

**DECISION
AND
FINDING OF NO SIGNIFICANT IMPACT
FOR
PREDATOR DAMAGE MANAGEMENT
ON
NONFEDERAL AND TRIBAL LANDS
IN THE
ARIZONA ANIMAL DAMAGE CONTROL PROGRAM**

INTRODUCTION and PROPOSED ACTION:

The U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), Animal Damage Control (ADC) program receives requests to conduct wildlife damage management to protect livestock, crops, property, wildlife, and human health and safety within the state of Arizona. ADC prepared an Environmental Assessment (EA) to analyze the environmental impacts of continuing the current program that provides assistance in response to such requests. The scope of the EA includes ADC's predator damage management (PDM) action on private land, state land, local government owned land (county or city property), and American Indian Tribal land in Arizona. This decision and Finding of No Significant Impact (FONSI) are based on the analysis in this EA.

Individual actions on lands encompassed by this decision could each be categorically excluded under the APHIS Implementing Regulations for compliance with the national Environmental Policy Act (NEPA) (7 CFR 372.5(c)). This decision covers ADC's plans for future actions within the lands described in the EA. The purpose of the proposed plan of action is to alleviate damage caused by predators on the above types of land status areas. The needs for the program, as identified in the EA, are related to the fact that livestock, crops, certain types of property, wildlife, and at times, public health or safety may be adversely affected by predators. ADC PDM on federal lands (Forest Service and Bureau of Land Management) was not included in the scope of the EA because such actions on those areas are currently covered by NEPA documentation specific to individual National Forests or BLM districts. The analysis in the EA, however, encompasses statewide impacts of ADC PDM activities, which, for the issues analyzed, includes potential impacts on all land status areas, including Federal land.

The Arizona ADC program has agreements to conduct predator damage management on about 9.1 million acres, which is 12.4% of the area of the State, but only conducts wildlife damage management on about 2.1 million acres or 2.9% of the area annually. Under the current program, ADC could be asked to provide this service on more properties in the state in the future; however, it is anticipated that control activities would be conducted in no more than 5% of the State's land area.

ADC is the Federal agency authorized to manage damage by predators and other wildlife. ADC cooperates with the Arizona Game and Fish Department (AGFD), Arizona Department of Agriculture (ADA), and Arizona Department of Health Services (ADHS) to minimize animal damage. The AGFD has the primary responsibility to manage all protected and classified wildlife in Arizona, except Federally listed threatened and endangered (T&E) species. Arizona Game & Fish manages mountain lion and black bear depredations according to ARS Title 17-239 & 17-302. The ADA is the state agency with responsibility for managing depredations to agricultural resources caused by predatory animals, rodents, and related species. ARS 3-2401 grants ADA this management authority and directs the agency to cooperate with ADC. ADC's authority comes from the Animal Damage Control Act of March 2, 1931, as amended (46 Stat. 1486; 7 U.S.C. 426-426c), and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988.

Memoranda of Understanding (MOUs) signed between APHIS-ADC, AGFD, ADA, and ADHS clearly outline the responsibility, technical expertise and coordination between agencies. All wildlife damage management will be conducted in a manner consistent with the Endangered Species Act of 1973 and the Section 7 Consultation completed with the U.S. Fish and Wildlife Service, as well as any further consultations that occur.

The EA analysis provides a comparison of four alternatives for addressing predator damage management on the subject land status areas in the State. The analysis and supporting documentation are available for review at the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control office at 1960 West North Lane, Phoenix, Arizona 85021.

Decision and Rationale

I have carefully reviewed the EA and believe that the issues identified are best addressed by selecting Alternative 1 (the Proposed Action) which continues the current program.

Alternative 1 provides ADC the best opportunity to meet program goals for responding to requests for service and for minimizing losses while minimizing environmental impacts. Alternative 1 best allows ADC to meet its obligations to the AGFD, ADA, American Indian Tribes, and to cooperating cities, counties and individuals within the State. As a part of this decision, the Arizona ADC program will provide all cooperators and cooperating Federal, State, and local agencies with information on nonlethal management techniques proven to be effective for reducing predation within one year of the decision. New cooperators or cooperating agencies will be provided this information within three weeks of signing a cooperative agreement.

Monitoring

The Arizona ADC program in consultation with the AGFD will compare the target and nontarget species killed in the State with the other kill to determine if the total take is within allowable harvest levels. Should allowable harvest levels be exceeded, ADC will consult with AGFD to determine if additional mitigations are necessary.

Public Involvement

The EA and this Record of Decision (ROD) were made available for public review and notices of availability were published in major newspapers in the State following APHIS and Council on Environmental Quality regulations. Most of the public comments received did not raise substantive issues requiring further analysis than that contained in the EA. Other comments received related to issues that have been adequately addressed in the ADC programmatic EIS (USDA 1994) and readers are referred to that document for more comprehensive reviews. Nevertheless, some comments regarding the EA indicated areas merited further clarification as follows. Cited references are included in Appendix A of the EA:

1. **The EA fails to demonstrate need for PDM for livestock protection on nonfederal and tribal lands.**

Chapter 1 has been revised to more clearly show livestock loss data specific to nonfederal and tribal lands.

2.. **The EA fails to provide population estimates for nonfederal and tribal lands and fails to fully assess the cumulative impacts of lethal activities directed at predator populations.**

As stated in section 4.2.1.1 of the EA, land ownership status in Arizona is intermingled, and predator populations do not recognize land status boundaries. ADC chose to define populations on a statewide basis according to the way they are defined by the Arizona Game and Fish Department which is the primary state agency with management responsibility for resident wildlife species in the State. Therefore, we believe statewide population estimates are appropriate for purposes of analysis. The EA addresses cumulative

impacts on each species by considering all known humanly caused mortality which includes private harvest and ADC lethal take on *all* land status areas within the state. Because private harvest figures are not available by land status, and because populations do not recognize land status boundaries, it is appropriate to consider impacts on populations regardless of land status in order to analyze cumulative impacts. The cumulative impacts analysis clearly shows that ADC PDM actions have low impacts on populations within the state.

3. **Does the value of livestock saved exceed the cost of providing PDM services?**

As stated in section 1.3.2.2 of the EA, it is not possible to accurately determine the number of livestock saved from predators by ADC since that number represents losses that never occurred. 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 ADC 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 ADC PDM services in the Arizona program.

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 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.

CEQ regulations (40 CFR 1502.23) do not require a formal, monetized cost-benefit analysis to comply with NEPA. Despite this fact and the general idea that government PDM is not necessarily intended to be cost effective, the following discussion addresses the question of costs vs. benefits for the current PDM program on nonfederal and tribal lands in Arizona:

Sheep and Lamb Losses. The EA cited scientific studies revealing that lacking 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) whereas in studies with PDM, losses were about 0.5 and 4.3%, respectively (USDI 1979). In analyzing the value of sheep and losses avoided by PDM, USDA (1994) used an unweighted average rate of loss in studies without PDM to be 4.5% for sheep and 17% for lambs.

Cattle and Calf Losses. No studies of cattle and calf losses lacking PDM have been conducted. Survey data discussed in USDI (1978) showed that 85% of cattle producers in the southwest U.S. had *no* losses of calves to coyotes, that 13% had coyote predation losses of up to 5% of calves born alive, and that 2% had losses to coyotes greater than 5%. Those data indicate a minority of cattle producers have most of the coyote predation problems experienced by cattle producers as a whole. It is within reason to assume that producers who experience higher losses are more likely to become ADC cooperators; thus, it is reasonable to predict that losses on cooperating cattle ranches would be as great as the higher loss producers in the data shown by USDI (1978). Therefore, we predict that cooperating cattle ranches would have an average of around 5% losses to coyotes on cooperating ranches in the absence of PDM.

Value of Avoided Losses and Costs vs. Estimated Benefits. Table "A" that follows shows the estimated losses of sheep, lambs, and calves avoided by cooperating farms and ranches because of ADC PDM services. It shows the estimated value of those resources saved by PDM was \$1.36 million in FY 93 and

\$1.52 million in FY 94. Compared to the cost of providing the service, it appears that the value of livestock saved exceeded the cost of providing service by a factor of 4.2 in 1993 and by 4.3 in 1994.

Table A. Estimated benefits (in terms of livestock losses avoided) vs. costs for ADC Predator Damage Management (PDM) on nonfederal and tribal lands in Arizona in 1993 and 1994. Data on resources protected and lost were from EA. Per head values were from ADC MIS data. Costs were estimated using data from ADC Annual Reports for 1993 and 1994. Percent loss estimates for sheep and lambs without PDM were taken from the ADC FEIS (USDA 1994); percent loss estimates for calves without PDM were estimated using an analysis of survey data from USDI (1978).

Year	Resource	# Protected by ADC	% Lost to Predation w/ PDM	Predicted % Lost to Predation w/o PDM	# Losses Avoided by PDM	\$ Value per Head	Value of Avoided Losses	Cost of Providing PDM Service	Benefit-Cost Ratio
1993	Lambs	68,689	1.05%	17.00%	10,956	\$90	\$986,040	\$323,000	4.2:1
	Sheep	16,305	0.42%	4.50%	665	\$110	\$73,150		
	Calves	24,336	1.66%	5.00%	812	\$374	\$303,688		
	TOTAL	NA	NA	NA	NA	NA	\$1,362,878		
1994	Lambs	12,805	0.70%	17.00%	2,087	\$90	\$187,830	\$355,000	4.3:1
	Sheep	4,040	0.25%	4.50%	172	\$110	\$18,920		
	Calves	51,383	0.63%	5.00%	2,245	\$586	\$1,315,570		
	TOTAL	NA	NA	NA	NA	NA	\$1,522,320		

4. “Although current ADC activities may not reduce coyote populations, at least over broad areas, the cumulative effect of control may be a decrease in the stability of the populations... and an increase in the overall population size. Given this information, it appears that coyote control may indeed be counterproductive.”

Coyote populations in Arizona are typically subjected to much higher private kill levels than those that result from ADC activities. The EA, p. 4-2 showed that ADC’s coyote kill for the entire state was only 7% or less of the total harvest (EA, p. 4-2). Therefore, ADC kill in Arizona is minor in relation to the private kills which mean ADC actions have little effect on the *status quo* of the overall coyote population of the state. Furthermore, wildlife populations in general are limited by the availability of food and by social tolerances. The removal of coyotes from a population would mean more food available per coyote and less social stress to those remaining, thus resulting in higher reproductive success as shown by Connolly and Longhurst (1975). However, this does not mean the population would *increase* to a level greater than what would normally occur without any mortality by humans. It only means the population would *return* fairly rapidly to precontrol levels. Many studies (cited in the EA), as well as professional experience, indicate that PDM can keep coyote numbers low enough in localized areas for a long enough period each season to allow young livestock or ungulate fawns to grow past the point of high susceptibility to coyote predation, even if the population returns to precontrol levels within the same year. The Government Accounting Office (GAO) supported this conclusion in a 1990 report stating that “according to available research, localized lethal controls have served their purpose in reducing predator damage” (GAO 1990).

