard dogs in combination with herding and has experienced very little predation to coyotes, although black bears have caused damage on occasion. The use of guard dogs in this case has apparently reduced the need for other methods of PDM.

  In many cases, the effort to train and use guard dogs is likely worthwhile — 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, Pueblo, CO, pers. comm. 1997).

  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 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 can, however, have 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. 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 to implement and maintain the nonlethal methods described above on the more than 250 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. Lethal PDM methods have been extremely limited for use on federal public lands by Proposition 201.

1. Aerial hunting, the shooting of coyotes from fixed-winged aircraft or helicopters, is used 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 and chemical methods established by Proposition 201, increased use of aerial hunting may become necessary to mitigate reduced effectiveness in resolving livestock depredation problems.

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 and black bears. 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. Leghold traps and snares (both neck and foot snares) will not be used by WS on federal public lands in the State, with the exception that they may be used in extremely limited circumstances as allowed by Proposition 201 (such as protection of human health and safety, wildlife disease surveillance, scientific research, or wildlife relocation).

   Cage-type traps may be used on federal public lands in the State. They 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) are sometimes used for capturing black bears.

   Proposition 201 allows for the use of traps and snares to relocate wildlife. However, since coyotes are numerous throughout the State, 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.

5. Den fumigation is the practice of destroying coyote pups in dens by fumigation with the carbon monoxide-producing gas cartridge. This method is no longer available for use on public lands in Arizona because of Proposition 201. Therefore, pups in active dens can no longer be euthanized with a fumigant when such dens are found following removal of adult coyotes in the spring.

Chemical Management Methods:

Chemical pesticides may no longer be used for livestock protection on federal public lands because of Proposition 201. Registered toxicant methods are now restricted on public lands in Arizona to very limited situations such as protection of human health and safety in which wild canid predators are vectors of a communicable disease, for protection of federally listed threatened or endangered species, or for scientific research. Any chemical methods that could be used by WS under these limited circumstances are registered under FIFRA and administered by the EPA and ADA. WS personnel that use restricted use pesticides are certified as pesticide applicators by ADA and are required to adhere to all certification requirements set forth in FIFRA and Arizona state pesticide control laws and regulations.

A quantitative risk assessment approach to evaluating potential impacts of WS methods concluded that no adverse effects are expected from WS use of any chemicals (USDA 1994, Appendix P). Now that such methods can no longer be used on public lands in the State for livestock protection, concerns about risks to the public and nontarget animals are unfounded.

3.2.2 ALTERNATIVE 2 - No Federal WS Predator Damage Management

This alternative would consist of no federal involvement in PDM on federal public lands in Arizona. 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 the WS research branch would not be available to producers unless the WS National Wildlife Research Center continued in operation and research results were disseminated by the Cooperative Extension Service and/or by state agencies. Producers, state agency personnel, or others could conduct PDM activities using any nonlethal methods they deem effective, but lethal

methods would be restricted by Proposition 201 in the same way that WS is now restricted. Methods and control devices could be applied by persons with little or no training and experience.

3.2.3 ALTERNATIVE 3 - Technical Assistance Only

This alternative would not allow WS operational PDM on federal public 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 using any nonlethal methods they deem effective, but lethal methods would be restricted by Proposition 201 in the same way that WS is now restricted. 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 following 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 on federal public lands as described under the proposed action. Producers, state agency personnel, or others could conduct PDM activities using any nonlethal methods they deem effective, but lethal methods would be restricted by Proposition 201 in the same way that WS is now restricted.

3.2.5 ALTERNATIVE 5 - Nonlethal Control Required Before Lethal

This alternative would allow no use of lethal methods by WS on federal public lands as described under the proposed action until nonlethal methods have been employed in a given damage situation and found to be ineffective or inadequate. 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. 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.

3.3 Alternatives Considered But Not Analyzed in Detail With Rationale

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

3.3.1 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). This alternative was eliminated from further analysis because it has been what the current program already practices on federal public lands when livestock is the protected resource. In particular, bear and mountain lion PDM for livestock protection is only conducted following confirmed depredation on livestock. Other reasons for rejecting this alternative are that (1) it is not practical or acceptable when public health or safety or threatened/endangered species are the resources being protected, and (2) it would preclude

most types of other wildlife protection projects such as coyote management to enhance fawn survival of deer and antelope.

3.3.2 Compensation for Predator Damage Losses

The Compensation alternative would require the establishment of a system to reimburse persons impacted by predator damage. No program for compensation of damage by predators currently exists in Arizona with the exception of the program by the Defenders of Wildlife to pay compensation for livestock depredation by reintroduced Mexican gray wolves. 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.

3.3.3 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 assure bounties are not paid on animals taken from outside damage management areas.

3.3.4 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 State.

In Arizona, 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 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 State would be conducted on a very small portion of the area inhabited by problem species (as discussed in section 1.0).

3.3.5 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 [WS] 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 the available 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.

3.3.6 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 ADA, and therefore cannot legally be used or recommended for this purpose.

3.3.7 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.

3.3.8 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. Although trapping of coyotes on federal public lands has been stopped in Arizona by the passage of Proposition 201, private coyote harvest in the State has increased according to the [redacted]. However, increased private harvest does not necessarily reduce damage problems. One reason is that, despite the increased harvest levels, cumulative harvest is still well below a level sustainable by the overall coyote population (see Chapter 4). Private fur takers tend to operate where furbearer populations are high, and 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. Because private individuals cannot use traps or snares on federal public lands in the State and are limited to ground-based shooting to take coyotes, their ability to resolve damage problems is less than the WS program which can also use aerial hunting. Although some private trappers and hunters are highly skilled and use good equipment, many are less skilled and use less adequate equipment, and can sometimes hamper professional PDM efforts by educating coyotes to control methods. With the exception of private lion and bear hunters who use trail dogs, private hunters and trappers are probably 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 2.3.4) 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. For all of these reasons, private recreational harvest is not a reasonable alternative to professional PDM programs.

