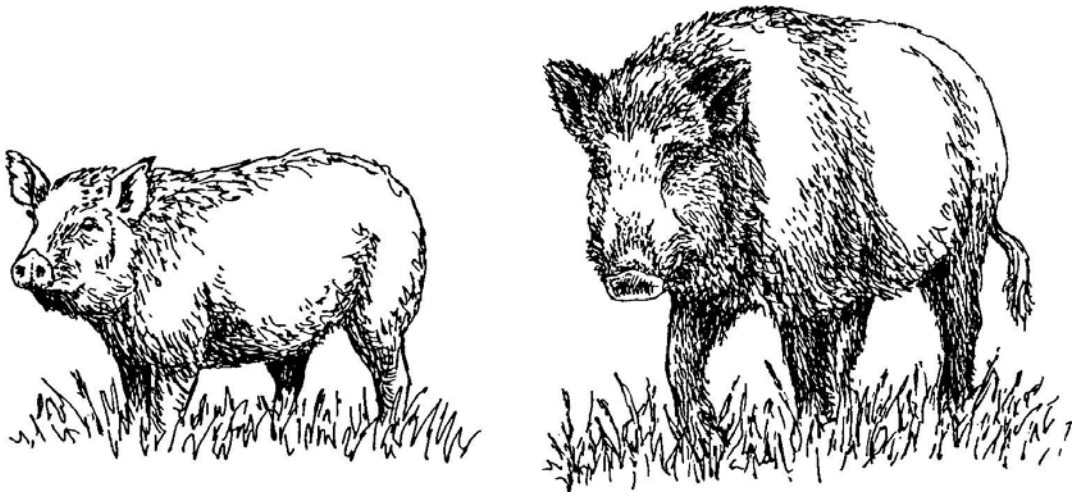
ENVIRONMENTAL ASSESSMENT

for

FERAL SWINE DAMAGE MANAGEMENT IN NEW MEXICO



Prepared By:

United States Department of Agriculture
Animal and Plant Health Inspection Service
New Mexico Wildlife Services Program

June 2009

ENVIRONMENTAL ASSESSMENT

FERAL SWINE DAMAGE MANAGEMENT BY THE NEW MEXICO WILDLIFE SERVICES PROGRAM

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

In Cooperation with:

NEW MEXICO DEPARTMENT OF AGRICULTURE

NEW MEXICO LIVESTOCK BOARD

In Consultation with:

NEW MEXICO DEPARTMENT OF GAME AND FISH

UNITED STATES FOREST SERVICE

UNITED STATES FISH AND WILDLIFE SERVICE

UNITED STATES BUREAU OF LAND MANAGEMENT

NEW MEXICO STATE LAND OFFICE

June 2009

TABLE OF CONTENTS

TABLES OF CONTENTS i
ACRONYMS USED iii
LIST OF TABLES AND FIGURES iii

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION 1

1.1 INTRODUCTION 1
1.2 PURPOSE 2
1.2.1 Summary of Proposed Action 2
1.3 NEED FOR ACTION 2
1.3.1 Need for FSDM to Protect Agricultural Resources 3
1.3.2 Need to Protect Natural Resources 4
1.3.3 Need to Protect Property 5
1.3.4 Need to Protect Human Health and Safety 5
1.4 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS 6
1.5 DECISIONS TO BE MADE 6
1.6 SCOPE OF THIS EA ANALYSIS 7
1.6.1 Actions Analyzed 7
1.6.2 Native American Lands and Tribes 7
1.6.3 Federal, State, County, City, Private Lands 7
1.6.4 Time Period This EA Will Be Valid 7
1.6.5 Site Specificity 7
1.6.6 Interdisciplinary Development of the EA 8
1.7 AUTHORITY AND COMPLIANCE 8
1.7.1 Authority of Federal and State Agencies for FSDM in New Mexico 8
1.7.2 Compliance with Federal Laws 9
1.7.3 Compliance with State Laws 12
1.8 A PREVIEW OF THE REMAINING CHAPTERS IN THIS EA 13

CHAPTER 2: DISCUSSION OF ISSUES 14

2.1 ISSUES 14
2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES 14
2.2.1 Effects on Feral Swine Populations 14
2.2.2 Effects on Nontarget Species Populations, Including T&E Species 14
2.2.3 Impacts on Public Safety, Pets, and the Environment 21
2.2.4 Humaneness and Animal Welfare Concerns of Methods Used by WS 22
2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE 24
2.3.1 Appropriateness of Preparing an EA and not an EIS for Such a Large Area 24
2.3.2 WS's Impact on Biodiversity 24
2.3.3 Wildlife Damage Is a Cost of Doing Business—a "Threshold of Loss" Should Be Established before Lethal FSDM Is Allowed 24
2.3.4 American Indian and Cultural Resource Concerns 25
2.3.5 Cost-effectiveness of FSDM 25
2.3.6 Concerns that the Proposed Action May Be "Highly Controversial" and Its Effects May Be "Highly Uncertain," Both of Which Would Require That an EIS Be Prepared 26

CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION 27

3.1 ALTERNATIVES ANALYZED IN DETAIL 27
3.2 DESCRIPTION OF THE ALTERNATIVES 27
3.2.1 Alternative 1 - Continue the Current Federal Program (No Action/Proposed Action) 27

3.2.2 Alternative 2 - Nonlethal FSDM Methods Used by WS 27
3.2.3 Alternative 3 - Technical Assistance Only 27
3.2.4 Alternative 4 - No Federal WS FSDM Program 28
3.3 FSDM METHODS AND STRATEGIES AVAILABLE TO WS IN NEW MEXICO 28
3.3.1 Alternative 1 - Continue the WS Program 28
3.3.2 Alternative 2 - Nonlethal Methods Used by WS 37
3.3.3 Alternative 3 - Technical Assistance Only 37
3.3.4 Alternative 4 - No Federal WS FSDM Program 37
3.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE 37
3.4.1 Compensation for Feral Swine Damage Losses 38
3.4.2 Lethal FSDM Only By WS 38
3.4.3 Relocation Rather Than Killing Problem Wildlife 38
3.4.4 Develop a Statewide Bounty Program for Feral Swine 39
3.5 STANDARD OPERATING PROCEDURES FOR FSDM METHODS 40
3.5.1 General SOPs Used by WS in FSDM 40
3.5.2 WS SOPs Specific to the Issues 40