Major Issues

The EA describes the alternatives considered and evaluated using the identified issues. The following issues were identified as important to the scope of the analysis (40 CFR 1508.25).

- Effects on Target Predator Species Populations
- Effects on Nontarget Species populations, including Threatened and Endangered Species
- Effects of Coyote Removal on Prey Populations
- Humaneness of Control Techniques

Six other issues were considered but rationales were presented for not analyzing them in detail. Those issues were:

- ADC's impact on biodiversity
- Livestock losses are a tax "write off".
- A threshold of loss and livestock losses are a cost of doing business.
- No wildlife damage management at taxpayer expense; wildlife damage management should be fee-based.
- The indiscriminate killing of coyotes often disturbs stable coyote populations, thus promoting opportunistic animals who are far more likely to kill livestock.
- American Indian and Cultural Resource Concerns.

Alternatives That Were Fully Evaluated

Four alternatives were analyzed in detail and four additional alternatives were considered, but not analyzed in detail. A detailed discussion of the effects of the alternatives on the issues is described in the EA; below is a summary of the alternatives and issues.

Alternative 1. Continuation of the current Arizona PDM Program on nonfederal and tribal lands (No Action) . The No Action Alternative was analyzed and used as a baseline for comparing the effects of the other Alternatives as required by 40 CFR 1502.14(d). Alternative 1 would allow ADC to meet its mission. The analysis of impacts that Alternative 1 would have was low for target species, predator/prey relationships, nontarget and T&E species, and provides a balanced approach to addressing the humaneness issue.

Alternative 2. No Federal ADC PDM - This Alternative would end the Federal predator damage management program on nonfederal and Tribal lands in Arizona. This alternative was not selected because it would not allow ADC to meet its statutory responsibility for providing assistance, nor would it optimize the chances for minimizing losses. Impacts on target, nontarget, T&E species populations, prey populations, and humaneness could be lower than, greater than, or the same as Alternative 1 depending on the level of private control efforts and whether illegal pesticide use occurred.

Alternative 3. Technical Assistance Only - Under this alternative, ADC would not conduct any direct operational PDM activities on nonfederal and tribal lands in the State. If requested, affected producers would be provided with technical assistance information only. Alternative 3 was not selected, because it would not allow the best chance for effective resolution of predator damage problems. The potential impacts on target, nontarget, and T&E species

populations, prey species populations, and humaneness would likely be similar to those of Alternative 2 and greater than Alternative 1.

Alternative 4. Nonlethal Control Required Prior to Lethal Control was not selected, because no standard exists to determine diligence in applying nonlethal methods, nor are there any standards to determine how many nonlethal applications are necessary before initiation of lethal controls, and ADC is charged by law to minimize damage caused by wildlife. This alternative would not allow PDM for wildlife protection. The impacts of this alternative could be greater than the proposed action depending on the level of private control efforts and whether illegal pesticide use occurred.

The alternatives considered but not analyzed in detail are the following:

Compensation for Predator Damage Losses. The Compensation Alternative would direct ADC efforts and resources toward the verification of livestock and crop losses from predators, and providing monetary compensation to the producers. ADC services would not include any direct damage management nor would technical assistance or nonlethal methods be provided. This alternative was eliminated from detailed analysis in ADC's Final EIS because of many disadvantages which are also cited in the EA and because Congress has not appropriated funds to compensate for predation or other wildlife damage to agricultural products. This alternative would not be practical for protection of wildlife resources from predation or for resolving human health and safety concerns.

Bounties. This alternative would establish a system of payment to individuals for killing target predators. It was not considered in detail because of concerns that have been adequately described in the EA.

Eradication and Long Term Population Suppression. This alternative would establish long term intensive programs for eradicating or suppressing target predator populations over broad areas. It was eliminated from detailed analysis because eradication of native predator species is not supported by ADC, AGFD, ADA or Indian tribes. Also, achieving eradication or long term suppression would be difficult or impossible to achieve under current constraints of technology, funding, and state restrictions on methods.

The Humane Society of the United States (HSUS) Alternative. This alternative (described fully in the EA) was not considered in detail because its primary element was similar to Alternative 4, and for other reasons stated completely in the EA.

Decision

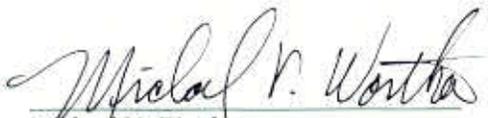
I have carefully reviewed the EA and believe the issues identified in the EA are best addressed by selecting Alternative 1. Alternative 1 provides the best range of damage management methods considered practical and effective to accomplish ADC's Congressionally authorized activities. While Alternative 1 does not require nonlethal methods to be used by producers, ADC will continue to encourage the use of practical and effective nonlethal methods by livestock producers. By this decision, I am directing the Arizona ADC Program to implement Alternative 1.

Finding of No Significant Impact

The EA indicates that there will not be a significant impact, individually or cumulatively, on the quality of the human environment because of this proposed action and that these actions do not constitute a major Federal action. I agree with this conclusion and, therefore, determine that an Environmental Impact Statement will not be prepared. This determination is based on the following factors:

1. Predator damage management, as conducted on nonfederal and tribal lands in Arizona is not regional or national in scope.

2. Based on the analysis documented in the EA, the impacts of the predator damage management program will not significantly affect the human environment.
3. The proposed action will not have an impact on unique characteristics of the areas such as historical or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecological critical areas.
4. The proposed action will not significantly affect public health and safety. No accidents associated with ADC predator damage management are known to have occurred in Arizona.
5. The effects on the quality of the human environment are not highly controversial. Although there is opposition to predator damage management, this action is not controversial in relation to size, nature, or effects.
6. Mitigation measures adopted and/or described as part of the proposed action minimize risks to the public and prevent adverse effects on the human environment and reduce uncertainty and risks.
7. The proposed action does not establish a precedent for future actions. This action would not set a precedent for future predator damage management that may be implemented or planned within the state.
8. The number of animals taken (both target and nontarget) by ADC annually is small in comparison to total populations. The land area on which PDM services are conducted is also minor. Adverse effects on wildlife or wildlife habitats would be minimal.
9. No significant cumulative effects were identified by this assessment for this or other anticipated actions to be implemented or planned within the area.
10. Predator damage management would not affect cultural or historic resources. ADC PDM activities are not undertakings that could have detrimental impacts on districts, sites, highways, structures or objects listed in or eligible for listing in the National Register of Historic Places nor will they cause a loss or destruction of significant scientific, cultural, or historical resources, including interference with American Indian cultural resources.
11. An evaluation of the proposed action and its effects on T&E species determined that no significant adverse effects on such species would occur. The proposed action will comply with the Endangered Species Act of 1973, as amended. Consultation with the U.S. Fish and Wildlife Service has taken place and mitigations developed as part of that process, or mitigations that may be established as the result of further consultations, will be implemented to avoid jeopardy or significant adverse impacts.
12. This action would be in compliance with Federal, State and local laws or requirements for predator damage management and environmental protection.


Michael V. Worthen
Regional Director, USDA-APHIS-ADC

5-29-96
Date

ENVIRONMENTAL ASSESSMENT (EA)
PREDATOR DAMAGE MANAGEMENT
ON
NONFEDERAL AND TRIBAL LANDS
IN THE
ARIZONA ANIMAL DAMAGE CONTROL PROGRAM

Prepared By:

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1.0 CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 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, certain segments of the public strive for protection for all wildlife. Such protection can create localized conflicts between human and wildlife activities. The Final Environmental Impact Statement (FEIS) for the USDA/APHIS/Animal Damage Control (ADC) program 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 generally is 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."

USDA/APHIS/Animal Damage Control (ADC) is authorized by Congress to manage a program to reduce human/wildlife conflicts, and this Environmental Assessment (EA) evaluates ways by which this mandate can be carried out to resolve conflicts with predator species on nonfederal (private, state, and local government-owned) and American Indian Tribal land in Arizona. Individual actions on lands encompassed by this analysis could each be categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR 372.5(c)). This analysis covers ADC's plans for current and future actions within the lands described in the EA. ADC predator damage management actions on lands administered by the USDA Forest Service (FS) and U.S. Department of Interior (USDI) Bureau of Land Management (BLM) within the state have been analyzed in NEPA documents specific to individual National Forests or BLM districts. Although much of the impacts analysis in this document is also applicable to actions on FS and BLM lands, those actions are not included in the scope of this document.

ADC is a cooperatively funded and service oriented program. Before any wildlife damage management is conducted, *Agreements for Control* or *ADC Work Plans* must be signed by ADC and the land owner/administrator. ADC cooperates with appropriate land and wildlife management agencies, as requested, to effectively and efficiently resolve wildlife damage problems in compliance with all applicable federal, state, and local laws.

1.1.1 ADC Program

ADC's mission, developed through its strategic planning process, is twofold. Its mission is to "provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety". This is accomplished through:

- A) training of wildlife damage management professionals;
- B) development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
- C) collection, evaluation, and dissemination of management information;
- D) cooperative wildlife damage management programs;
- E) informing and educating the public on how to reduce wildlife damage and;
- F) providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

1.2 Purpose

This EA analyzes predator damage management (PDM) for the protection of livestock, crops, wildlife, and human health and safety on private land, state land, local government owned land (county or city property), and American Indian Tribal land in the State of Arizona. The State encompasses 72.7 million acres in 15 counties. During FY 1995, ADC had agreements to conduct PDM on 9,067,807 acres distributed throughout all 15 counties. This is 12.5% of the total area of the State (MIS 1996). The breakdown of land areas under ADC PDM agreements by land ownership type in the state is (in acres): Private - 3,720,963 (41.1%); Local Government - 640 (<0.1%); State - 826,453 (9.1%); Tribal - 3,422,018 (37.7%); Forest Service - 556,734 (6.1%); and Bureau of Land Management - 540,999 (6.0%). ADC generally only conducts PDM actions on a portion of the properties under Agreement in any one year; in FY 1995 that portion was 23% (Table 1.). The 2,091,270 acres actually worked in FY-1995 represents 2.9% of the total area in the State of Arizona.