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 Arizona, 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.
- On federal public lands in Arizona, lethal PDM methods that may be used by WS for livestock or non-T&E wildlife protection are restricted to those that are virtually 100% selective for target species (aerial and ground based shooting or shooting subsequent to baying of a target animal by trail dogs).

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.
- The risk of hazards to public safety and hazard to the environment from WS PDM methods 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

- On federal public lands in Arizona, lethal PDM methods that may be used by WS for livestock or non-T&E wildlife protection are restricted to those that are virtually 100% selective for target species (aerial and ground based shooting or shooting subsequent to

baying of a target animal by trail dogs).

- 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, jaguarundi, ocelot, desert tortoise, and California condor, all of which occur or could occur in Arizona. WS is also in the process of reinitiating formal consultation, and, as appropriate for experimental nonessential populations such as the California condor, *conferences*, on a nationwide programmatic basis, and will abide by any necessary RPAs or mitigations established as a result of that process. The restrictions on PDM methods imposed by Proposition 201 have virtually eliminated the risk of nontarget take of any of these species by WS on federal public lands. Other possible adverse impacts on scavenging species such as bald and golden eagles and California condors from possible ingestion of lead shot have been mitigated by AZ WS's exclusive use of steel shot.

3.4.2.3 Impact of Coyote Removal on Prey Populations

- WS PDM activities are directed toward resolving problems by taking action against individual problem animals, or local populations or groups. WS conducts PDM activities on less than 4% of the land area of the State, less than 4% and 1% of [redacted] lands in the State, respectively, in any one year. It is anticipated that, under the current program, PDM actions would not be conducted on more than 7% of the State or of the federal public lands in any one year in the reasonably foreseeable future. Thus, 93% of the land area of the State, and of all federal public lands in the State, 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 on federal public lands only when and where a need exists and is requested. WS PDM actions on such lands under the current program are extremely limited in extent -- for example, WS conducted some level of PDM on only 3.8% of the FS land and on 1.5% of the BLM land in the State in FY 1997.
- Vehicle access will be limited to existing roads unless off-road 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 when conflicts with recreational events may occur.

- PDM in Wilderness Areas would be in accordance with [redacted] policy.
- PDM in [redacted] would conform to the [redacted]) until or unless that policy has been revised or rescinded.

3.4.2.5 Humaneness and selectivity of methods used by WS

- In compliance with State law, methods available for use on federal public lands by WS are virtually 100% selective for target species (aerial and ground based shooting).
- Research continues with the goal of improving the selectivity and humaneness of wildlife damage management methods.

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions concerning the issues discussed in Chapter 2. This 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 Consistency of Alternatives with [redacted]

Actions taken on [redacted] lands must be consistent with land management and/or resource management plans. 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] 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 and EAs that have been prepared by WS.

EAs and work plans written by both the [redacted] found WS PDM actions to be consistent with land management plans in Arizona, even when such activity was not addressed *per se* in those plans. Under the 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.

[redacted]. The only [redacted] in Arizona that address PDM are the [redacted]. The [redacted] states that animal damage control will be coordinated with the USFWS where needed (the federal WS program was transferred from the USFWS to USDA, APHIS in 1986). The [redacted] states that predator control will conform to applicable state and federal laws. PDM as proposed by WS in this EA would conform to the language in both of these [redacted]. The lack of discussion about PDM in the [redacted] for the [redacted] does not mean PDM is inconsistent with those [redacted] plans. The [redacted] found that PDM by WS was consistent with the [redacted] in previous EAs for animal damage management (USDA, FS 1990, 1992), and has not identified any inconsistencies with WS PDM actions on those forests following Decisions and Findings of No Significant Impact issued by WS on those EAs (USDA 1997a, 1998a, 1998b). In accordance with the national level MOU with the [redacted], WS would coordinate with each individual [redacted] prior to initiating any PDM activity. Each [redacted] was asked to review a preliminary draft of this EA and did not identify any inconsistencies with land use plans. Each [redacted] is responsible for identifying any inconsistencies with land use plans during the coordination of WS Work Plans.

[redacted]. [redacted] lands in Arizona were previously managed by [redacted] — [redacted]. Each [redacted] was divided into two or more [redacted]. The [redacted] in each District were: [redacted] The [redacted] has recently abolished the "[redacted]" designations, and placed all management of [redacted] lands in the State under seven [redacted] which are the [redacted]. The [redacted] is still operating under [redacted] that are based on the previous [redacted] designations. The [redacted] found that PDM by WS was consistent with the [redacted] in a previous EA for animal damage management ([redacted] 1994), and has not identified any inconsistencies with WS PDM actions on [redacted] lands following Decisions and Findings of No Significant Impact issued by WS on that EA (USDA 1997b, 1998c). In accordance with the national level MOU with the [redacted], WS would coordinate with each individual [redacted] prior to initiating any PDM activity. Each [redacted] was asked to review a preliminary draft of this EA and did not identify any inconsistencies with land use plans. The [redacted] is responsible for identifying any

inconsistencies with land use plans during the coordination of WS Work Plans.

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 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 expected "take" or kill of each species, in combination with other mortality, indicates that cumulative impacts of the proposed action would not cause substantive declines in populations or would be within levels desired by the State. 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 State 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

The species evaluated in this chapter were selected for analysis because they are taken by WS or may be taken in the future during PDM activities on federal public lands in the State. Estimating population densities of wildlife species is not precise and is 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.