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES 43

4.1 ENVIRONMENTAL CONSEQUENCES OF FSDM FOR ISSUES ANALYZED IN DETAIL 43
4.1.1 Effects of FSDM on Feral Swine Populations 43
4.1.2 Effects on Nontarget Species Populations, Including T&E Species 45
4.1.3 Impacts on Public Safety, Pets, and the Environment 47
4.1.4 Humaneness and Animal Welfare Concerns of Methods Used by WS 49
4.2 SUMMARY AND CONCLUSION 50

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED 51

5.1 LIST OF PREPARERS/REVIEWERS 51
5.2 LIST OF PERSONS CONSULTED 51
5.3 LITERATURE CITED 51

ACRONYMS USED

APHIS	Animal and Plant Health Inspection Service
BISON-M	Biota Information System of New Mexico
BO	Biological Opinion
CEQ	Council on Environmental Quality
CFR	Codes of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FSDM	Feral Swine Damage Management
FY	Fiscal Year
IWDM	Integrated Wildlife Damage Management
MIS	Management Information System
NEPA	National Environmental Policy Act
NHPA	National Historical Preservation Act
NMAC	New Mexico Administrative Codes
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMSA	New Mexico Statutes Annotated
NWRC	WS-National Wildlife Research Center
PRRS	Porcine Reproductive and Respiratory Syndrome Virus
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WDM	Wildlife Damage Management
WS	Wildlife Services

LIST OF TABLES AND FIGURES

Table 1. Occurrence of vehicular accidents with feral swine in New Mexico from 2000 to 2007 (information obtained from K. Smith, Univ. of New Mexico where accidents are monitored for the New Mexico Traffic Safety Bureau). 6

Table 2 Federal and State listed T&E animal species and Federal T&E plant and candidate species in New Mexico and potential impact as nontargets from FSDM methods and from feral swine removal. 14

Table 3. A summary of the environmental consequences of each program alternative relative to each issue 49

Figure 1. Feral swine damage in New Mexico from FY05 to FY08 reported to WS. From FY92 to FY04, New Mexico WS only recorded two incidences of damage reflecting the relatively recent arrival of this invasive species into the State. 3

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

While wildlife is a valuable natural resource, some species of wildlife can cause problems with human interests. Feral swine (*Sus scrofa*) in New Mexico can come into conflict with human interests at sometime or another, and may need to be managed to control their damage. The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program has personnel with expertise to respond to damage caused by wildlife, including invasive species.

USDA-APHIS-WS is authorized by Congress to manage a program to reduce human/wildlife conflicts. WS's mission, developed through a strategic planning process (WS Directive 1.201, 09/16/2003), is to "... *provide Federal leadership in managing problems caused by wildlife. WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can damage agricultural and industrial resources, pose risks to human health and safety, and affect other natural resources. The WS program carries out the Federal responsibility for helping to solve problems that occur when human activity and wildlife are in conflict with one another*." This is accomplished through:

- training of wildlife damage management (WDM) professionals;
- development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
- the collection, evaluation, and dissemination of management information;
- cooperative WDM programs;
- informing and educating the public on how to reduce wildlife damage; and
- providing technical advice to the public on WDM and a source for limited use of WDM materials and equipment such as cage traps.

This Environmental Assessment (EA) evaluates ways that this responsibility could be carried out to resolve conflicts with feral swine in New Mexico. Feral swine damage management (FSDM) is an important function of the New Mexico WS Program.

WS is a cooperatively funded and service oriented program. Before FSDM control is conducted, Agreements for Control or WS Work Plans must be signed by WS and the land owner or administrator. WS cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable federal, state, and local laws.

USDA-APHIS-WS has the Federal statutory authority under the Act of March 2, 1931, as amended, and the Act of December 22, 1987, to cooperate with other Federal agencies and programs, States, local jurisdictions, individuals, public and private agencies, organizations, and institutions while conducting a program of wildlife services involving animal species that are injurious or a nuisance to, among other things, agriculture, horticulture, forestry, animal husbandry, natural resources such as wildlife, and human health and safety as well as conducting a program of wildlife services involving mammalian and avian (bird) species that are reservoirs for zoonotic diseases.

Individual actions on the types of sites encompassed by this analysis are normally categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) as described in the Code of Federal Regulations (CFR) 7, 372.5 (c). APHIS Implementing

Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR 372.5 (c) and 60 Federal Register 6,000, 6,003). WS has prepared this EA to assist in planning activities and to clearly communicate with the public the analysis of cumulative impacts for a number of issues of concern in relation to alternative means of meeting needs for such management in the state. This analysis covers WS's plans for current and future actions wherever they might be requested within New Mexico.

1.2 PURPOSE

The purpose of this EA is to analyze the effects of WS activities in New Mexico to manage damage caused by feral swine. The damage caused by New Mexico's feral swine population has increased significantly in New Mexico since 2005. Consequently, there is an increasing need for WS's assistance to individuals experiencing swine damage problems or threatened by feral swine populations in the vicinity of their property. Feral swine cause considerable damage to agricultural crops, pastures, stored feed, national wildlife refuges, state parks, and other resources. Swine directly compete with valuable native wildlife to include threatened and endangered (T&E) species and decrease habitat quality in New Mexico. In some cases, they may predate directly on livestock and wildlife species, or can pass diseases on to them. Feral hogs are known vectors of swine brucellosis, pseudorabies, leptospirosis, plague, tularemia, and other diseases. Swine pose a threat to human health and safety from zoonotic disease, and automobile and aircraft accidents. These damages, mostly to private landowners, wildlife refuges, and public lands in New Mexico, drive the need for action.