The largest individual properties worked are Indian Tribal land, and ADC currently has agreements to provide PDM service to the Fort Apache and the Paiute Indian Tribes. Tribal lands comprised 45% of the area of properties worked in FY 1995. However, even though an entire reservation might be under Agreement and ADC records can be interpreted to indicate that the entire reservation was worked in a given year, only a portion of the area actually was worked. This is also true of larger private land property areas. Thus the percentage of area worked shown in Table 1 is an overestimate of the amount of area upon which ADC PDM was actually conducted.

On private, State, and Tribal lands, ADC responds to requests for assistance to protect livestock, crops, property, wildlife, and human health and safety. On a limited infrequent basis, ADC conducts PDM actions on local government owned land to assist the Arizona Department of Health Services (ADHS) in obtaining blood samples used for disease monitoring. ADC may also be requested by ADHS to reduce local populations of predator species to reduce risks of disease transmission to people and pets (e.g., during identified rabies outbreaks). Additional requests for service on all of these land ownership types could be received in the future and could be responded to

Table 1. Land Area Worked for Predator Damage Management (PDM) by ADC in Arizona in FY 1995.

County	Total Land Area (Acres)	Total Acres of Properties Worked on for PDM in FY 1995	% of Land Area Worked for PDM in FY 1995
Apache	7,181,000	362,142	5.04%
Cochise	3,980,000	369,612	9.29%
Coconino	11,947,000	39,675	0.33%
Gila	3,067,000	404,034	13.17%
Graham	2,977,000	348,914	11.72%
Greenlee	1,176,000	64,185	5.46%
La Paz	2,889,000	0	0.00%
Maricopa	5,904,000	1,200	0.02%
Mohave	8,622,000	25,718	0.30%
Navajo	6,374,000	210,636	3.30%
Pima	5,880,000	0	0.00%
Pinal	3,439,000	2,258	0.07%
Santa Cruz	792,000	0	0.00%
Yavapai	5,201,000	260,896	5.02%
Yuma	3,531,000	2,000	0.06%
TOTAL	72,960,000	2,091,270	2.87%

by ADC under the current program.

1.3 NEED FOR ACTION

1.3.1 Summary of Proposed Action

The proposed action is to continue the current ADC PDM activities in the State for the protection of livestock, crops, property, wildlife, and human health and safety on nonfederal and tribal lands. The major objective of the program is to minimize loss or the risk of loss of the above resources to predators by responding to all requests for assistance with, at a minimum, technical assistance or self-help advice, or, where appropriate and when cooperative funding is available, direct control assistance in which professional ADC specialists conduct damage management actions. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of all legal techniques and methods, used singly or in combination, to meet requestor needs for resolving conflicts with predators. Livestock producers would be provided with information regarding the use of effective animal husbandry methods, and other nonlethal and lethal techniques. Lethal methods used by ADC would include calling and shooting, aerial hunting, trapping and snaring, M-44s, denning, and dogs. PDM would be allowed in the State, when requested, on nonfederal and tribal lands upon completion of an *Agreement for Control*. All management actions would comply with appropriate federal, state, and local laws.

1.3.2 Need for Predator Damage Management for Protection of Livestock

1.3.2.1 Contribution of Livestock to the Economy

Agriculture generates nearly \$1.9 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 44% of total farm commodity cash receipts (USDA-AAS 1995).

Livestock production in Arizona contributes substantially to local economies. In 1994 there were an estimated 830,000 cattle and calves in the State valued at more than \$506 million. Sheep and lamb inventories totaled 145,000 valued at more than \$12.5 million. Total cash receipts from sales of all livestock products were about \$824 million in the State in 1994 (USDA-AAS 1995).

1.3.2.2 Scope of Livestock Losses

Cattle and calves are most vulnerable to predation (killing, harassment, or injury resulting in monetary losses to the owner) at calving and less vulnerable at other times of the year. However, sheep and lambs (especially lambs) can sustain high predation rates throughout the year (Henne 1977, Nass 1977, 1980, Tigner and Larson 1977, O'Gara et al. 1983). 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).

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*).

Connolly (1992) determined that only a fraction of the total predation attributable to coyotes is reported to or confirmed by ADC. He also stated that based on scientific studies and recent livestock loss surveys from the NASS, ADC only confirms about 19% of the total adult sheep and 23% of the lambs actually killed by predators. ADC 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 ADC, 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).

1.3.2.3 Loss of Livestock to Predators

NASS (1995) reported that predators killed 1750 adult sheep valued at \$161,000 and 2650 lambs valued at \$100,700 in Arizona in 1994. The most recent data available for statewide cattle and calf losses to predators is for 1991 (NASS 1992). Those data indicated predation losses of 1,600 cattle and 3,300 calves valued at \$2.2 million in Arizona during 1991. In the State, losses of all classes of livestock from coyote predation are higher than the losses caused by other predators combined. Of all livestock predation losses (on all land status areas in the State) reported to and/or verified by ADC personnel during fiscal year 1995, coyote predation accounted for 50% of the value, followed by feral/free-ranging dogs at 42%. The remainder of reported and verified predation losses were caused by such species as gray fox, black bear, and mountain lion.

Tables 2 and 3 show 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 nonfederal and tribal lands in the State in calendar years 1993 and 1994 (the latest years for which data are available). It must be emphasized that these losses were those that occurred with ADC PDM services provided to reduce losses. Losses would have been higher in the absence of such service. ADC protects a small percentage of all the livestock in the State. The remainder do not sustain substantial predation or are protected by the livestock producers themselves or by other private individuals.

As shown in Tables 2 and 3, predators were responsible for about \$259,000 and \$219,000 in losses of sheep, lambs, cattle, and calves on cooperating farms and ranches (nonfederal and tribal lands only) in 1993 and 1994, respectively. Coyotes were responsible for \$306,500 or 64% of the total losses over the two-year period. Mountain lions, feral/free-ranging dogs, and black bears were responsible for 17%, 13%, and 5%, respectively, of the remainder of reported losses. Other predators causing minor losses (less than 1% of total value) were ravens and bobcats.

Table 2. Reported Sheep and Lamb Losses to Selected Predator Species on Nonfederal (private) and Tribal land Cooperating Farms and Ranches in Arizona in 1993 and 1994. Losses occurred *with* ADC Predator Damage Management. Numbers in parentheses are the number of each livestock type protected by ADC during the year.

1993					
Species	Lambs (68,689)		Sheep (16,305)		Total Value of Losses
	# Lost	% of Lambs Protected that were Lost	# Lost	% of Sheep Protected that were Lost	
Coyote	643	0.90	66	0.40	\$65,130
Cougar	0	0.00	3	0.02	\$330
Black Bear	0	0.00	0	0.00	\$0
Feral Dog	73	0.11	0	0.00	\$6,570
Other Predators	5	0.00	0	0.00	\$450
Total	721	1.00	69	0.40	\$72,480

1994					
Species	Lambs (12,805)		Sheep (4,040)		Total Value of Losses
	# Lost	% of Lambs Protected that were Lost	# Lost	% of Sheep Protected that were Lost	
Coyote	89	0.70	10	0.20	\$9,110
Other Predators	0	0.00	0	0.00	\$0
Total	89	0.70	10	0.20	\$9,110

Table 3. Reported Cattle and Calf Losses to Selected Predator Species on Nonfederal (private) and Tribal land Cooperating Farms and Ranches in Arizona in 1993 and 1994. Losses occurred *with* ADC Predator Damage Management. Numbers in parentheses are the number of each livestock type protected by ADC during the year.

1993					
Species	Calves (24,336)		Cattle (34,188)		Total Value of Losses
	# Lost	% of Calves Protected that were Lost	# Lost	% of Cattle Protected that were Lost	
Coyote	238	1.00	23	0.07	\$102,513
Cougar	70	0.30	5	0.00	\$29,115
Black Bear	23	0.09	20	0.05	\$20,342
Feral Dog	71	0.30	12	0.04	\$33,598
Other Predators	2	0.00	0	0.00	\$748
Total	404	1.70	60	0.10	\$186,316

1994					
Species	Calves (51,383)		Cattle (29,654)		Total Value of Losses
	# Lost	% of Calves Protected that were Lost	# Lost	% of Cattle Protected that were Lost	
Coyote	199	0.40	21	0.07	\$129,736
Cougar	88	0.17	2	0.00	\$51,782
Black Bear	4	0.00	2	0.00	\$3,818
Feral Dog	32	0.06	7	0.00	\$23,641
Other Predators	0	0.00	0	0.00	\$0
Total	325	0.60	32	0.10	\$210,119

Losses (animals killed or injured) confirmed (verified) by ADC on nonfederal and tribal land in the State during FY 1995 totaled 20 adult cattle, 104 calves, 14 adult sheep, 65 lambs, 1 adult goat, 7 kid goats, 88 domestic fowl (ducks, geese, turkeys, chickens, guinea fowl), 6 horses and 2 ostriches at an estimated total value of nearly \$96,000 (MIS 1996). Persons concerned about ADC PDM programs frequently assume ADC-confirmed losses represent total predation losses experienced by livestock producers. However, ADC 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.

ADC also records losses reported by persons requesting technical assistance (i.e., self-help information). Those reports showed 2 calves, 4 lambs, 1 goat, 2 domestic fowl, 3 emus, and 80 domestic pets killed by predators in FY 1995 at an estimated value of \$3,800.

These losses occur in spite of current control efforts by producers, who often sustain substantial indirect costs (Jahnke et al. 1987), and by ADC program personnel.

1.3.2.4 Need for Predator Damage Management for Protection of Wildlife

Under certain conditions, predators, primarily coyotes, have been documented as having a significant adverse impact on deer and pronghorn antelope (*Antilocapra americana*) populations and this predation is not necessarily limited to sick or inferior animals (Pimlott 1970, Bartush 1978, USDI 1978, Hamlin et al. 1984, Neff et al. 1985). Mackie et al. (1976) documented high winter losses of mule deer due to coyote predation in north-central Montana and stated that coyotes were the cause of most overwinter deer mortalities. 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). 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 some populations of white-tailed deer (*Odocoileus virginianus*), black-tailed deer (*Odocoileus hemionus columbianus*), pronghorn antelope and bighorn sheep (*Ovis canadensis*). Hamlin et al. (1984), observed that a minimum of 90% summer mortality of fawns was a result of coyote predation. Trainer et al. (1981) reported that heavy mortality of mule deer fawns during early summer and late fall and winter was limiting the ability of the population to maintain or increase itself (recruitment). Their study concluded that predation, primarily by coyotes, was the major cause for low fawn crops on Steens Mountain in Oregon. Other authors observed that coyotes were responsible for the majority of fawn mortality during the first few weeks of life (Knowlton 1964, White 1967).