WS take of target and nontarget species on federal public lands is, in actuality, very minor and is expected to remain relatively minor under the current program. Table 4-1 shows that the only take by WS on such lands in FY 1997 was 12 coyotes and 27 mountain lions. Each of the mountain lions taken were authorized by the [redacted] to be taken in response to confirmed livestock depredation. No other species were taken.

Table 4-1. Target and Nontarget Species Take (#killed) by WS PDM Activities on Federal Public Lands in Arizona During FY 1997.

# Killed by Species	[redacted] Lands (by Resource Area)						[redacted] Lands (by [redacted])					
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Coyote	9	--	--	--	--	--	3	--	--	--	--	--
Mountain Lion	--	--	--	8	--	--	10	--	9	--	--	--
Black Bear	--	--	--	--	--	--	--	--	--	--	--	--
Gray Fox	--	--	--	--	--	--	--	--	--	--	--	--
Kit Fox	--	--	--	--	--	--	--	--	--	--	--	--
Raccoon	--	--	--	--	--	--	--	--	--	--	--	--
Spotted Skunk	--	--	--	--	--	--	--	--	--	--	--	--
Striped Skunk	--	--	--	--	--	--	--	--	--	--	--	--
Badger	--	--	--	--	--	--	--	--	--	--	--	--
Fer.FR Dog	--	--	--	--	--	--	--	--	--	--	--	--
Fer.FR Cat	--	--	--	--	--	--	--	--	--	--	--	--

WS PDM actions on federal public lands could take members of any of the species shown in Table 4-1 under the current program. Potential impacts on populations are discussed in the rest of section 4.2.1 and in 4.2.2.

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

Coyotes are the primary species responsible for predator damage in Arizona and are therefore the major target species of the PDM program. However, they have been a relatively minor part of the program on federal public lands in the State — only 12 coyotes were taken by WS on such lands in FY 1997.

Coyote Population Information

Localized coyote populations could be affected to a small degree by the current predator damage management program. However, the WS program conducted operational PDM activities on only 3.4% of the land area of the State and on 3.8% of the [redacted] land and 1.5% of the [redacted] land in the State in FY 1997. WS expects to conduct such activities on no more than 7% of the land area of the State or on no more than that same percentage of all [redacted] or [redacted] lands in the State in any one year under the current program. Thus the impact of coyote removals on the coyote population would at most apply to only 7% of the federal public lands, and, cumulatively, to no more than 7% of all lands in Arizona.

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 Arizona is controlled by the [redacted]. The current sport harvest season for coyotes runs year long. 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., [redacted], 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). The [redacted] has recently estimated coyote abundance on a statewide basis to be 180,000 ([redacted], pers. comm. 1998). This estimate is consistent with population estimates that have been determined by scientific studies which have shown that densities can range from 0.1 to 14.3 per mi.^{2} (USDI 1978; Knowlton 1972; Hein and Andelt 1995; Gese et al. 1989). Field observations by WS personnel support the estimate by [redacted] as being reasonable. 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).

Coyote Population Impact Analysis

Data on the WS coyote kill for FY 1997 were used for this analysis. Table 4-2 displays the known information about coyote abundance and harvest during FY 1997, as well as projected maximum harvest/take levels that could reasonably be expected in the State in any one year in the future. WS take in the State would likely not exceed 3,000 in any one year under the current program. This is supported by WS records showing the maximum *statewide* take by WS in any one year since 1990 has not exceeded 2,500. Current private harvest as reported by the [redacted] was about 50,670 in the State in the 1996-97 harvest season. This is the highest private harvest level in a number of years which is counter to what would normally be expected with the restrictions on trapping that were established by Proposition 201.

Table 4-2. Fiscal Year 1997 and Greatest Expected Annual Coyote Take Data for Arizona.
Sustainable Harvest = 70%

	FY 1997	With Greatest Expected Future Take
Est. Population[1]	180,000	180,000
WS Take	1,525	3,000
Other Take	50,670	60,000
Total Take	52,195	63,000
WS Kill - % of Population	0.8%	1.7%
Other Take - % of Population	28.2%	33.3%
Total Take - % of Population	29.0%	35.0%

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, which was 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).

Using standards established in USDA (1994) to determine the magnitude of total harvest impacts to the population, a cumulative harvest of less than 75% of the allowable harvest level of 70% of the population of coyotes results in a determination of "low magnitude." Thus, a “low magnitude” impact rating is achieved if no more than 52.5% of the population is taken per year. The data in Table 4-2 indicate that current cumulative annual harvest of coyotes in the State is less than 30% of the population and would remain. Private coyote harvest and WS take would have to increase far beyond the greatest expected levels before the cumulative impact would exceed the level sustainable by the population. As shown in Table 4-2, the impact of WS’s PDM actions on the *status quo* for coyote populations in the state is negligible — i.e., cumulative harvest would still be 95 - 97% of what it is now without any program by WS.

Black Bear Population Impacts

Black bears can be found throughout much of North America. 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). Annual survival of unhunted and lightly hunted adult female black bears is approximately 80-90% (Kolenosky and Strathearn 1987). Bunnell and Tait (1985), using data from 8 studies in North America, calculated a weighted average of apparent annual mortality in female black bears to be 17.2%. Bear densities vary between 0.3 and 3.4 per mi.^{2}, depending on habitat, and black bears can live up to 25 years (Kolenosky and Strathearn 1987; Rogers 1976). LeCount (1982) determined the density of black bears to be 0.9 per square mile on a 46 mi.^{2} study area in central Arizona. In Arizona, black bear population densities generally range from 1 per mi.^{2} in good habitat to 1 per 2-5 mi.^{2} in intermediate habitat to 1 per 10 mi.^{2} in poorer suitable habitat ([redacted], pers. comm. 1996). The [redacted] estimated the adult black bear population to be at 2,500 in 1997 and considers the population to be stable overall ([redacted], pers. comm. 1998). The estimate is considered conservative because it does not include bears on [redacted] lands or [redacted] lands which comprise about 32,000 mi.^{2} or about 28% of the State.