1.2.1 Summary of Proposed Action

The proposed action is to continue the current portion of the WS program that responds to requests for FSDM. Thus far, feral swine, in any numbers, have been a recent arrival in New Mexico. The proposed action is to provide a continued or increased response to the increasing population and distribution of feral swine in New Mexico and the increase in reported conflicts attributed to them. To meet these goals, WS would have the objective of responding to all requests for assistance with, at a minimum, technical assistance or self-help advice, or, where appropriate and cooperative or congressional funding is available, direct control assistance in which professional WS personnel conduct FSDM. Given enough funding, programs could be initiated to eradicate feral swine form small or large areas where they have the potential of creating an ecological catastrophe. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which allows the use of all legal techniques and methods, used singly or in combination, to meet each requestor's need for resolving conflicts with feral swine. Agricultural producers and others requesting assistance would be provided with information regarding the use of effective nonlethal and lethal techniques. Lethal methods used by WS may include shooting, spotlighting, aerial hunting, trapping, snaring, and euthanasia following live capture in cage traps. Nonlethal methods used by WS may include propane exploders, fencing, other barriers, and deterrents. In many situations, the implementation of nonlethal methods such as fencing would be the responsibility of the requestor to implement. FSDM by WS would be allowed in the state, when requested, on private or public lands where a need has been documented, upon completion of an Agreement for Control. All management actions would comply with appropriate federal, state, and local laws.

1.3 NEED FOR ACTION

The need for action is based on the increased damage and complaints caused by feral swine (an invasive species) in New Mexico. Executive Order-13112 directs federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

The feral swine population has increased considerably in the last decade. From Fiscal Year 1992 (FY92) through FY04 (federal fiscal year 2004 = October 1, 2003 – September 30, 2004) there were two damage incidents valued at $5,000 confirmed by WS Specialists to pastures and alfalfa fields in New Mexico. Figure 1 shows that the WS Management Information System (MIS[1]) damage data of reported and verified feral swine losses increased dramatically from FY05 at $300 to FY08 at $236,550. The value of damage accounts for only those incidents where WS assistance was requested in dealing with feral swine conflicts. This does not represent all damage that occurs in New Mexico.

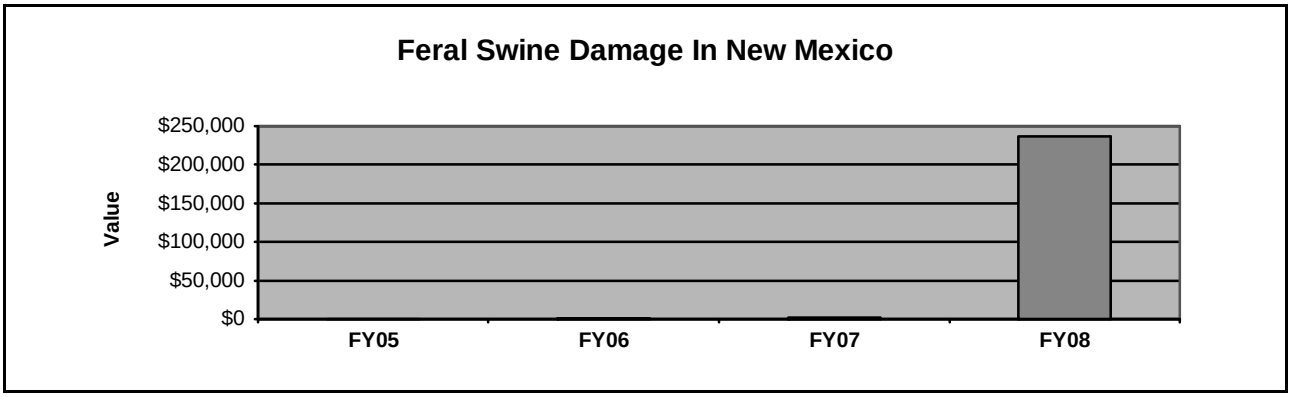


Figure 1. Feral swine damage in New Mexico from FY05 to FY08 reported to WS. From FY92 to FY04, New Mexico WS only recorded two incidences of damage reflecting the relatively recent arrival of this invasive species into the State.

1.3.1 Need for FSDM to Protect Agricultural Resources

Feral swine are responsible for large scale destruction of dikes, irrigation lines, hay, corn, wheat, barley, watermelons, hay (stack/bales), grasses/sod, and pasture primarily by rooting and wallowing. Rooting is a common activity and is done year-round in search of food (Springer 1977, Stevens 2006). Rooting and wallowing activities by feral swine damage pastures and crops, spoil watering areas, and can severely damage dikes and irrigation equipment. From FY05 through FY08, WS Specialists answered calls requesting assistance for feral hog damage increasing in FY08 to $214,750 in losses to crops, rangeland, and other agricultural property. In addition to damage to pasture and seed crops, soil upheaval can lead to soil loss through leaching and erosion. Feral swine activity in the vicinity of stock watering facilities can lead to degradation of the area and tainting of the water. Wallowing activities in stock ponds can result in severely muddied water, algal blooms, oxygen depletion, bank erosion, soured water and reduction in fish viability (Beach 1993). Feral hogs also cause damage to field crops. Damages to crops result both from feeding and feeding related activities (i.e., trampling and rooting). A large percentage of the losses are in addition to that loss resulting from the resource being eaten (Beach 1993).

Livestock, another important agricultural resource in New Mexico, can also be impacted by feral swine. Of great concern is disease transmission to swine production facilities such as swine brucellosis, pseudorabies, and brucellosis. Feral swine are potential reservoirs for several diseases and parasites that threaten livestock. A study (Corn et al. 1986) conducted in Texas found that feral swine do represent a reservoir of diseases. Swine harvested in this study tested positive for pseudorabies, brucellosis, and leptospirosis. Other diseases carried by feral swine include hog cholera, tuberculosis, bubonic plague, and anthrax (Beach 1993). A study in Oklahoma (Saliki et al. 1998) also found samples positive for

[1] MIS - Computer-based Management Information System used for tracking WS WDM activities. Throughout the text, data for a year (i.e. FY06) will be given and is from the MIS. MIS reports will not be further referenced in the text or Literature Cited Section because MIS reports are not kept on file. A database is kept that allows queries to be made to retrieve the information needed.

antibodies against porcine parvovirus, swine influenza, and the recently emerged porcine reproductive and respiratory syndrome virus (PRRS). PRRS is a highly infectious, requiring only a few viral particles to initiate infection (Henry 2003). New Mexico's inventory of all domestic swine in December 2007 and 2008 was estimated at 2,000, remaining stable since 2005 (New Mexico Agricultural Statistics Service 2009). Domestic swine have had a dramatic decrease since the early 1980s from 74,000 to 2,000 in 2008. Domestic swine production is low in New Mexico, but could increase again. Although the number of feral swine in New Mexico is unknown, possibilities of contacts between feral and domestic swine exist. In a study conducted in Oklahoma, it was noted that a number of small-scale "backyard" swine operations could potentially be exposed to feral swine (Saliki et al. 1998). Although relatively few domestic swine are produced in New Mexico, the potential exists for economic losses from a two-way transmission of infectious diseases between feral and domestic swine. A recent outbreak of PRRS in a northern Oklahoma domestic swine operation resulted in losses, associated with high rates of illness and high mortality in both adult swine and neonates, of nearly 15,000 pigs and financial losses in excess of $500,000.00 (M. Marlow, Disease Biol., Okla. WS, pers. comm. 2008).