Teer et al. (1991) documented that coyote diets contained nearly 90% deer during May and June. They concluded from work conducted at the Welder Wildlife Refuge, Texas that coyotes take a large portion of the fawns each year during the first few weeks of life. Another Texas study (Beasom 1974) found that predators were responsible for 74% and 61% of the fawn mortality for two consecutive years. Fawn remains were also common in coyote scats (feces) during the first 4 to 8 weeks of life in studies from Steele (1969), Cook et al. (1971), Holle (1977), Litvaitis (1978), Litvaitis and Shaw (1980). Garner (1976), Garner et al. (1976), and Bartush (1978) found annual losses of deer fawns in Oklahoma to be about 88%, with coyotes responsible for about 88% to 97% of the mortality.

Predation was the leading cause of pronghorn antelope fawn loss, accounting for 91% of the mortalities that occurred during a 1981-82 study in southeastern Oregon (Trainer et al. 1983). Trainer et al. (1983) also noted that most pronghorn antelope fawns were killed by coyotes and that known probable coyote kills comprised 60% of fawn mortality. After a 5-year study, Neff and Woolsey (1979, 1980) determined that coyote predation on pronghorn antelope fawns was the primary factor

causing fawn mortality and low pronghorn densities on Anderson Mesa, Arizona.

Reductions of local coyote and other predator populations have been shown to be beneficial in increasing fawn survival of mule deer (LeCount 1977, Smith and LeCount 1976), white-tailed deer (Guthery and Beasom 1977, Stout 1982, Knowlton and Stoddart 1992), and pronghorn antelope (Arrington and Edwards 1951, Smith et al. 1986).

Based on the above information, it is clear that local short term predator population reductions can enhance certain ungulate populations. As the agency with primary authority to manage ungulate herds, the Arizona Game & Fish Dept. determined coyotes are a limiting factor on pronghorn antelope in some areas within Arizona and that short term reduction of coyote populations in specific areas increases fawn survival. ADC conducts this type of action in limited specific areas at the request of the Arizona Game and Fish Department and, occasionally, Indian tribes, to increase pronghorn herds by improving fawn survival.

1.3.2.5 Need for Predator Damage Management for Protection of Crops, Property, and Human Health and Safety

Predators impact a number of resources in Arizona other than livestock for which ADC is requested to provide PDM actions. Those resources include:

- Crops - Field crops such as melons (watermelons and cantaloupes), peanuts, sweet corn, field corn, lettuce, and wheat are sometimes damaged by predators and such damage problems typically involve species such as coyotes, and occasionally other species such as raccoons. Total losses verified by or reported to ADC as a result of predator damage to crops in the state during FY 1995 were valued at \$27,870.
- Property - Animals kept as pets are one type of personal property damaged by predators in the state. ADC personnel verified a total of 81 pets killed by predators in FY-1995. The value of losses reported by owners was \$430. Predatory animals responsible for pet predation in the State included coyotes, skunks, raccoons, and badgers. Coyote predation accounted for 94% of the reported loss.
- Human Health and Safety - ADC occasionally is requested to conduct limited PDM actions in Arizona to reduce the risk of disease transmission to people and domestic animals (e.g., rabies). Species for which ADC could be called upon to conduct such actions include coyotes, striped skunks (*Mephitis mephitis*), gray fox, raccoon, and feral/free-ranging domestic dogs and cats. ADC also assists ADHS in obtaining blood samples from carnivore species for purposes of monitoring plague and potentially other wildlife-borne diseases.

1.4 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER ENVIRONMENTAL DOCUMENTS

ADC Programmatic EIS. ADC has issued a Final EIS on the national APHIS/ADC program (USDA 1994). Pertinent information available in the FEIS has been incorporated by reference into this EA.

1.5 DECISION TO BE MADE

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

- Should PDM as currently implemented be continued on nonfederal and tribal lands in the State?

- If not, how should ADC fulfill its legislative mandate and responsibilities for managing predator damage on nonfederal and tribal lands in the State?
- Might the proposal have significant impacts requiring preparation of an EIS?

1.6 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.6.1 Actions Analyzed. This EA evaluates wildlife damage management to protect livestock, wildlife, crops, property, and human health and safety on nonfederal (private, state, and local government owned) and American Indian Tribal land within the State. ADC predator damage management actions on FS and BLM lands within the state have been analyzed in NEPA documents specific to individual National Forests or BLM districts. Although much of the impacts analysis in this document is also applicable to actions on FS and BLM lands, those actions are not included in the scope of this document.

1.6.2 Properties Not Currently Part of the Operational ADC Wildlife Damage Management Program. The current program only operates on a small percentage of properties in the state. Because the current program's mission is to provide assistance wherever requested and when funds permit, this EA analyzes impacts not only at current program levels, but at potentially increased program levels should nonparticipating individuals, agencies, or tribes decide to enter the program.

1.6.3 Period for Which this EA is Valid. This EA will remain valid until ADC determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be supplemented pursuant to NEPA. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of the State PDM activities.

1.6.4 Site Specificity. This EA analyzes potential impacts of PDM and addresses ADC's PDM activities on nonfederal and tribal lands under Agreements For Control within the State. It also addresses the impacts of PDM on areas where additional agreements with ADC may be written in the reasonably foreseeable future. Because the proposed action is to continue the current program, and because the current program's goal and mandate is to provide service when requested within the constraints of available funding and manpower, it is conceivable that additional PDM efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such expanded efforts as part of the current program. The EA emphasizes significant issues as they relate to specific areas whenever possible; however, the issues that pertain to predator damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard ADC Decision Model (Slate et al. 1992) and ADC Directive 2.105 describe the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by ADC in the State (See USDA 1994, Chapter 2 and Appendix N for a more complete description of the ADC Decision Model and examples of its application). Decisions made using the model will be in accordance with any mitigations and standard operating procedures described herein and adopted or established as part of the decision.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies in Wildlife Damage Management in Arizona¹

1.7.1.1 ADC Legislative Mandate

¹ See Chapter 1 of USDA 1994 for a complete discussion of federal laws pertaining to ADC.

The primary statutory authority for the ADC program is the Animal Damage Control Act of 1931, 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, ADC 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 mandate of ADC with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

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

1.7.1.2 Arizona Game and Fish Department (AGFD)

The AGFD has the responsibility to manage all protected and classified wildlife in Arizona, except federally listed threatened and endangered (T&E) species, regardless of the land class on which the animals are found (ARS 17-201). ADC conducts activities in accordance with ARS Title 17-239, Wildlife Depredations, and 17-302, Taking of Bear or Mountain Lion. Coyotes are classified as a predatory animal under ARS Title 17-101.B.6 and regulated under Arizona Game & Fish Commission Order No. 13. The Arizona Game & Fish Dept. issues aerial hunting permits according to ARS 28-1745 and Arizona Game & Fish Commission Policy A 2.9.

1.7.1.3 Arizona Department of Agriculture (ADA)

The ADA currently has a Cooperative Agreement with ADC dated June 1, 1994 and under the authority of ARS 3-2401 cooperates with ADC to alleviate wildlife depredations. This document establishes a cooperative relationship between ADC and ADA, outlines responsibilities, and sets forth objectives and goals of each agency for resolving wildlife damage management conflicts in Arizona.

1.7.1.4 Arizona Statutes - Animal Control Laws

The State of Arizona delegates feral dog control to the County Board of Supervisors through ARS 11-1005. ARS 11-1012 and various county regulations govern feral/free ranging dogs found in the act of killing or injuring livestock. ADC Directive 2.325 provides for ADC to assist County Boards of Supervisors or the ADHS with feral/free ranging dog problems, upon request, and after approval by the ADC State Director.

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

Prohibits the use of 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.

1.7.2 COMPLIANCE WITH FEDERAL LAWS.

Several federal laws authorize, regulate, or otherwise affect ADC wildlife damage management. ADC complies with these laws, and consults and cooperates with other agencies as appropriate.

1.7.2.1 National Environmental Policy Act (NEPA)

ADC prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. Individual actions on lands described in this EA could each be categorically excluded under the APHIS Implementing Regulations for compliance with the national Environmental Policy Act (NEPA) (7 CFR 372.5(c)). This EA is intended to provide clear assurances that NEPA requirements have been met for the proposed action in Arizona.

1.7.2.2 Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). As authorized by the ESA, ADC has determined that proposed action would have no effect on the majority of listed species. For those species that might be affected, ADC conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to use the expertise of the USFWS 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 . . . Each agency shall use the best scientific and commercial data available" (Sec.7(a)(2)). ADC obtained a Biological Opinion (BO) from USFWS in 1992 describing potential effects on T & E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1994, Appendix F). ADC has also initiated formal consultation on several species not covered by the 1992 BO and will abide by any reasonable and prudent measures or alternatives that are established as a result of that consultation.

1.7.2.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act provides the USFWS regulatory authority to protect species of birds that migrate outside the United States. The law prohibits any "take" of these species, except as permitted by the USFWS; therefore the USFWS issues permits for managing wildlife damage situations.

1.7.2.4 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 or recommended by the ADC program in Arizona are registered with and regulated by the EPA, and the ADA, and used by ADC in compliance with labeling procedures and requirements.

1.7.2.5 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 and are not undertakings as defined by the NHPA.

2.0 CHAPTER 2 - ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that were used to develop mitigation measures and standard operating procedures, 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.

2.1 Issues. The following issues have been identified as areas of concern requiring consideration in this EA.

- Effects on Target Predator Species Populations
- Effects on Nontarget Species populations, including Threatened and Endangered Species
- Effects of Coyote Removal on Prey Populations
- Humaneness of Control Techniques

2.2 Issues Used to Develop Mitigation

2.2.1 Effects on Nontarget Species populations, including Threatened and Endangered Species

A common concern among members of the public and wildlife professionals, including ADC personnel, is the impact of damage control methods and activities on nontarget species, particularly Threatened and Endangered Species. Standard operating procedures of ADC include measures intended to mitigate or reduce the effects on nontarget species populations and are presented in Chapter 3.

Special efforts are made to avoid jeopardizing Threatened and Endangered Species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures.

2.2.2 Humaneness of methods used by ADC

The issue of 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. The issue of humaneness has two aspects in relation to the proposed action:

1. Animal welfare organizations are concerned that some methods used to manage wildlife damage 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). The suffering apparently endured by livestock damaged in this way is unacceptable to many livestock producers.

Thus, the decision-making process involves tradeoffs between the above two aspects of humaneness. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology.

ADC has improved the selectivity of management devices through research and development of pan tension devices and other device modifications such as breakaway snares. Research is continuing to bring new findings and products into practical use. Until such time as new findings and products are found to be practical, a certain amount of animal suffering will occur in accomplishing PDM objectives. Furthermore, if it were possible to quantify suffering, it is possible that the actual net amount of animal suffering would be less under the proposed action (or any other alternative involving the use of lethal methods) than under no PDM since suffering of livestock preyed upon by predators would be reduced if the action is successful.