WS killed a total of 17 black bears in the State in FY 1997. Of these, 15 were taken on Indian reservations and 2 were taken on private land. No bears were killed by WS on federal public lands in the State. The 2 bears taken by WS on private land constituted the total depredation take reported by the [redacted] for 1997. Private sport harvest and known “other” harvest was 229 in the 1996-97 season. Thus, cumulative take in 1997 was 231.

The [redacted] manages bear harvest by evaluating impacts on the female component of the population only ([redacted], pers. comm. 1998). Assuming a 50:50 sex ratio in the population of 2,500 adult black bears in the state estimated by the [redacted], the adult ($\geq$ 3.5 years old) female population is about

1,250. This estimate does not include bears on Indian Reservations. [redacted] has established a conservative harvest objective of 5% of the adult female population annually, and has determined that up to an 8% harvest of adult females can probably be sustained by the population (Kolenosky and Strathearn.1987). The number of adult females killed by all known causes was 77 in 1996 and 72 in 1997 (estimated from sport, depredation, and "other" harvest data, and from age data obtained from [redacted] files, J. Phelps, pers. comm. 1998). The percentages of the estimated adult female population killed in 1996 and 1997 were therefore 6.1% and 5.8%, respectively. Although these harvest levels exceeded the [redacted]'s 5% objective, they are below the 8% maximum harvest level determined to be sustainable by the [redacted].

An indicator of the relative intensity of harvest pressure on black bear populations is the sex ratio of the kill. This is based on the generality that males tend to be more vulnerable to hunting than females and that overharvest is probably occurring when the proportion of females in the harvest approaches 50% (Bunnell and Tait 1985; Fraser et al. 1982). The percentage of females in the sport harvest for 1996 and 1997 was 40 and 38, respectively (data from [redacted] files, J[redacted], pers. comm. 1998). Beecham and Zager (1992) established a general guideline that harvest is acceptable when the proportion of females is less than 40%. Harvest pressure based on this indicator appears to be moderate, rather than heavy. Another indicator of harvest pressure is the median age of bears harvested. In general, overharvest does not occur when the median age of all bears harvested is > 3 years and the median age of females harvested is > 4 years (Beecham and Zager 1992). The median age of all bears harvested in Arizona was > 4 in 1996 and in 1997; the median age of females harvested was > 4 in 1996 and > 5 in 1997 (calculated from age data provided by [redacted], [redacted], pers. comm. 1998). These statistics indicate overharvest did not occur.

The above analysis indicates cumulative take of black bears in Arizona is sustainable by the population. Furthermore, depredation take by WS has been an extremely minor component of the cumulative take. WS proposes to continue to take black bears on a case-by-case basis on public and private lands in the State only when authorized by ARS 17-302 as administered by the [redacted]. The [redacted] can modify harvest objectives as necessary to assure that cumulative impacts on the black bear population are within those desired by the State. This relationship is a built-in means by which the current program avoids significant adverse impacts on the quality of the human environment in the State as a result of WS's take of black bears. In addition, the impact of WS's PDM actions on the *status quo* for black bear populations in the State is negligible — e.g., cumulative harvest (which is predominantly sport harvest) would still have been about 99% of what it was in 1997 even without any program by WS.

Mountain Lion Population Impacts

Mountain lions have an extensive distribution across Western North America including Arizona. It is known by several other names, including panther, puma, catamount, and cougar. Mountain lions inhabit most 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 intraspecific (i.e., between or among members of the same species) tolerance for other mountain lions. Prey availability is directly related to prey habitat quality that directly influence's 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 strife also increase and/or mountain lions disperse into unoccupied habitat.

Mountain lion densities in the wild, based on a variety of population estimating techniques, range from a low of about 1/100 mi.^{2} (McBride 1976; Hemker 1984) to a high of 24/100 mi.^{2} (Sitton 1972) and average densities for the western states have been estimated at 7.5/100 mi^{-2} (Johnson and Strickland 1992). Shaw (1981) presented evidence in Arizona that livestock (i.e., calves) provide a supplemental prey base that supports mountain lions through seasonal declines in their primary prey which is deer. Cunningham et al. (1995), also a study in Arizona, determined there were actually greater cougar densities (about 75% greater) in the portion of their study area where there was substantial depredation control and sport hunting; their estimates of density ranged from 4 to 7 per 100 mi.^{2}. The [redacted] estimates the population of adult mountain lions in the state to be 2,500 in 1997 and considers the overall population to be stable ([redacted], [redacted], pers. comm. 1998). The estimate is considered conservative because it does not include lions on [redacted] or [redacted] lands which comprise about 32,000 mi.^{2} or about 28% of the State.