Feral swine can be efficient predators. Calves, kids, lambs, and poultry have been known to become prey of feral swine (Stevens 2006). The young are generally most vulnerable, but adult animals that are weakened or injured are also preyed upon. Since feral swine so thoroughly consume young prey, it is often hard to find evidence that birthing and subsequent predation occurred. If a landowner is not alert to the possibility of feral swine predation, it is easy to overlook this as a cause for low production. Frequently, even when predation is considered, feral swine often escape suspicion because people generally underestimate their capabilities as a predator (Beach 1993).

In many parts of New Mexico, ranchers rely on riparian habitat to provide shade and watering areas for their livestock. Riparian habitat can be destroyed by the rooting and wallowing behavior exhibited by feral swine. This is particularly true when drought conditions concentrate large numbers of feral swine into limited riparian areas (Beach 1993).

1.3.2 Need to Protect Natural Resources

Feral swine can negatively impact native wildlife. Feral swine have been shown to reduce or remove understory vegetation, increase soil erosion and decrease stream water quality (Springer 1977, Wood and Lynn 1977, Wood and Brenneman 1980, Tate 1984, Lipscomb 1989). Feral swine are omnivorous and feed on a wide variety of items, many of which are staples for native fauna. One of the more important seasonal food resources used by feral swine is wild fruit and nut crops, especially oak mast (Wood and Roark 1980). Oak mast is also an important food source for deer (*Odocoileus spp*.) and Wild Turkey (*Meleagris gallopavo*). When feral swine actively compete for mast, resident deer and Wild Turkey may enter the winter with inadequate fat reserves, thus threatening the viability of these native wildlife species (Beach 1993). Singer et al. (1982, 1984) noted rooting activity mixed soil horizons, reduced ground vegetative cover and leaf litter, accelerated decomposition of organic matter, accelerated leaching of certain minerals and altered ecosystem nitrogen transformation processes. Feral swine have also been implicated in nest predation of ground nesting birds, (Bratton 1974, Wood and Lynn 1977, Schley and Roper 2003) herpetofauna, and small mammals (Bratton 1974, Singer et al. 1984, Baber and Coblentz 1987). Notable potential negative impacts to New Mexico wildlife include competition for mast foods with Wild Turkey and black bears, destruction of Sacramento Mountain Salamander habitat in the Sacramento Mountains, and reduction of oak tree densities in the Madrean Encinal habitat in the Bootheel region of New Mexico due to excessive mast consumption, among others. Additionally, feral swine are vectors for the transmission of diseases such as tuberculosis, brucellosis, pseudo rabies and leptospirosis, among others, to wildlife, livestock, and humans (Hutton et al. 2006).

Wildlife refuges complain of feral swine damage to their moist soil units from extensive rooting (J. Sanchez, Wildl. Biol., U.S. Fish and Wildl. Serv., Bitter Lakes National Wildlife Refuge, pers. comm. 2009). These moist soil units are normally left dry in the summer and fall months when most of the damage occurs. During the winter months when waterfowl are expected to arrive, these units are flooded to provide additional habitat for the migrating waterfowl.

Although the occurrence of feral swine in New Mexico is not well documented, they have been reported in the northeastern part of the state, the Sacramento Mountains, the Brantley Wildlife Area, the Gila National Forest, and the Bootheel region. Feral swine have very high fecundity with population growth rates reportedly as high as 178%, though it typically is closer to 40%. Litters of feral swine in California consist of an average of 5.6 young per sow with two litters under favorable conditions produced yearly (Barrett 1978). Because of this high reproduction rate and the negative effects that feral swine can have on wildlife and habitat, the New Mexico Department of Game and Fish (NMDGF) supports effective measures to minimize or eliminate damage caused by feral swine populations in New Mexico (L. Rios, Chief SW Area Operations, NMDGF, pers. comm.. 2008).

Feral swine also predate native wildlife, especially young and injured wildlife, and ground nesting birds, their nestlings and eggs (Beach 1993). Finally, feral swine can be very damaging to different habitats, especially wetlands. Their rooting and foraging can completely destroy the understory in forests and make trees less stable during windstorms. Their wallowing and foraging can significantly damage wetlands, which may be important for T&E and sensitive species such as fish.

1.3.3 Need to Protect Property

Feral swine can severely damage a variety of property. Lawns, landscaping, and gardens can literally be destroyed by a herd of feral swine, causing thousands of dollars in damage. Suburban communities, where feral swine exist often have landscaping destroyed by feral swine foraging, costing thousands of dollars to repair. Another problem is the potential for swine to cause collisions with vehicles and aircraft. Like deer and other large game species which cross highways, feral swine often cause damage to automobiles (Miller 1993). Feral swine were involved in 13 vehicular crashes from 2003 to 2007 in New Mexico (Table 1) resulting in substantial vehicle damage (K. Smith, Div. Govt. Research, Univ. New Mex., 2008, *unpubl. data*). Damage is typically greatest in areas where populations are dense. Finally, where feral swine have access to runways, they can cause considerable damage to aircraft. The Wildlife Strike Data base reports a feral hog strike at Meacham Airport, Ft. Worth, TX (S. Wright, Federal Aviation Admin.-WS Wildlife Strike Data Base Mgr., WS, pers. comm. 2008).