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

2.2.3 The public's concern about use of chemicals

The use of toxicants by ADC, which under the alternatives proposed in this EA involves sodium cyanide in the M-44 device and the gas cartridge used for fumigating coyote dens, is regulated by the EPA through the Federal Insecticide, Fungicide, and Rodenticide Act, by Arizona State Pesticide Control Laws, and by ADC Directives. Based on a thorough Risk Assessment, APHIS concluded that, when ADC program chemical methods, including those referenced above, are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1994).

2.3 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.3.1 ADC's impact on Biodiversity

No ADC wildlife damage management in Arizona is conducted to eradicate a wildlife population. ADC operates in accordance with international, federal and state laws, and regulations enacted to ensure species viability. Any reduction of a local population or group would be temporary because immigration from adjacent areas or reproduction would soon replace the animals removed. The impacts of the current ADC program on biodiversity are not significant nationwide or statewide (USDA 1994). ADC operates on a relatively small percentage of the land area of the State, and ADC take is a small proportion of the total population of any species as analyzed in Chapter 4.

2.3.2 Livestock losses are a tax "write off"

There is a belief that livestock producers receive double benefits by having a partially publicly funded program to resolve predation problems and also receive deductions as a business expense on tax returns. The Internal Revenue Service tax code (Internal Revenue Code, Section 1245, 1281) does not allow for livestock losses to be "written off" if the killed livestock was produced on the ranch. Many young ewes and cows are added to herds as replacements for breeding stock, and if lost to predation they cannot be "written off" since they were not purchased. These factors limit the ability of livestock producers to recover economic losses. Producers do not receive double benefits by having a federal program to manage wildlife damage and federal tax deductions for predation losses. This issue is beyond the scope of this analysis.

2.3.3 Threshold of Loss and Livestock losses are a cost of doing business

ADC is aware of concerns that federal wildlife damage management should not be allowed until economic losses became unacceptable. Although some losses of livestock and poultry can be expected

and tolerated by livestock producers, ADC has the legal direction to respond to requests for wildlife damage management, and it is program policy to aid each requester to minimize losses. ADC uses the Decision Model discussed in Chapter 3 to determine an appropriate strategy.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie NF, et al., the United States District Court of Utah denied plaintiffs' motion for preliminary injunction. In part the court found that a forest supervisor need only show that damage from predators is threatened, to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993).

2.3.4 No wildlife damage management at taxpayer expense, wildlife damage management should be fee based

ADC is aware of concerns that wildlife damage management should not be provided at the expense of the taxpayer or that it should be fee based. ADC was established by Congress as the agency responsible for providing wildlife damage management to the people of the United States. Funding for ADC 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 ADC should be conducted by appropriating funds. Additionally, wildlife damage management is an appropriate sphere of activity for government programs, since wildlife management is a government responsibility. A commonly voiced argument for publicly funded wildlife damage management is that the public should bear responsibility for damage to private property caused by public wildlife.

2.3.5 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. USDI (1979) analyzed studies of coyote survival rates and found:

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 ADC activities.

Dispersal of "surplus" young coyotes is the main factor that keeps coyote populations distributed throughout their habitat. Such dispersal of subdominant animals removes surplus animals from higher density areas and repopulates areas where artificial reductions have occurred. Two studies (Connolly et al. 1976, Gese and Grothe 1995) investigated the predatory behavior and social hierarchy of coyotes, and determined that the more dominant (alpha) animals were the ones that initiated and killed most of the prey items. Connolly et al. (1976) concluded that the proclivity of individuals to attack seemed related to their age and relationship with conspecifics. The coyotes that attacked sheep most frequently were 2-year-old males and females paired with these males. Gese and Grothe (1995) concluded from observing wild coyotes that the dominant pair was involved in the vast majority of predation attempts. The alpha male was the main aggressor in all successful kills, even when other pack members were present. Thus it appears removal of local established territorial coyotes actually removes the individuals that are most likely to kill livestock and generally results in the immigration of young coyotes that are less likely to kill livestock.

2.3.6 American Indian and Cultural Resource Concerns

The NHPA of 1966, as amended, and its Implementing regulations (36 CFR 800) require federal agencies to consult with American Indian Tribes to determine whether they have concerns for cultural resources or properties in areas of federal undertakings. ADC actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources. ADC has determined that activities described under the proposed action or alternatives are not undertakings as defined by the NHPA. In addition, consultation with the Arizona State Historical Preservation Office has determined that the minor ground disturbances caused by ADC operations will have no impact on cultural resources.

3.0 CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 Alternatives analyzed in detail are:

- 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 ADC PDM. This alternative consists of no federal PDM.
- 3) Alternative 3 - Technical Assistance Only. Under this alternative, ADC would not conduct any direct operational PDM activities in Arizona. If requested, affected producers would be provided with technical assistance information only.
- 4) Alternative 4 - Nonlethal Required Before Lethal Control. This alternative would not allow any lethal control by ADC 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)

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.

Integrated Wildlife Damage Management (IWDM)

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

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. IWDM is the implementation and application of safe and practical methods for the prevention and control of damage caused by wildlife based on local problem analyses and the informed judgement of trained personnel. The ADC 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. 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 cost effective manner while minimizing the 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 ADC employs consist of:

- **Technical Assistance Recommendations** (implementation is the responsibility of the requestor): ADC 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, habits and 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; these strategies are based on the level of risk, need, and practical application. Technical assistance may require substantial effort by ADC personnel in the decision making process, but the actual management is the responsibility of the requester.

- **Direct Control Assistance** (activities conducted or supervised by ADC personnel): Direct control assistance is implemented when the problem cannot effectively be resolved through technical assistance and when Cooperative Agreements provide for ADC 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 ADC 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. ADC 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, ADC, or other agency, as appropriate. Two strategies are available:
 1. **Preventive Damage Management.** Preventive damage management is applying wildlife damage management strategies before damage occurs, based on historical damage problems. As requested and appropriate, ADC personnel provide information and conduct demonstrations or take action to prevent these historical problems from recurring. For example, in areas where substantial lamb depredation has occurred on lambing grounds, ADC may provide information about guarding dogs, fencing or other husbandry techniques, or be requested to conduct PDM. Preventive damage management can take place on private, county, and Tribal lands without special authorization.

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

Predator Damage Management Methods Available for Use

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

Nonlethal Methods

Livestock producer practices consist primarily of nonlethal preventive methods such as animal husbandry, habitat modification, and animal behavior modification. Livestock husbandry and other

management techniques are implemented by the livestock producer. Producers are encouraged to use these methods, based on the level of risk, need, and professional judgement on their effectiveness and practicality (USDA 1992). Livestock producer practices recommended by ADC 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 guard dogs, herders, shed lambing, and carcass removal. Guarding animals have not been proven to be effective for cattle and calf protection. In addition, some guard dogs chase other wildlife besides predators, some apparently learn to regularly kill deer fawns, and may influence wild turkey distribution (Timm and Schmidt 1989). Thus, although considered a nonlethal control measure, guard dogs can sometimes have lethal or otherwise detrimental impacts on nontarget wildlife. Close confinement of cattle during calving is sometimes practical for small operations and, as a rule, not practical on large rangeland operations. Carcass removal usually is not feasible on extensive pasture and range operations (Wade 1982).
- 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. In many cases, habitat alteration may not be recommended if it has substantial negative impacts on other species of wildlife. This option is generally not available for public land areas.
- Animal behavior modification 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 are generally only practical on small pasture situations. Scaring devices can be effective but usually only for a short period of time before predators become accustomed and learn to ignore them. Predator proof fencing is effective but generally cost-prohibitive in most situations. Fencing 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. Scaring devices such as propane exploders are not practical under large rangeland pasture situations. They can also be disturbing to other wildlife besides target predators.

Lethal Methods

1. Leg-hold and cage traps, and neck and foot snares are used by ADC for preventive and corrective damage management only where signed *Agreements For Control On Private Property* or *Agreements For Control On Nonprivate Property* are in place. Leghold traps are set in limited numbers in selected locations where tracks and other signs indicate coyotes have been and will return. Scent lures are used to attract coyotes to the sets. When the coyote visits the set to investigate the scent, it generally steps on the trap pan

which triggers the trap springs to close the jaws of the trap on the coyote's leg. Traps are secured either by a chain and stake driven into the ground or by a chain and "drag" which hangs up in brush soon after the captured animal leaves the trap site. The coyote is held until the ADC specialist returns to check the trap. Coyotes are euthanized by shooting. Since the passage of Proposition 201, use of leghold traps and snares is limited only to private and tribal lands in the state, except under certain declared public health emergencies.

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

2. Ground shooting is selective for target species and may be used in conjunction with the use of spotlights, decoy dogs, and predator calling. Shooting with rifles or shotguns is used to manage predator damage problems when lethal methods are determined to be appropriate. The animals are killed as quickly and humanely as possible.
3. Hunting dogs are used to trail and capture certain problem predators such as mountain lions, black bears, and bobcats. Dogs are also trained and used for coyote damage management to alleviate livestock depredation (Rowley and Rowley 1987, Coolahan 1990). Trained dogs are used primarily to locate coyotes and dens, to pursue coyotes to assist aerial hunting, or to decoy problem coyotes into shooting range.
4. Denning is the practice of locating coyote dens and destroying the pups by fumigation of the den with the gas cartridge or by excavation of the den and euthanasia of the pups (see the gas cartridge under chemical methods). Denning is only useful during the spring and early summer for a few months following the birth of pups. Effective den hunting generally requires good tracking conditions and is not a major method of take in the State. For example, in FY 1995 only 0.6% of coyotes killed (12 out of a total of 1,880) were taken by this method.
5. Aerial hunting, the shooting of coyotes from fixed-winged aircraft or helicopters, is used on all lands where authorized and determined to be appropriate. Aerial hunting consists of visually sighting target animals and shooting them from the aircraft.

Chemical Management Methods:

All chemicals used by ADC are registered under FIFRA and administered by the EPA and ADA. ADC personnel that use chemical methods 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. Methods that employ chemical toxicants are no longer used to take predators on public lands (including state, FS, BLM, and local government) since the passage of Proposition 201. They are only used on private, nonpublic local government, or tribal lands with authorization from the property owner/manager.