Various studies on mountain lion population dynamics provide insights into harvest levels that can be sustained by populations. The allowable annual harvest level for mountain lion populations, determined by the USDA (1994, Table 4-2) was 30%. Ashman et al. (1983) believed that under "Moderate to heavy exploitation (30%-50% removal)," mountain lion populations on their study area in Nevada had the recruitment (reproduction and immigration) capability to rapidly replace annual losses. Logan et al. (1996) determined the rate of increase varied from 8 to 11% in an unhunted, uncontrolled mountain lion population, and from 21 to 28% in a population in which harvest or control was simulated by removing half of the lions in a study area in New Mexico. They concluded that rates of increase in mountain lion populations are density dependent, meaning that, as a population declines in relation to carrying capacity, the rate of increase becomes greater. This is a natural mechanism of wildlife populations in general that serves to protect species by enhancing the ability of populations to recover from declines. The Logan et al. study suggested that, for a lion population to remain at or near the maximum supportable by the habitat (i.e., at carrying capacity), no more than 11% of the adults should be harvested per year. It also suggested that, for a population managed for control, the harvest level might need to exceed 28% per year to cause the population to decline substantially. It appears that a viable population can be maintained at about 50% of carrying capacity with harvest levels that are at or below 21% or, in some years, as high as 28%. To reduce a population that is at or near carrying capacity to 50% of carrying capacity would likely require initial harvest rates that are much higher than this 21-28% range ([redacted], [redacted], pers. comm. 1998). The [redacted] has established management guidelines that allow for the harvest of up to 25% of the adult lions in game management areas.

WS killed 43 mountain lions in Arizona in FY 1997. Of these, 27 were taken on [redacted] lands (see Table 4-1). The greatest number of mountain lions anticipated to be taken in any one year by WS in the future should be no more than 100. In the 1996-97 sport hunting season, private kill of mountain lions in the State was 267, total depredation take was 47, and total “other” known mortality (i.e., highway kills, capture mortality, and illegal take) was 3. Thus, cumulative take was 317 in FY 1997. Information on the ages of lions taken was not available so the proportion of adults in the

harvest is not known. Assuming that all lions taken were adults, the level of take was, at most, 12.7% of the adult population. Data from [redacted] files for lions harvested in the state from 1982 through 1987 showed that about 30% of the lions taken were young, or, presumably, subadult lions. Assuming the same holds true in general for sport harvest but not for depredation take, then the total number of adults taken cumulatively in the 1996-97 season was about 237 or 9.5% of the adult population. That level of harvest is below the 11% level that should be sustainable by a lion population at or near carrying capacity and less than half of the level that should be sustainable by a population that is at half of carrying capacity, as suggested by Logan et al. (1996). Over the long term, total lion harvest in the State has been about 10% of the estimated population annually which is considered by the [redacted] to be well within levels sustainable by the population [redacted], [redacted], pers. comm. 1998).

Further evidence of the sustainability of the cumulative harvest levels that have occurred over the years is shown by records of historic total harvests which have consistently oscillated within the range of 180 to 320 lions per year during the 46-year period from 1951 through 1997 (Figure 1; compiled from [redacted] data). The fact that there have been enough lions to maintain total harvest at these levels for so long a period is strong evidence that the State's lion population has been near

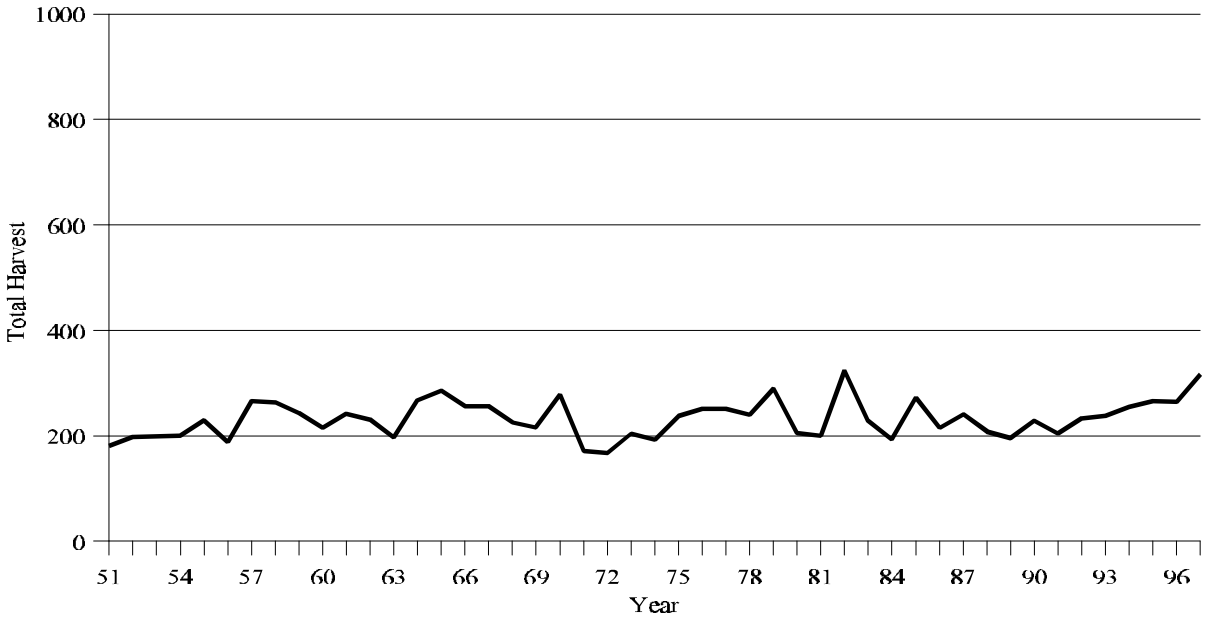

Figure 1. **Historic annual total harvest of mountain lions in Arizona from 1951 through 1997.**

carrying capacity and able to withstand the levels of harvest and depredation take that have occurred.