1.3.4 Need to Protect Human Health and Safety

Feral swine can be a threat to human health and safety from disease and in vehicle accidents. Scientists suspected feral swine as the cause of an *E. coli* outbreak in California in 2006 (Tracie Conethe, Assoc. Press Inc.-The Modesto Bee, 9/12/08). Feral swine are potential reservoirs for at least 30 viral and bacterial diseases (Davidson and Nettles 1997, Samuel et al. 2001, Williams and Barker 2001) and 37 parasites (Forrester 1991) that threaten people. Diseases such as brucellosis, salmonellosis, toxoplasmosis, trichinosis (Seward et al. 2004), tuberculosis, and tularemia (Stevens 2006, Hubalek et al. 2002) are among those that they can carry and transmit to humans. Amass (1998) reported that human infection with swine diseases are rare based on the lack of reported human cases. While these diseases are rare, they can be fatal to those that contract them. Additionally, many of the diseases would not be reported because they may go untreated, misdiagnosed, or unreported. Most of these diseases can be transmitted to livestock and were discussed above.

Another potential problem with feral swine is vehicular accidents. With an increase in their population, these could increase dramatically. These accidents could result in the injury or death of persons involved in the accidents. Feral swine were involved in 13 automobile collisions (Table 1) from 2000 to 2007 in New Mexico (K. Smith, UNM., 2008, *unpubl. data*).. As feral swine populations continue to increase in numbers and geographical distribution, more incidents of vehicular encounters can be expected. Table 1 illustrates the geographic distribution of accidents that a have occurred, coming from 10 counties in New Mexico. Feral swine at airports could cause a catastrophic incident involving the death of the crew and passengers, but this has not yet occurred at a New Mexico airport

Table 1. Occurrence of vehicular accidents with feral swine in New Mexico from 2000 to 2007 (information obtained from K. Smith, Univ. of New Mexico where accidents are monitored for the New Mexico Traffic Safety Bureau).

Count	Year	County
1	2007	Chaves
2	2005	Curry
3	2003	Dona Ana
4	2002	Eddy
5	2007	Eddy
6	2003	Grant
7	2002	Hidalgo
8	2005	Hidalgo
9	2000	Lea
10	2006	Lea
11	2004	Lincoln
12	2006	McKinley
13	2003	Union

1.4 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

WS issued an Environmental Impact Statement (EIS) on the national WS program, hereinafter referred to as USDA (1997). This EA is incorporates by reference USDA (1997).

1.5 DECISIONS TO BE MADE

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

- Should WS continue FSDM as currently implemented in New Mexico?
- If not, how should WS fulfill its legislative responsibilities for managing feral swine damage in the state?
- What standard operating procedures (SOPs) should be implemented to minimize identified risks?
- Might continuing WS's current program have significant impacts requiring the preparation of an EIS?

1.6 SCOPE OF THIS EA ANALYSIS

1.6.1 Actions Analyzed

This EA evaluates the effects of WS activities on the human environment. FSDM is conducted to protect agricultural and natural resources, property, and human health and safety.

1.6.2 Native American Lands and Tribes

Tribes have not requested WS to provide assistance within New Mexico for the protection of resources on Tribal lands. If a Tribe contacted WS for assistance, the methods employed and potential impacts would be the same as for any private land upon which WS could provide service.

1.6.3 Federal, State, County, City, Private Lands

WS provides FSDM on federal, state, county and private lands in New Mexico including the Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service (USFWS) Refuges, NMDGF Waterfowl Areas and others. If WS were requested to conduct FSDM on federal lands for the protection of private resources, this EA would cover the actions implemented. However, if the request is to protect federal resources, the requesting federal agencies would be responsible for NEPA documentation. This EA would cover such actions, though, if the requesting federal agency determined that this EA had an adequate analysis to cover the actions to be implemented and they adopted it in their own Decision Record. Actions taken on federal lands are included in the analysis in this EA.

1.6.4 Time Period This EA Will Be Valid

This EA will remain valid until WS 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 reviewed and revised as necessary. This EA will be reviewed annually to ensure that FSDM activities are still within the scope of analyses in this EA.

1.6.5 Site Specificity

This EA analyzes potential impacts on the human environment as required by NEPA and addresses WS activities on all lands under Cooperative Agreement or Agreements for Control, or as otherwise covered by WS Work Plans (e.g., on federal public lands) within New Mexico. It also addresses the impacts of FSDM on areas where additional agreements with WS may be written in the reasonably foreseeable future in New Mexico. Because the proposed action is to continue the current program under this EA, and because the current program's goal and responsibility is to provide FSDM when requested within the constraints of available funding and manpower, it is conceivable that additional FSDM efforts would occur. Thus, this EA anticipates potential expansion and analyzes the impacts of such expanded efforts as part of the current program.

Planning for the management of feral swine damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, and other emergency response agencies. Although some of the sites where feral swine damage is likely to occur and lead to requests for WS assistance can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas

whenever possible; however, many issues apply wherever feral swine damage and resulting management occurs, and are treated as such.

The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 are the site-specific routine thought process for determining methods and strategies to use or recommend for individual actions conducted by WS in New Mexico (see USDA 1997, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). The Decision Model is not intended to require documentation or a written record each time it is used, and it necessarily oversimplifies complex thought processes. Decisions made using the model would be in accordance with SOPs described herein and adopted or established as part of the decision. The analysis in this EA considers impacts on target and nontarget wildlife species, people, pets, and the environment. Wildlife populations, with the exception of T&E species, are typically monitored over large geographic areas (i.e., the West, the state) and smaller geographic areas by the State Wildlife Agency (i.e., NMDGF game management units). WS monitors target predator and nontarget take for New Mexico and by county. The game management units and counties do not correspond to each other in New Mexico, thus, analysis of wildlife population impacts are better monitored at the statewide level. Additionally, because feral swine are nonindigenous to New Mexico and often viewed as an ecological pest, the removal of any would likely benefit the human environment.

1.6.6 Interdisciplinary Development of the EA

Comments were solicited from NMDGF, New Mexico Department of Agriculture (NMDA), New Mexico Livestock Board and USFWS. Comments are maintained in an administrative file located at the WS State Office.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies for FSDM in New Mexico

WS Legislative Authority. USDA is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. WS has legislative authority to conduct WDM in New Mexico.

The primary statutory authorities for the APHIS-WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 United States Code (USC) 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c). The Act of March 2, 1931, as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, provides that:

"*The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001*."

The Act of December 22, 1987 provides 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 mammals and birds 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."

WS conducts WDM in cooperation with and under the authorities of NMDA and NMDGF. WS works cooperatively with local livestock associations and county governments to provide FSDM assistance for its constituents. FSDM assistance is provided statewide in areas where funding has been provided, occurring on both private and public lands as addressed in Section 1.6.2. The FSDM methods that can be used in New Mexico are discussed in Section 3.3.1.3 and each feral swine damage operational project may require the use of one or more of these.