The chemical methods that would be used in the proposed action are:

1. Sodium cyanide in the M-44 device. The M-44 cyanide ejector is a selective device for use in reducing wild canid (coyote, red fox, gray fox and feral dog) predation (EPA Reg. No. 56228-15), and also for protecting endangered species and for certain public health uses (Thomas 1986, Connolly 1988). The M-44 operating mechanism is a spring-loaded plunger. When a target canid pulls up on the device, the plunger is released and bursts or "pops" through a plastic capsule containing one gram of powdered sodium cyanide, propelling the powder into the animal's mouth. No explosive components are involved which is a common misconception among some persons unfamiliar with the device. M-44s are used for preventive and corrective management. ADC personnel comply with the EPA label and 26 use restrictions (see USDA 1994, Appendix Q). Since the passage of Proposition 201, M-44 use is restricted to private and tribal lands in Arizona, except under certain declared public health emergencies.

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

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

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

3.2.2 ALTERNATIVE 2 - No Federal ADC Predator Damage Management

This alternative would consist of no federal involvement in PDM on private, state, local government, or tribal lands in the State -- neither direct operational management assistance nor technical assistance to provide information on nonlethal and/or lethal management techniques would be available from ADC. Information on future developments in nonlethal and lethal management techniques that culminate from research efforts by ADC's research branch would not be available to producers. They would be left with the option to conduct their own predator damage control efforts. Private persons would not be bound to follow mitigation measures that ADC personnel must follow to avoid adverse impacts to T&E species. It is possible that illegal use of pesticides could occur out of frustration by some producers over the inability to reduce losses to a tolerable level.

3.2.3 ALTERNATIVE 3 - Technical Assistance Only

This alternative would not allow ADC operational PDM on private, state, local government, or tribal lands in the State. ADC would only provide technical assistance and make recommendations when

requested. However, producers, state agency personnel, or others could conduct PDM activities including the use of traps and snares, shooting, and any nonlethal methods they deem effective.

Methods and control devices could be applied by persons with little or no training and experience. This in turn could require more effort and cost to achieve the same level of problem resolution, and could cause greater impacts on nontarget species. Private persons would not be bound to follow mitigation measures that ADC personnel must follow to avoid adverse impacts to T&E species.

3.2.4 ALTERNATIVE 4 - Nonlethal Control Required Before Lethal

This alternative would allow no use of lethal methods by ADC on private, local government, state, and tribal 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. No preventive lethal control would be allowed. Producers would still have the option of implementing their own lethal control measures.

3.3 Alternatives Considered But Not Analyzed in Detail With Rationale

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

3.3.1 Compensation for Predator Damage Losses

The Compensation alternative would require the establishment of a system to reimburse persons impacted by predator damage. This alternative was eliminated from further analysis because no federal or state laws currently exist to authorize such action. Under such an alternative, ADC would not provide any direct control or technical assistance. Aside from lack of 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 give little incentive to livestock owners to limit predation through improved animal husbandry practices and other management strategies.
- Not all ranchers would rely completely on a compensation program and unregulated 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 in situations where the ADHS determines operational PDM is necessary (e.g., to reduce the risk of rabies transmission to pets and humans in a local area by reducing local populations of infected carnivore species).
- Compensation programs cannot address problems where predation is a limiting factor on other desirable wildlife species that management agencies or tribes wish to increase.

3.3.2 Bounties

Payment of funds for killing predators (bounties) suspected of causing economic losses is not supported by Arizona State agencies such as AGFD and ADA. ADC also does not support this concept because:

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

3.3.3 Eradication and Long Term Population Suppression

An eradication alternative would direct all ADC program efforts toward total long term elimination of coyotes and perhaps other predator species on private, state, local government, and tribal lands within entire cooperating counties or larger defined areas in the State.

In Arizona, eradication of predator species is not a desired population management goal of state agencies, although coyotes may be taken year round with no restriction on the numbers that can be taken. Eradication as a general strategy for managing predator damage will not be considered in detail because:

- ADC opposes eradication of any native wildlife species.
- AGFD and ADA oppose eradication of any native Arizona 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, particularly under the restrictions on methods and areas where certain PDM methods can be used in Arizona. 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 ADC 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, ADC can decide to implement local population suppression as a result of using the ADC Decision Model. However, with the constraints on control methods established in Arizona, localized population suppression is difficult to maintain except for short time periods.

It is not realistic or practical to consider large-scale population suppression as the basis of the ADC program. Typically, ADC activities in the State would be conducted on a very small portion of the area inhabited by problem species (as shown in Table 1).

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

The HSUS has proposed an alternative that requires: 1) "permittees evidence sustained and ongoing use of nonlethal/husbandry techniques aimed at preventing or reducing predation prior to receiving the services of the ADC Program"; 2) "employees of the ADC 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 components of this proposed alternative by the HSUS have been analyzed in detail in the alternatives contained in this EA and through court rulings. The HSUS alternative would not allow for a full range of IWDM techniques to resolve wildlife damage management problems. In addition, ADC is mandated to protect American agriculture, despite the cost of control. Element 4 in the HSUS alternative is not pertinent to this EA because federal public lands are outside the scope. In *Southern Utah Wilderness Society, The Wilderness Society et al. v. Hugh Thompson et al.*, U.S. Forest Service (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 ADC program. . . . Hence, to establish need for an ADC, 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 ADC 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 and available in IWDM as used by ADC.

3.3.5 Lithium Chloride as an Aversive Agent

Lithium chloride has been tested as a taste aversion agent to condition coyotes to avoid livestock, especially sheep. Despite extensive research, the efficacy of this technique remains unproven (Conover et al. 1977; Sterner and Shumake 1978; Burns 1980, 1983; Horn 1983; Johnson 1984; Burns and Connolly 1980, 1985). 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.

3.4 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 ADC 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 ADC's Standard Operating Procedures include:

- The ADC Decision Model which is designed to identify effective wildlife damage management strategies and their impacts.
- Traps and snares are not set within 30 feet of exposed carcasses to prevent the capture of scavenging birds. The exception to this is for the capture of mountain lion and black bear because the weight of these target animals allows foot snare tension adjustments to exclude the capture of smaller nontarget animals such as scavenging birds.
- Leghold trap underpan tension devices and foot snare trigger tension devices are used throughout the program to reduce capture of nontarget wildlife that weigh less than the target species.
- Nontarget animals captured in leghold traps or foot snares are released unless it is determined by the ADC Specialist that they will not survive. Release of large nontarget animals, such as mountain lions and black bears, may be preceded by sedation using chemical immobilizing agents administered by trained and certified ADC personnel.

- Conspicuous, bilingual warning signs alerting people to the presence of traps, snares, and M-44s are placed at major access points when they are set in the field.
- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid adverse impacts to T&E species.
- EPA-approved label directions are followed for all pesticide use.
- All State ADC Specialists who use restricted chemicals are trained by program personnel or others who are experts in the safe and effective use of these materials.
- The M-44 sodium cyanide devices are used following EPA label requirements (see FEIS Appendix Q for label and use restrictions).

Some additional mitigating factors specific to the current program include:

- Management actions would be directed toward localized populations or groups of target predator species and/or individual offending members of those species. Generalized population suppression across the State, or even across major portions of the state, would not be conducted.
- ADC uses PDM devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1994, Appendix P). Where such devices and activities are used and conducted on private lands or other lands of restricted public access, the risk of hazard to the public is even further reduced.

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.
- ADC kill is monitored by considering "Total Harvest" and estimated population numbers of key species. These data are used to assess cumulative effects so as to maintain the magnitude of harvest below the level that would impact the viability of populations of native species (See Chapter 4).

3.4.2.2 Effects on Nontarget Species Populations Including Threatened and Endangered Species

- ADC personnel are highly trained and experienced to select the most appropriate method for taking problem animals and excluding nontarget animals.
- Leghold trap and foot snare underpan tension devices are used to reduce hazards to nontarget wildlife that weigh less than the target species.
- Nontarget animals captured in leghold traps or foot snares are released unless it is determined by the ADC Specialist that they will not survive.
- Release of large nontarget animals, such as mountain lions and black bears, may be

preceded by sedation using chemical immobilizing agents administered by trained and certified ADC personnel.

- ADC has consulted with the USFWS regarding potential impacts of all 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 see the ADC FEIS, Appendix F (USDA 1994). ADC has initiated or reinitiated formal section 7 consultation on several species not covered by the 1992 B.O. (Mexican spotted owl, southwestern willow flycatcher, Mexican gray wolf, jaguar, desert tortoise, and California condor) all of which are listed species (with the exception of the jaguar, which is proposed for listing) in Arizona. Further consultation on species not covered by or included in these formal consultation processes has been initiated and ADC will abide by any RPM's and terms and conditions that result from that process.

3.4.2.3 Impact of Coyote Removal on Prey Populations

- State activities are directed to resolving problems by taking action against individual problem animals, or local populations or groups. ADC has agreements for PDM on about 12% of the land area of the State and generally conducts PDM activities on less than 3% of the land area in any one year. It is anticipated that, under the current program, PDM actions would not be conducted on more than 10% of the land area of the state in any one year in the reasonably foreseeable future. Thus, 90% of the land area of the State would not be impacted by ADC's PDM activities.

3.4.2.4 Humaneness of methods used by ADC

- Research continues with the goal of improving the selectivity and humaneness of management devices.
- Underpan tension devices are in use which are designed to exclude nontarget animals.

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. The chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2.

4.1 ENVIRONMENTAL CONSEQUENCES

This section analyzes the environmental consequences of each alternative in comparison with the proposed action to determine if the real or potential impacts are greater, lesser, or the same.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, floodplains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber and range. These resources will not be analyzed further.

Cumulative and Unavoidable Impacts: Discussed in relationship to each of the potentially affected species analyzed in this chapter.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Impacts on sites or resources protected under the National Historical Preservation Act: Consultation with the Arizona State Historical Preservation Office determined ADC operations would have no effect on cultural resources.

4.2 Issues Analyzed in Detail

4.2.1 Effects on Target Predator Populations

4.2.1.1 Alternative 1, - Continue the Current Federal Predator Damage Management Program (The Proposed Action as described in Chapter 1)

Wildlife population estimates useful for evaluating impacts of PDM actions are only available on a statewide basis. Therefore, this analysis focuses on Statewide population impacts which means the analysis could be considered germane to all land status areas, including FS and BLM lands. However, as stated in section 1.1, actions on FS and BLM lands are outside the scope of this EA. Nevertheless, this type of analysis is valid because coyotes and other predator species do not recognize artificial land status boundaries and frequently occupy areas of intermingled land status.

Coyote Population Information

As mentioned previously, coyotes are the major damage-causing predator of livestock in the State and also have been determined to be limiting desirable pronghorn antelope herds in certain areas. Because of requests for assistance to resolve these types of problems, coyote damage management is the major focus of ADC PDM efforts in the State.

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' unique resilience, its ability to adapt, and its perseverance under adverse conditions is commonly recognized among biologists and rangeland managers.