The Hornocker Wildlife Institute (HWI) provided recommendations on mountain lion management to the New Mexico Department of Game and Fish following the completion of the 10-year study documented by Logan et al. (1996). Those recommendations included the establishment of 1000-mi.^{2} refuge areas where lions are not hunted to assure that the species can be maintained in the event that overharvest causes population declines in hunted areas. In Arizona, about 2,300 mi^2 of [redacted] lands exist in which no lion hunting or control is allowed. A total of 1,875 mi^2 is in the [redacted]. Also, little or no lion hunting occurs on the [redacted]

[redacted] which total about 18,000, 1,600, 2,750, and 4,400 mi^2, respectively ([redacted], pers. comm. 1998). While Indian Reservations are not federal public lands and hunting regulations and exploitation levels may change, present circumstances indicate that these areas could fulfill the role of mountain lion refuge areas, as recommended by the Hornocker Wildlife Institute, if consistent with the goals and objectives of the specific Indian Reservation. Therefore, even if a sustainable harvest level is exceeded in other areas of the State, the existence of these large blocks of unhunted/uncontrolled areas should assure that viable mountain lion populations continue to exist in the State.

Regardless of the level of take by WS, the program proposes to continue to take mountain lions on a case-by-case basis on public and private lands in the State only when authorized by ARS 17-302 as administered by the [redacted]. This should assure that cumulative impacts on the lion population are within those desired by the State. It is a built-in mitigation measure of the current program that serves to assure there are no significant impacts on the quality of the human environment as a result of WS's take of mountain lions.

Other Target Predator Species Impacts

Other target species that might be taken by WS during PDM in the State include feral/free-ranging dogs, feral/free-ranging cats, skunks, raccoons, gray fox, and potentially red fox. The numbers of these species killed by WS in the State in FY 1997 were 241, 0, 46 (44 striped skunks and 2 spotted skunks), 1, 5 and 0, respectively (these numbers include those killed as nontargets). It is highly unlikely that WS would be requested to conduct PDM to take these species on federal public lands, however.

Take of feral and/or free-ranging dogs and cats by the program is considered to be of no significant impact on the human environment since those species are not an indigenous component of ecosystems in the state. The kill of dogs and cats by WS is minor in comparison to the number killed by animal control and humane organizations in the country each year. The other species shown above are common and not classified as threatened or endangered under either state or federal law and would be taken in low enough numbers (< 40 per year of each species) that population impacts analysis is unnecessary.

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 PDM programs on federal public lands 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 Federal Program" 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. 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 or with certain provisions of the Endangered Species Act that require certain procedures of federal agencies. It is unknown whether private or state managed PDM would be in compliance with federal land management policies. It is assumed that a State agency such as [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, perhaps with or without the knowledge of land managers. 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 potentially 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 on federal public lands in the State. 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 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.

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

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

Methods available for use by WS in PDM activities on federal public lands in the State are limited, for the most part, to aerial and ground-based shooting, use of cage traps, trail dogs, and nonlethal methods. These methods have been 100% selective for target species. Therefore, there should be virtually no adverse impacts from the taking of nontarget animals by continuing the current program. Potential effects on nontarget species on lands other than federal lands in Arizona were evaluated and found to present no significant adverse impacts in an EA and Decision/FONSI completed in 1996 (USDA 1996).

T&E and Sensitive Species

Vertebrate T&E species that are federally listed, or are proposed for listing, as occurring or that could occur on federal public lands in Arizona were taken from USFWS (1998). They are:

Mammals:
- Black-footed ferret (*Mustela nigripes*)
- Mexican gray wolf (*Canis lupus baileyi*)
- Ocelot (*Felis pardalis*)
- Jaguarundi (*Felis yagouaroundi tolteca*)
- Jaguar (*Panthera onca*)
- Hualapai Mexican vole (*Microtus mexicanus hualpaiensis*)
- Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)
- Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*)
- Sonoran pronghorn (*Antilocapra americana sonoriensis*)

Birds:
- Bald eagle (*Haliaeetus leucocephalus*)
- American peregrine falcon (*Falco peregrinus*)
- Northern aplomado falcon (*Falco femoralis septentrionalis*)
- Mexican spotted owl (*Strix occidentalis lucida*)
- Whooping crane (*Grus americana*)
- Masked bobwhite (*Colinus virginianus ridgwayi*)
- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- Piping plover (*Charadrius montanus*)
- California Brown pelican (*Pelecanus occidentalis californicus*)
- Cactus ferruginous pygmy-owl (*Glaucidium*

brasilianum cactorum)
California condor (*Gymnops californianus*) (experimental nonessential reintroduced population)

Fish:

Apache (Arizona) trout (*Oncorhynchus apache*)
Gila trout (*Oncorhynchus gilae*)
Beautiful shiner (*Cyprinella formosa*)
Bonytail chub (*Gila elegans*)
Humpback chub (*Gila cypha*)
Colorado squawfish (*Ptychocheilus lucius*)
Desert pupfish (*Cyprinodon macularius*)
Gila topminnow (*Poeciliopsis occidentalis occidentalis*)
Little Colorado spinedace (L*epidomeda vittata*)
Loach minnow (*Tiaroga cobitis*)
Razorback sucker (*Xyrauchen texanus*)
Sonora chub (*Gila ditaenia*)
Spikedace (*Meda fulgida*)
Virgin river chub (*Gila seminuda*)
Woundfin (*Plagopterus argentissimus*)
Yaqui catfish (*Ictalurus pricei*)
Yaqui topminnow (*Poeciliopsis occidentalis sonoriensis*)
Yaqui chub (*Gila purpurea*)

Reptiles:

Desert tortoise, mohave population (*Gopherus agassizii [xerobates]*)
New Mexican ridge-nosed rattlesnake (*Ctoralus willardi obscurus*)
Flat-tailed horned lizard (*Phrynosoma mcallii*) (proposed for listing)

Amphibians:

Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*)

In addition to the above vertebrate species, two invertebrate and 18 plant species are listed or proposed to be listed as threatened or endangered in the State. WS PDM activities would have no effect on any plants or invertebrates and this was supported by FWS's 1992 B.O. (USDA 1994, Appendix F).