New Mexico Department of Game and Fish. NMDGF has the primary responsibility to manage all protected and classified wildlife in New Mexico, except federally listed T&E species, regardless of the land class on which the animals are found (New Mexico Revised Statutes (NMSA) Title 17). Feral swine in New Mexico are not classified as game animals or under the jurisdiction of NMDGF. However, feral swine negatively impact native wildlife managed by NMDGF and the expansion of this invasive species concerns them. Moreover, NMDGF supports effective measures to minimize or eliminate damage caused by feral swine populations in New Mexico.

New Mexico Department of Agriculture. NMDA is authorized to cooperate with WS to conduct WDM. NMDA also regulates the pesticide laws in New Mexico. WS registers any pesticides it uses with NMDA. WS personnel that use pesticides in their job duties must be certified as a pesticide applicator through NMDA or be supervised by a certified pesticide applicator. No toxicants or repellents are currently registered to use on feral swine.

New Mexico Livestock Board. The New Mexico livestock board was established to govern the livestock industry of the state in the manner required by law per NMSA 77-2-1-3.

U.S. Fish and Wildlife Service. USFWS has statutory authority to manage federally listed T&E species through the Endangered Species Act of 1973 (ESA) (16 USC 1531-1543, 87 Stat. 884) and migratory birds under the Migratory Bird Treaty Act of 1918 (16 USC 703-711; 40 Stat. 755), as amended. They are also responsible for managing refuges and conflicts with predators if they conflict with the refuge management goals.

U.S. Forest Service and Bureau of Land Management. These agencies have the responsibility to manage the resources of federal National Forests, National Grasslands, and public lands for multiple uses including livestock grazing, timber production, recreation and wildlife habitat, while recognizing the State's authority to manage wildlife populations. WS conducts WDM activities on U.S. Forest Service and Bureau of Land Management lands in accordance with all applicable laws and regulations. These agencies recognize WS's expertise in WDM and rely on WS to determine the appropriate methodologies for conducting WDM to reduce livestock and other resource losses.

1.7.2 Compliance with Federal Laws

Several federal laws authorize, regulate, or otherwise affect WS FSDM activities. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act. All Federal actions are subject to NEPA (Public Law 91-190, 42 USC 4321 et seq.). WS follows the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500 et seq.), USDA (7 CFR 1b), and the APHIS Implementing Guidelines (7 CFR 372) as a part of the decision-making process. These laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis,

documentation, implementation, and monitoring. NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential significant impact on the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated, in part, by CEQ through regulations (Title 40, Code of Federal Regulations, Parts 1500-1508). In accordance with CEQ and USDA regulations, APHIS Guidelines Concerning Implementation of NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384), provide guidance to APHIS regarding the NEPA process.

Pursuant to NEPA and CEQ regulations, this EA documents the analysis for potential impacts of a proposed federal action, informs decision-makers and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that the policies and goals of NEPA are infused into Federal agency actions. An EA is prepared by integrating as many of the natural and social sciences as may be warranted based on the potential effects of the proposed action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

Endangered Species Act. It is federal policy, under ESA, that all federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with 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)). WS 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 1997, Appendix F). WS is in the process of initiating formal consultation at the programmatic level to reevaluate the 1992 BO and to fully evaluate potential effects on T&E species listed or proposed for listing since the 1992 USFWS BO (USDA 1997, Appendix F). WS has conducted a Section 7 consultation in New Mexico with USFWS in 2003 (WS 2003, USFWS 2003a).

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. All pesticides used or recommended by WS are registered with and regulated by the Environmental Protection Agency (EPA). WS uses the chemicals according to labeling procedures and requirements as regulated by EPA. Chemical repellents are the only chemicals that potentially will be used for feral swine.

Food, Drug, and Cosmetic Act. This Act, as amended, gives the Food and Drug Administration (FDA) the authorization to regulate the study and use of animal drugs. FDA could potentially regulate chemical sterilization drugs (e.g., GonaCon™) that could potentially be used by WS under this Act.

National Historical Preservation Act of 1966, as amended (NHPA). NHPA and its implementing regulations (CFR 36, 800) require federal agencies to initiate the section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106. Each of the FSDM methods described in Section 3.2.1.2 that might be used operationally by WS do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic

properties. If an individual activity with the potential to affect historic resources is planned under the alternative selected in the decision for this EA, then a site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods such as propane exploders, pyrotechnics, or firearms that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance feral swine have the potential for audible effects on the use and enjoyment of a historic property. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use, would be to benefit the historic property. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

Native American Graves Protection and Repatriation Act. The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

The Wilderness Act (Public Law 88-577(USC 1131-1136). The Wilderness Act established a national preservation system to protect areas "where the earth and its community life are untrammeled by man" for the United States. Wilderness areas are devoted to the public for recreational, scenic, scientific, educational, conservation, and historical use. This includes the grazing of livestock where it was established prior to the enactment of the law (Sept. 3, 1964) and WDM is an integral part of a livestock grazing program. The Act did leave management authority for fish and wildlife with the State for those species under their jurisdiction. Some portions of wilderness areas in New Mexico have historic grazing allotments and WS could conduct limited feral swine damage management to protect livestock and other resources following all applicable laws and regulations in doing so.

Executive Order 13112 of February 3, 1999, Invasive Species. Nonnative plants and animals that inadvertently find their way to the United States are of increasing concern as they threaten our natural resources. One study estimated that the total costs of invasive species in the United States amounted to more than $138 billion each year (Pimentel et. al. 1999). Invasive species impact nearly half of the currently listed T&E species under ESA. On February 3, 1999, Executive Order 13112 was signed establishing the National Invasive Species Council (Council). The Council is an inter-Departmental body that helps coordinate cost-effective federal activities regarding invasive species and ensure that activities are complementary. Council members include the Departments of the Interior, Agriculture, Commerce, State, Treasury, Transportation, Defense, and Health and Human Services, and EPA, and the U.S. Agency for International Development. Together with the Invasive Species Advisory Committee, stakeholders, concerned members of the public, and member departments, the Council formulated an action plan for the nation. The Council issued the National Invasive Species Management Plan early in 2001 to provide an overall blueprint for Federal action. The Plan recommends specific action items to improve coordination, prevention, control and management of invasive species by the federal agency members of the Council. Feral swine are considered an invasive species in the United States because they are not part of the native fauna of wildlife.