Determinations of absolute densities for coyote populations are frequently limited to educated guesses

(Knowlton 1972). Coyotes are highly mobile animals with home ranges (territory) 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). Coyote population densities will vary depending on the time of year, food abundance, and habitat. Coyote densities in some populations have ranged from a low of 0.39/mi² during the time when populations are low (just prior to the annual period of pup birth) to a high of 3.55/mi² when populations are high (just after the period of pup birth) (Pyrah 1984, Knowlton 1972). Coyote home ranges may vary from 2.0 mi² to 21.3 mi² (Andelt and Gipson 1979, Gese et al.1988). Ozoga and Harger (1966), Edwards (1975), and Danner (1976) however, observed a wide overlap between coyote home range and did not consider coyotes territorial.

The presence of unusual food concentrations and nonbreeding helpers at the den can influence coyote densities, and complicate any effort to estimate abundance (Danner and Smith 1980). A positive relationship was established between coyote densities in mid-late winter and the availability of dead livestock (Roy and Dorrance 1985).

Each occupied coyote territory may have several nonbreeding helpers at the den during whelping (Allen, et al. 1987, Bekoff and Wells 1982). Therefore, each defended coyote territory may have more than just a pair of coyotes. Messier and Barrette (1982) reported that during November through April, 35% of the coyotes were in groups of three to five animals and Gese et al. (1988) reported that coyote groups of 2, 3, 4, and 5 comprised 40%, 37%, 10% and 6% of the resident population, respectively.

Many authors have estimated coyote populations throughout the west and elsewhere (Pyrah 1984, Camenzind 1978, Knowlton 1972, Clark 1972, USDI 1979). The AGFD estimated the coyote population in the state to be about 260,000 in 1994 and 200,000 in 1995. Although this appears to indicate a declining population, their most recent determination (for 1995) is that the population is increasing (AGFD, 1996, Pers. Com.). These estimates indicate an average statewide density of between 1.8 and 2.2 per square mile across the State.

Knowlton (1972) estimated coyote densities west wide to be an average of 0.5 to 1.0 per square mile over a large portion of the coyote's range. Densities in certain regions have been estimated at levels as high as 4-6 per square mile and in certain local areas up to 14 per square mile (USDI 1978). Thus, although higher than general published averages, the AGFD estimates are reasonable.

Coyote Population Impact Analysis

ADC killed 1,880 coyotes in the State during Fiscal Year 1995 and 1,528 coyotes in FY 1994. Sport hunters and trappers harvested 29,137 coyotes during the 1993-94 fur harvest season and 25,400 coyotes in 1994-95 (AGFD, pers. comm., 1996). Although private coyote take may legally occur at any time, since there is no closed season or bag limit (AGFD Commission Order #13), it is reasonable to assume that most of the private take occurs in the winter period when furs are prime. Thus the ADC fiscal year and the period of take by private individuals should be similar. These data indicate the total number of coyotes taken (killed) per year in the State is between 27,000 and 31,000. Based on the estimates of the statewide population, the cumulative take was between 11 and 14% of the population (Table 2).

Table 2
Cumulative Coyote Kill in Arizona in Two Typical Years

	FY-1994	FY-1995
Est. Population	260,000	200,000
ADC Kill	1,528	1,880
Other Take (Kill)	29,137	25,400
Total Kill	30,665	27,280
ADC Kill - % of Population	0.6%	0.9%
Other Kill - % of Population	11.2%	12.7%
Total Kill - % of Population	11.8%	13.6%

Connolly and Longhurst (1975) determined

that, "If 75% of the coyotes are killed each year, the population would be exterminated in slightly over 50 years." The authors further state that their model suggests that coyotes through compensatory reproduction can withstand an annual control level of 70%. To further demonstrate the coyote's recruitment (reproduction and immigration) ability, if 75% control occurred for 20 years, coyote populations would regain precontrol densities by the end of the fifth year after control was terminated. Furthermore, immigration, not considered in the Connolly/Longhurst model can result in rapid occupancy of vacant territories (Windberg and Knowlton 1988). While removing animals from small areas at the appropriate time can protect vulnerable livestock and thus can and most often does result in success for such PDM actions, immigration of coyotes from the surrounding area could quickly replace the animals removed (Stoddart, et al. 1984). Connolly (1978) noted the coyote has survived and even thrived in spite of early century efforts to exterminate it. Based on this information, ADC's impact on the coyote population in the State, even with possible under-reporting of "Other Harvest", will not affect the general coyote population because the total kill of coyotes in the State is no more than 14% of the estimated population. Evaluating the data using standards established in USDA (1994) to determine the magnitude to which total harvest impacts the species, 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. Based on the above analysis, the expected cumulative harvest rate of 11 - 16% of the coyote population in the State is well within the "low magnitude" criteria. The analysis further suggests annual coyote take could be increased by a factor of between 4 and 5 before the low magnitude rating is exceeded or a factor of between 5 and 6 before the 70% allowable harvest level would be exceeded. Therefore, it is reasonable to conclude that cumulative impacts on coyote populations in general within the State are not substantial and would remain so even if the program's lethal coyote damage management efforts were increased several fold.

Further supporting a conclusion of low impact on coyote populations is the fact that ADC PDM activities only occur on less than 10% of the land area in the State under the current program. Thus, coyote populations on more than 90% of the area of the State are not impacted by ADC.

Mountain lion Population Impacts Analysis

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

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

Mountain lion density is primarily dependent on prey availability and the social tolerance for other mountain lions. Prey availability is directly related to prey habitat quality that directly 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 (i.e., between or among members of the same species) fighting and cannibalism also increase, and/or mountain lions disperse into unoccupied or less densely occupied habitat.

Mountain lion densities in the wild, based on a variety of population estimating techniques, range from a low of about 1/100mi² to a high of 24/100mi², and average densities for the western states have been estimated at 7.5/100mi² (Johnson and Strickland 1992). The AGFD estimates the mountain lion population in the state to be 2,500 and considered the population to be stable from 1993 through 1995 (AGFD pers. comm. 1996).

Mountain lion populations can sustain relatively moderate to heavy losses of adults and still maintain viable

populations. Robinette et al. (1977) reported an annual mortality of 32% in Utah, while Ashman et al. (1983) noted a sustained annual mortality of at least 30% in Nevada. Ashman et al. (1983) believed that under "Moderate to heavy exploitation (30%-50% removal)," mountain lion populations on their study area had the recruitment (reproduction and immigration) capability to rapidly replace annual losses. The allowable annual harvest level for mountain lion populations, determined by the USDA (1994, Table 4-2) is 30% of the population.

ADC killed 22 mountain lions in Arizona in FY 1995. The greatest number of mountain lions anticipated to be taken in any one year by ADC in the future should be no more than 50, particularly now that Proposition 201 has been passed and foot snares are no longer used on federal or state public land areas. Private harvest of mountain lions in Arizona was 225 in the 1993-94 season and 204 in the 1994-95 season. Cumulative take of mountain lions in the state was 226 in FY 1995. Assuming a similar harvest level in any future year, cumulative take from all sources probably would not exceed 300 mountain lions in the State in any one year.

At the allowable harvest level of 30% shown above, the mountain lion population could withstand an annual kill of at least 750 animals in the State before that level is exceeded. The combined private and ADC kill of mountain lions was less than 33% of the allowable harvest level in FY 1995, and would be about 40% of that level should the cumulative kill increase to 300 per year. Thus, no significant cumulative effect on the mountain lion population is expected to occur as a result of ADC's PDM activities. Even if private harvest increased to 300 per year, ADC's take would have to increase nearly 10 times anticipated maximum take before the allowable harvest level would be exceeded. Thus, significant impacts on lion populations would be avoided even if ADC PDM activities were expanded considerably.

Black Bear Population Impact Analysis

Black bears can be found throughout the Rocky Mountains and west coast mountain ranges. Female black bears reach reproductive maturity at approximately 3.5 years (Kohn 1982; Graber 1981). Following a 7-8 month gestation period, they may have one to five cubs (Rogers 1976, Alt 1981, Kolenosky and Strathearn 1987). Juvenile black bear annual mortality ranges between 20 and 70 percent, with orphaned cubs having the highest mortality (Kolenosky and Strathearn 1987). Natural mortality in adult black bears is approximately 10-20 percent (Fraser et al. 1982). Bear densities vary between 0.3 and 3.4 per square mile, depending on habitat, and black bears can live up to 25 years (Rogers 1976).

The AGFD estimated the black bear population to be at 2,250 in 1993 and at 2,000 in 1995 and considers the population to be stable overall. The allowable harvest (kill) level for black bear described in USDA (1994, Table 4-2) is 20% of the population. Thus, a sustainable level of kill for the black bear population would be 400 to 450 bears per year. ADC killed 6 black bears in the State in FY 1995. Private harvest was 126 in the 1993-94 season and 194 in the 1994-95 season. Thus, cumulative take in FY 1995 was 200 bears. Assuming private harvest remains at 250 bears or less per year, ADC's kill would have to increase by 20 - 30 times its 1995 kill level to cause cumulative take to exceed the allowable harvest level. Thus, ADC's PDM activities are insignificant to bear populations and should remain so even if bear damage problems increase substantially in the future and require additional take of bears by ADC.

Other Target Predator Species Impacts

Other target species that might be taken by ADC for PDM in the State include feral/free-ranging dogs, striped skunks, hog-nosed skunks, raccoons, gray fox, and potentially red fox. The numbers of these species killed by ADC in the State in FY 1995 were 131, 67, 1, 1, 3 and 0, respectively (these numbers include those killed as nontargets).

Take of feral and/or free-ranging dogs by the program is considered to be of no significant impact on the human environment since dogs are not an indigenous component of ecosystems in the state. The kill of dogs by ADC is minor in comparison to the number killed by animal control and humane organizations in the country each year.

The numbers of the other target species killed as shown above are low enough that impacts should be insignificant to populations.

4.2.1.2 Alternative 2 - No Federal ADC Predator Damage Management)

Under this alternative, ADC would have no impact on target predator species populations in the State. Private efforts to reduce or prevent depredations could increase which could result in impacts on target species populations. Impacts on target species under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by private persons. For the same reasons shown in the population impacts analysis in section 4.2.1.1 it is unlikely that coyote or other target populations would be impacted significantly by implementation of this alternative. However, it is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to unknown impacts on carnivore populations in general in the area.

4.2.1.3 Alternative 3 - Technical Assistance Only

Under this alternative, ADC would have no impact on target predator species populations directly. Private efforts to reduce or prevent depredations could increase which could result in impacts on those populations. For the same reasons shown in the population impacts analysis in section 4.2.1.1, it is unlikely that coyote or other target populations would be impacted significantly by implementation of this alternative. Impacts and hypothetical risks of illegal chemical toxicant use under this alternative would probably be about the same as those under Alternative 2.