None of the above bird, reptile, or amphibian species would be adversely affected by WS PDM on federal public lands because lethal methods have been restricted to aerial and ground-based shooting, cage traps, and trail dogs, which have been proven to be virtually 100% selective for target species. Impacts on reintroduced California condors from low level flights during aerial hunting should be negligible based on the analysis in section 2.3.5 which found that raptors are not disturbed significantly by low level flights. Because, as stated in section 2.3.12, the AZ WS program currently uses steel shot for aerial hunting, there is no risk to condors from potential consumption of lead shot during scavenging on coyotes killed by aerial hunting. Coyote carcasses taken by aerial hunting could actually benefit condors by providing a supplemental food source. Of the mammal species, there is potential for effects on the jaguar, ocelot, and jaguarundi from the use of trail dogs to pursue mountain lions and black bears. However, nontarget animals that are brought to bay by hunting dogs can be released unharmed. WS has initiated formal section 7 consultation with FWS on these three species to determine if any mitigation measures are necessary and will abide by any reasonable and prudent alternatives (RPAs) and measures (RPMs) that are established.

The [redacted] has established a draft list of "Wildlife of Special Concern in Arizona" (WSCA) that includes 21 species of invertebrates, 25 fish, 1 amphibian, 9 frogs, 10 reptiles (4 snakes, 4 lizards, 1 turtle, 1 tortoise), 29 birds (including 6 raptor species), and 22 mammals (2 shrews, 5 bats, 8 rodents, 6 carnivores, 1 ungulate) (AGFD 1996). The list has not yet been published in final form. The species on the list include those shown above as federally listed or proposed to be federally listed as T&E species.

WS PDM activities on federal public lands will not affect any of the invertebrate, fish, amphibian, or reptile species on the WSCA. Local reduction in coyote numbers by WS PDM activities has the potential to benefit some of the mammal and bird species that could be preyed upon by coyotes, but such benefits are unlikely to be significant. The potential for aerial hunting overflights to adversely affect wildlife species was analyzed in Chapter 2, section 2.3.5 which determined that adverse effects were unlikely. Again, because the methods available for use on federal public lands are virtually 100% selective for target species, none of the species of concern would be affected by WS PDM.

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 on federal public land in the State. Thus, their impacts on this issue would be similar to each other. Again, because PDM methods available for use on federal public lands are virtually 100% selective for target species, nontarget species would not be adversely affected by WS PDM activities. However, it must be considered that nontarget species impacts may occur if frustration of some livestock producers leads to use of illegal methods including pesticide use. 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 on federal public lands in the State. However, 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.

Because PDM methods currently available for use on federal public lands are virtually 100% selective for target species, nontarget species would not be adversely affected by WS PDM activities by the current program. Therefore, WS's impacts on nontarget and T&E species under Alternative 4 would be no different than under the current program alternative. However, it is anticipated that cooperating livestock producers would drop out of the current program because of reduced effectiveness and that 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 nontarget species populations. Adverse impacts on nontarget species would probably be greater than the current program and Alternative 5, and less than Alternatives 2 and 3 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. Because PDM methods available for use on federal public lands are virtually 100% selective for target species, nontarget species would not be affected by WS any differently than under the current program. However, it is anticipated that some cooperating livestock producers would drop out of the current program because of reduced effectiveness and that 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, and 4.

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 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 other ecosystems such as the Great Basin where jackrabbits are the primary prey species, 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 ($\leq$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 State would not be year round but would 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 or the birth of deer and antelope fawns in the spring.

2. WS would conduct PDM on properties that comprise less than 10% of the total land area of the State and would kill a low percentage (< 2%) of the population of coyotes in any one year. This in itself means the potential for ecosystem impacts from WS actions would be low in magnitude.

3. WS PDM methods available for use on federal public lands are virtually 100% selective for target species. Therefore, there is no potential for adverse effects on other carnivores that also prey on rodents and rabbits. 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 deer, mule deer, and pronghorn antelope. Based on the information presented in section 1.1.3, it is clear that, under the right conditions, 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 would only conduct PDM on less than 10% of the federal public land area in the State and would take less than 2% 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] requests coyote removal for the purpose of enhancing antelope or deer herds, an increase in local populations would be a desired effect. 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 constitute a significant impact on the quality of the human environment as a whole in major portions of the State.

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 on federal public lands and there would be no potential for WS to impact prey species populations in such areas. Even though private and/or state agency efforts to control predation would likely increase, it is unlikely that such efforts would increase to the point that adverse impacts on prey species populations or ecosystems would occur. Therefore, impacts on this issue would likely not be substantially different than under the current program.

4.2.3.3 Alternative 4 - Nonlethal WS PDM Only

Under this alternative, lethal PDM by WS would not occur on federal public lands and there would be no potential for WS to impact prey species populations in such areas. Even though private and/or state agency efforts to control predation would likely increase, it is unlikely that such efforts would increase to the point that adverse impacts on prey species populations or ecosystems would occur. Therefore, impacts on this issue would likely not be substantially different than under the current program or other alternatives.

4.2.3.4 Alternative 5 - Nonlethal Required Before Lethal Control.

Under this alternative, lethal PDM by WS would not occur unless nonlethal methods have been tried first. Thus the potential for WS to have impacts on prey species populations would be less than under the current program but somewhat greater than under Alternatives 2,3, and 4. However, even though private and/or state agency efforts to control predation would likely increase, it is unlikely that such efforts would increase to the point that adverse impacts on prey species populations or ecosystems would occur. Therefore, impacts on this issue would likely not be substantially different than under the current program or other alternatives.