Environmental Justice and Executive Order 12898. These laws assure that federal actions will not have differing impacts on minority and low-income populations. Environmental Justice has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Executive Order

12898 requires federal agencies to make Environmental Justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies and activities on minority and low-income persons or populations. A critical goal of Executive Order 12898 is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. Environmental Justice is a priority within USDA, APHIS, and WS. APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA.

WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice. WS personnel use WDM methods as selectively and environmentally conscientiously as possible. All chemicals used by WS are regulated by the EPA through FIFRA, NDOA, by Memorandum Of Understanding's with federal land managing agencies, and by WS Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used following label directions, they are highly selective for the target species or population, and such use has negligible impacts on the environment (USDA 1997, Appendix P). The WS operational program properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

Executive Order 13045 - Protection of Children from Environmental Health and Safety Risks. Children may suffer disproportionately from environmental health and safety risks, including their developmental physical and mental status, for many reasons. Because WS makes it a high priority to identify and assess environmental health and safety risks, WS has considered the impacts that alternatives analyzed in this EA might have on children. All WS FSDM is conducted using only legally available and approved damage management methods where it is highly unlikely that children would be adversely affected.

1.7.3 Compliance with State Laws

NMDGF manages big game (cougars and black bear) and furbearers, NMDA manages damage to agricultural and rangeland resources from predators, and counties and local agencies manage feral domestic animals. These agencies, and inherently WS, are bound to several state laws that regulate FSDM. WS complies with these laws, and consults and cooperates with state and local agencies as appropriate. These laws are in NMSA or the New Mexico Administrative Codes (NMAC). Feral swine are not regulated by any state or local laws because they are a non-native, invasive species. Thus, laws in New Mexico regard feral swine as invasive species which can be controlled as a pest on any lands, including public lands, without a permit or license.

NMSA 6.11.5-6. Taylor Grazing Act and Farm and Range Improvement Fund. These statutes allow Taylor Grazing Act monies collected by the U.S. government to be used for WDM.

NMSA 17.2.41. Endangered Species. This is the state law that provides special protection to state designated T&E species.

NMSA 17.3.46-47. Permits for Airborne Hunting. NMDGF can issue permits that allow the control of predators from aircraft under this statute. However, government employees are exempt.

NMSA 77.15.1-14. Predatory Wild Animals and Rodent Pests. These statutes allow the state of New Mexico to cooperate with and fund WS WDM.

NMSA 77-2-1 - 3. Creation of the New Mexico Livestock Board. This statute created the Livestock Board which, for a lack of laws that discuss the management of feral swine, governs the management of feral swine, ad hoc.

NMAC 19.30.2.1-11. Procedures for NMDGF to Handle Depredations Caused by Wildlife. These sections provide information for NMDGF and private landowners on how to handle wildlife damage on private and leased lands. In essence, these set the time frames for handling wildlife complaints for NMDGF. Under this law, NMDGF must provide landowners with short- and long-term solutions for depredation problems.

NMAC 19.32.2.11-12. Trap Inspection Requirements. These codes allow exemption from trap inspection requirements for personnel of NMDGF, NMDA, and WS who are acting in their official capacity in the control of depredating animals or for other management purposes.

1.8 A PREVIEW OF THE REMAINING CHAPTERS IN THIS EA

This EA is composed of 5 chapters. Chapter 2 discusses and analyzes the issues and affected environment. Chapter 3 contains a description of each alternative, alternatives not considered in detail, and SOPs to minimize or avoid environmental impacts. Chapter 4 analyzes the environmental impacts associated with each alternative considered in detail for each of the issues. Chapter 5 contains the list of preparers of this EA, persons consulted, and literature cited.

CHAPTER 2: DISCUSSION OF ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of SOPs, and issues that will not be considered in detail, with rationale. The 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. These will be analyzed in detail in Chapter 4:

Effects of FSDM on Feral Swine Populations
Effects of FSDM on Nontarget Species Populations, including T&E Species
Effects of FSDM on Human Health and Safety
Humaneness of FSDM Methods Used

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

2.2.1 Effects on Feral Swine Populations

A common concern among members of the public is whether WDM actions adversely affect the viability of target species populations. The effect of damage management actions on feral swine populations will be analyzed in this EA. However, it must be noted that feral swine are considered an invasive species in New Mexico, and as such, extirpation may be a desired goal for their population. This is likely unfeasible at this point in many areas because of the number of areas in the state where they are found and the lack of sufficient funding for such an undertaking. . However, we believe it is possible in certain areas of New Mexico that a population in a given area can be eradicated. Other areas, where extirpation may not be possible, the goal will be to manage the population at its lowest possible level.

An example of the feasibility of extirpation points to a population of feral swine at Fort Riley in northeast Kansas (WS 2009). Feral swine were discovered on the 100,000 acre Army installation in 1993. WS was asked to cooperate and develop a control program in 1995. WS removed 385 feral swine from 1995-2000 via aerial hunting, cage traps, snares, and shooting. The last feral hog seen at the site was in 2000. After eight years of monitoring, the Kansas WS Program believes that the extirpation of that population was successful. Several populations in New Mexico are of similar size and reside in similar habitat as Fort Riley. WS believes that with adequate funding and personnel, some populations in New Mexico can be extirpated.

2.2.2 Effects on Nontarget Species Populations, Including T&E Species

Another common concern among members of the public and wildlife professionals, including WS personnel, is the potential impacts of damage control methods and activities on nontarget species, particularly T&E species. WS's SOPs include measures intended to avoid or reduce the effects of FSDM methods on nontarget species populations and are presented in Chapter 3.

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects of an action and the establishment of special restrictions or measures that would minimize impacts. WS completed a Biological Assessment of potential impacts nationwide from the WS program. USFWS issued BOs on the species that WS had the likelihood to adversely affect. However, USFWS concluded that WS would have only a minimum to potential to have an adverse impact on species that were

determined to be "may effect" species (USDA 1997, Appendix F). Several FSDM methods were discussed in the BO and the reasonable and prudent alternatives and measures, and terms and conditions of those BOs are still applicable and effective today at reducing the potential for take. WS also completed a Section 7 consultation in New Mexico (WS 2003, USFWS 2003a). These will be discussed in the following individual accounts for listed species that could be affected by FSDM. It should be noted that the National WS Program began a new nationwide consultation to replace the 1992 BO (USDA 1997) which will guide FSDM activities nationally and supersede the 1992 BO (USDA 1997) when it is complete.