4.2.1.4 Alternative 4 - Nonlethal Required Before Lethal

Under this alternative, ADC take of target predator species would probably be less than that of the proposed action because lethal actions by ADC would be restricted to situations in which nonlethal controls have been tried, in most cases by the requestor but also by ADC, without success. No preventive lethal control actions would be taken by ADC. For many individual damage situations, this alternative would be similar to the current program because many producers have tried one or more nonlethal methods such as predator resistant fencing without success or have considered them and found them to be impractical in their particular situations prior to requesting ADC assistance. Without ADC conducting preventive control activities, it is likely that private efforts at preventive control would increase, leading to potentially similar cumulative impacts as those of the proposed action. For the same reasons shown in the population impacts analysis in section 4.2.1.1, it is unlikely that statewide coyote or other target species populations would be impacted significantly by implementation of this alternative. Impacts and hypothetical risks of illegal chemical toxicant use under this alternative would probably be greater than the proposed action, but less than those under Alternatives 2 and 3.

4.2.2 **Effects on Nontarget Species Populations, including Threatened and Endangered Species.**

4.2.2.1 Alternative 1 - The Proposed Action

Nontarget species taken in the State in FY 1995 were recorded as Target - Unintentional (i.e., they were listed on the agreement as target species but were taken unintentionally during efforts to take other target species) or Nontarget (i.e., they were not listed as target species on the agreement and were taken unintentionally during efforts to take target species). With this type of data recording, some species were targets in some situations and nontargets in others.

Nontarget animals killed by ADC during PDM activities in the State in FY 1995 included 1 coyote, 7 feral/free-ranging dogs, 1 raccoon, 4 striped skunks, and 3 gray fox. This level of nontarget take is low and insignificant to populations because all of these species are common in the state. None have been declared to be threatened or endangered. It is expected that nontarget take will continue to be low, even if PDM activities are expanded in the future.

Nontarget animals captured in leghold traps or foot snares are released unless it is determined by the ADC Specialist that they will not survive. Release of large nontarget animals, such as mountain lions and black bears, may be preceded by sedation using chemical immobilizing agents administered by trained and certified ADC personnel.

Mitigation measures to avoid T&E impacts were described in Chapter 3 (section 3.4.2.2). Those measures should assure there would be no jeopardy to T&E species from the proposed action. No T&E species have been killed by ADC in the State.

4.2.2.2 Alternative 2 - No Federal ADC Predator Damage Management

Alternative 2 would not allow any ADC wildlife damage management in the State. There would be no impact on nontarget or T&E species by ADC activities from this alternative. However, private efforts to reduce or prevent depredations could increase which could result in less experienced persons implementing control methods and could lead to greater take of nontarget wildlife than the proposed action. Hazards to raptors, including bald eagles, could therefore be greater under this alternative. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could impact local nontarget species populations, including T&E species. Deaths of the larger nontarget animals such as mountain lions and black bears may increase because private individuals do not have ready access to immobilizing drugs or equipment.

4.2.2.3 Alternative 3 - Technical Assistance Only

Alternative 3 would not allow any ADC direct operational PDM in the area. There would be no impact on nontarget or T&E species by ADC activities from this alternative. Technical assistance or self-help information would be provided at the request of livestock producers and others. Although technical support might lead to more selective use of control methods by private parties than that which could occur under Alternative 2, private efforts to reduce or prevent depredations could result in less experienced persons implementing control methods leading to greater take of nontarget wildlife. Hazards to raptors, including bald eagles, could therefore be greater under this alternative. It is hypothetically possible that, similar to Alternative 2, frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to unknown impacts on local nontarget species populations, including T&E species. Deaths of the larger nontarget animals such as mountain lions and black bears may increase because private individuals do not have ready access to immobilizing drugs or equipment.

4.2.2.4 Alternative 4 - Nonlethal Required Before Lethal

Under this alternative, ADC take of nontarget animals would probably be less than that of the proposed action because no preventive lethal control actions would be taken by ADC. Mitigation measures to avoid T&E impacts were described in Chapter 3. Those measures should assure that adverse impacts are not likely to occur to T&E species from ADC's activities if Alternative 4 was implemented. However, if producers were not satisfied by corrective control only operations by ADC, private efforts to reduce or prevent depredations could increase. This could result in less experienced persons implementing control methods and could lead to greater take of nontarget wildlife than the proposed action. Hazards to raptors, including bald eagles, could therefore be greater under this alternative. It is hypothetically possible that, similar to Alternative 2, frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to unknown impacts on local nontarget species populations, including T&E species. Deaths of the larger nontarget animals such as mountain lions and black bears may increase because private individuals do not have ready access to immobilizing drugs or equipment.

4.2.3 Effects of Coyote Removal on Prey Populations

4.2.3.1 Alternative 1 - The Proposed 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 1983), 2) populations are regulated by environmental factors such as food and predation (Pitelka 1957, Fuller 1969).

Keith (1974) concluded that: 1) during cyclic declines in prey populations, predation has a depressive effect and as a result, the prey populations may decline further and be held for some time at relatively low densities, 2) prey populations may escape this low point when predator populations decrease in response to low prey populations, and 3) since rabbit and rodent populations increase at a faster rate than predator populations, factors other than predation must initiate the decline in populations.

Wagner and Stoddart (1972) and Clark (1972) independently studied the relationship between coyote and black-tailed jackrabbit (*Lepus californicus*) populations in northern Utah and southern Idaho. Both concluded that coyote populations seemed to respond to an abundance of jackrabbits. When a broad range of prey species is available, coyotes will generally feed on all species available; therefore coyote populations may not vary with changes in the availability of a single prey species (Knowlton 1964, Clark 1972).

The impact analysis on rodents and lagomorphs (rabbits and hares) showed that predators generally 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 "ADC Program activities have no adverse impacts to populations of rodents and lagomorphs." The USDA (1994) did not specifically deal with this issue.

Henke (1995) reviewed literature concerning coyote-prey interactions and concluded that short term (≤ 6 months) 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) 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. Nevertheless, most PDM actions in the State are not year round but occur for short periods after damage occurs (corrective control situations) or for short periods (< 6 months) at the time of year when benefits are most likely such as the 2-3 month period immediately preceding calving in the spring. This factor, combined with the fact that ADC conducts PDM on less than 5% of the land area of the State, and kills a low percentage ($< 5\%$) of the State population of coyotes, means ecosystem impacts should be low in magnitude. Also, take of other carnivores that prey on rodents and rabbits is too low to indicate any potential for a significant effect. Evidence also exists to suggest other carnivores such as badgers, bobcats, and foxes increase in number when coyote populations are reduced (Robinson 1961, Nunley 1977). Therefore, even if coyote numbers were reduced significantly, other species that prey on rodents and rabbits would probably increase in number to naturally mitigate any reduction in coyote predation on those prey species that might occur.

Other prey species of coyotes include white-tailed and mule deer, and pronghorn antelope. Based on the information presented in section 1.1.3, it is clear that local short term predator population reductions can enhance deer and antelope populations. This could either be a beneficial or detrimental effect depending upon whether local deer populations were at or below the capacity of the habitat to support them. However, since ADC only conducts PDM on less than 5% of the land area of the State in any one year and takes less than 5% of the coyote population, it is unlikely that effects on deer or

antelope populations would be significant, except in isolated instances. In those areas where coyote removal has been requested by AGFD or Indian tribes for the purpose of enhancing antelope herds, an increase in local population is desired and considered a beneficial impact on the human environment. When herd management goals have been met, it is likely that coyote control in those situations will be ended. In any event, the impacts are unlikely to be significant in major portions of the State.

4.2.3.2 Alternative 2 - No Federal ADC Predator Damage Management and Alternative 3 - Technical Assistance

Since Alternatives 2 and 3 would result in no ADC operational programs, the potential effects would be similar and will be analyzed together. Under Alternatives 2 and 3, the impacts on prey populations from predator removal would likely be somewhat less than those of the proposed action because no federal PDM activities would occur. However, the difference is not likely to be substantial because private efforts to reduce coyote populations could still occur and would probably increase without ADC operational activities. Also, anticipated effects on coyote populations and other carnivore populations are expected to be minimal as identified by the analysis in section 4.2.1.

4.2.3.3 Alternative 4 - Nonlethal Required Before Lethal

Impacts of implementing Alternative 4 on prey species populations would likely not differ much from those of the proposed action for the same reasons identified in section 4.2.3.1.

4.2.4 Humaneness of Control Techniques

4.2.4.1 Alternative 1 - Continue the Current Program (Proposed Action)

Under this alternative, methods viewed by some persons as inhumane would be employed. Despite standard operating procedures designed to maximize humaneness described in sections 3.4.2.4 and 2.2.3, the perceived stress and trauma associated with being held in leghold traps or snares until the ADC specialist arrives at the site and dispatches, or, as in the case of unharmed nontargets, releases, trapped or snared animals would be unacceptable to some persons. Most target animals that are killed by shooting or by M-44's would die instantly or within seconds to a few minutes, effecting a humane death.

On the other hand, if the PDM actions used in the current program were successful, fewer livestock and 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 proposed action.

4.2.4.2 Alternative 2 - No Federal ADC PDM:

Under this alternative, methods viewed by some persons as inhumane would not be employed by ADC but would likely be employed by private individuals, with the exception of the M-44 device. Use of leghold traps and shooting by private individuals would probably increase. This could result in less experienced persons implementing use of traps and snares. Greater take and suffering of nontarget wildlife could result. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which might result in increased animal suffering.

More livestock could be expected to suffer from injuries caused by depredations than under the proposed action.

4.2.4.3 Alternative 3 - Technical Assistance Only.

Impacts regarding the issue of humaneness under this alternative would likely be similar to those under Alternative 2.

4.2.4.4 Alternative 4 - Nonlethal Required Before Lethal.

The amount of suffering by target and nontarget wildlife under this alternative would likely be less than under the proposed action since preventive control activity by ADC would not be allowed. However, use of leghold traps and shooting by private individuals would probably increase if depredation was not satisfactorily reduced. This could result in less experienced persons implementing use of traps and snares without modifications such as underpan tension devices which exclude smaller nontarget animals. Greater take and suffering of nontarget wildlife could result. The hypothetical risk of frustration leading to illegal pesticide use and its associated animal suffering is probably less than under alternatives 2 and 3 but more than under the proposed action.

Suffering of livestock because of injuries caused by depredation would likely increase under this alternative because, in many situations, effective PDM actions by ADC could not be implemented until the onset of depredation.

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APPENDIX A

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