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 coordinated with 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] lands, and for restrictions on certain methods during certain periods. These are factored into the ADC Decision Model thought process. With the passage of Proposition 201, concerns about WS use of restricted methods such as leghold traps, snares, and chemical pesticides on public lands in Arizona have been rendered moot because such use has been prohibited except in extremely limited situations that exclude livestock and, with exception of T&E species, wildlife protection. A formal risk assessment of WS methods found no evidence of hazardous exposures to recreationists from any such method (USDA 1994, Appendix P).

Over the past several years, no significant conflicts with other public land uses have been identified in the work planning process in Arizona. In actuality, the extent of WS PDM activities on [redacted] lands has been extremely limited. For example, WS did not conduct any PDM activity on more

than 98% of the [redacted] land nor on more than 96% of the [redacted] in the State during FY 1997. Under the current program, the amount of federal public land worked by WS could increase but is expected to continue to be of relatively minor presence on livestock grazing allotments. 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. As stated in previous sections, private and/or state agency control efforts would probably increase under this alternative, but it is doubtful that such efforts would increase to the point of conflicting significantly with recreational uses. With the prohibition of traps and snares on public land, some frustrated livestock producers might resort to illegal pesticide uses to resolve predation problems. Thus, the risk to pets or hunting dogs could actually be greater than under the current program although such risk is not expected to be great.

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 but it is doubtful that such efforts would increase to the point of conflicting significantly with recreational uses. With the prohibition of traps and snares on public land, some frustrated livestock producers might resort to illegal pesticide uses to resolve predation problems. Thus, the risk to pets or hunting dogs could actually be greater than under the current program although such risk is not expected to be great.

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, similar to Alternative 4 , but to a lesser degree, they may experience conflicts with some nonlethal uses as

described in section 4.2.4.3. Similar to Alternatives 2, 3, and 4, private control efforts would probably increase under this alternative but it is doubtful that such efforts would increase to the point of conflicting significantly with recreational uses. With the prohibition of traps and snares on public land, some frustrated livestock producers might resort to illegal pesticide uses to resolve predation problems. Thus, the risk to pets or hunting dogs could actually be greater than under the current program but probably less than under Alternatives 2, 3, and 4.

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.

With the passage of Proposition 201, lethal PDM methods for use in livestock or wildlife protection on federal public lands have been limited to aerial and ground based shooting, cage traps, and use of trail dogs which also generally involves shooting to kill target animals once they are brought to bay. Those methods are virtually 100% selective for target species which renders the issue of selectivity nearly moot. Some persons will still be concerned about the selectivity of methods in taking offending individual target animals. With the use of trail hounds following confirmed depredation, offending individual mountain lions and black bears can be selectively taken to a relatively high degree. Calling and shooting and aerial hunting can be selective for offending individuals under the right circumstances such as when the location of a depredating pair of denning coyotes is identified.

Table 4-3 shows that leghold traps, snares, and toxicants are perceived as inhumane by the public. However, these methods are no longer available for use in livestock or wildlife protection efforts on federal public lands. Thus, concerns about the humaneness of these methods on such lands have

been rendered moot.

Table 4-3 indicates the public perceives fumigation or gassing of dens to be more humane than traps, snares, or aerial hunting. However, Proposition 201 has prohibited this method on public lands. For this reason, coyote pups left in dens which are discovered following removal of adults can no longer be euthanized which will be objectionable to some people on humaneness grounds.

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 probably results in less anxiety for animals 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. The only animals taken by this method on federal public lands were nine coyotes in FY 1997.

Ground-based Shooting. Shooting from the ground, which includes calling and shooting and shooting during chance observations or during ground-based hunting, is regarded as more humane than restraining type capture devices or even aerial hunting (Table 4-3). Both methods are highly selective (100%) in that positive identification of the target predator is made before shots are fired. Ground-based shooting has not been used extensively in recent years by WS on federal public lands in the State — only 3 coyotes were taken by ground-based shooting on such lands in FY 1997.

Trail and Decoy Dogs. Decoy dogs are commonly 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 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 an important method of take in the program and are extremely important in resolving certain individual problems. In FY 1997, 27 target animals (all mountain lions) were taken on federal public lands by these methods.

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 federal 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.

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 on federal public lands, could be argued to be the most humane, as no wildlife would be killed by the Federal government. However, with the prohibition of traps and snares on public land, some frustrated livestock producers might resort to illegal pesticide uses or other illegal methods to resolve predation problems, 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 frustrated livestock producers might resort to illegal pesticide uses or other illegal methods to resolve predation problems, which might result in increased animal suffering.

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 and 3, some frustrated livestock producers might resort to illegal pesticide uses or other illegal methods to resolve predation problems, which might result in increased animal suffering.

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.

4.2.6 Summary of WS Impacts

Table 4-4 is a comparison of the alternatives and environmental consequences (impacts) based on the above analysis. The relative impact of each issue/alternative combination is subjectively rated as: Neutral, Neu/Low, Low, Low/Moderate, Moderate, Moderate/High, and High. The impacts are also rated in a positive (+) or negative (-) manner to depict individual or societal perceptions of how the impact could affect the environment. Although the narrative discussions above indicate that the relative impacts on each issue vary somewhat among the alternatives, it is believed that the actual impacts are relatively low for all of the alternatives analyzed.

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

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

[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 on federal public lands in Arizona.

APPENDIX A

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APPENDIX B

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