In all, the Federal and State T&E, and candidate species and subspecies list for New Mexico includes 19 mammals, 34 birds, 15 reptiles, 7 amphibian, 26 fish, 26 invertebrates, and 13 plants (Table 2). WS FSDM will have no negative effect on listed birds, reptiles, amphibians, fish, invertebrates, and plants and little potential to adversely affect mammals (3 of 26). USFWS had no concerns with FSDM methods and listed species of New Mexico in their 1992 BO (USDA 1997). The potential for adverse impacts are expected to negligible because WS has SOPs in place to nullify or minimize potential negative effects. Of the species listed, only the wolf, jaguar, and bighorn sheep have the potential to be taken with some FSDM methods. WS does not use methods that could jeopardize these species in "occupied habitat," areas where these species are known to occur. WS does not anticipate taking any of these species, but the potential exists. These species are given below with some life history and information pertaining to their take as a nontarget species.

Table 2 Federal and State listed T&E animal species and Federal T&E plant and candidate species in New Mexico and potential impact as nontargets from FSDM methods and from feral swine removal.

Species	**Scientific Name**	**Status**	**Locale**	**Feral Swine**	
				Methods	**Removal**
Mammals					
Arizona Shrew	*Sorex arizonae*	SE	Hidalgo	0	+
Least Shrew	*Cryptotis parva*	ST	Southeast	0	+
Lesser (Southern) Long-nosed Bat	*Leptonycteris curasoae yerbabuenae*	FE, SE	Hidalgo	0	0
Mexican Long-nosed Bat	*Leptonycteris nivalis*	FE, ST	Hidalgo	0	0
Western Yellow Bat	*Lasiurus xanthinus*	ST	Hidalgo	0	0
Spotted Bat	*Euderma maculatum*	ST	West	0	0
White-sided Jackrabbit	*Lepus callotis*	ST	Hidalgo	-	+
Peñasco Least Chipmunk	*Tamias minimus atristriatus*	ST	South-central	0	+
Organ Mtns. Colorado Chipmunk	*Tamias quadrivittatus australis*	ST	Dona Ana	0	+
Oscura Mtns. Colorado Chipmunk	*Tamias quadrivittatus oscuraensis*	ST	Socorro	0	+
Gunnison's Prairie Dog (N-central pop.)	*Cynomys gunnisoni*	FC	North-central	0	0
Southern Pocket Gopher	*Thomomys umbrinus*	ST	Hidalgo	0	0
Arizona Montane Vole	*Microtus montanus arizonensis*	SE	Northwest	0	+
New Mexican Meadow Jumping Mouse	*Zapus hudsonicus luteus*	FC ST	West	0	+
Mexican Gray Wolf	*Canis lupus baileyi*	FE, SE	Southwest	-	0
American Marten	*Martes americana*	ST	North-central	-	0
Black-footed Ferret	*Mustela nigripes*	FE, SX	Extirpated	-	0
Jaguar	*Panthera onca*	FE	Hidalgo	-	0
Desert Bighorn Sheep	*Ovis canadensis mexicana*	SE	Southwest	-	+
Birds					
White-tailed Ptarmigan	*Lagopus leucura altipetens*	SE	North-central	0	0
Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*	FC	East	-	+
Gould's Wild Turkey	*Meleagris gallopavo mexicana*	ST	Southwest	-	+
Brown Pelican	*Pelecanus occidentalis carolinensis*	FE, SE	Accidental	0	0
Neotropic Cormorant	*Phalacrocorax brasilianus*	ST	South-central	0	0
Bald Eagle	*Haliaeetus leucocephalus alascanus*	ST	Statewide	-	0
Common Black-Hawk	*Buteogallus anthracinus anthracinus*	ST	Southwest	0	0
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	FE, SE	South	0	0
Peregrine Falcon	*Falco peregrinus anatum & tundrius*	ST	Statewide	0	0
Piping Plover	*Charadrius melodus circumcinctus*	FT, ST	Statewide	0	+
Least Tern (interior population)	*Sterna antillarum athalassos*	FE, SE	Statewide	0	+
Common Ground-Dove	*Columbina passerine pallescens*	SE	South	0	+
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	FC	West	0	0
Whiskered Screech-Owl	*Megascops trichopsis asperus*	ST	Hidalgo	0	0

Mexican Spotted Owl	*Strix occidentalis lucida*	FT	West	0	0
Boreal Owl	*Aegolius funereus*	ST	Northwest	0	0
Buff-collared Nightjar	*Caprimulgus ridgwayi ridgwayi*	SE	Hidalgo	0	+
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	ST	Hidalgo	0	0
White-eared Hummingbird	*Hylocharis leucotis borealis*	ST	Hidalgo	0	0
Violet-crowned Hummingbird	*Amazilia violaceps ellioti*	ST	Hidalgo	0	0
Lucifer Hummingbird	*Calothorax lucifer*	ST	Hidalgo	0	0
Costa's Hummingbird	*Calypte costae*	ST	Southwest	0	0
Elegant Trogon	*Trogon elegans canescens*	SE	Hidalgo	0	0
Gila Woodpecker	*Melanerpes uropygialis uropygialis*	ST	Hidalgo	0	0
Northern Beardless-Tyrannulet	*Camptostoma imberbe ridgwayi*	SE	Hidalgo	0	0
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	FE, SE	West	0	0
Thick-billed Kingbird	*Tyrannus crassirostris*	SE	Hidalgo	0	0
Bell's Vireo	*Vireo bellii arizonae & medius*	ST	South	0	0
Gray Vireo	*Vireo vicinior*	ST	West	0	0
Abert's Towhee	*Pipilo aberti aberti*	ST	Southwest	0	+
Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*	SE	Hidalgo	0,	+
Baird's Sparrow	*Ammodramus bairdii*	ST	Statewide	0	+
Yellow-eyed Junco	*Junco phaeonotus palliatus*	ST	Hidalgo	0	+
Varied Bunting	*Passerina versicolor versicolor*	ST	South	0	0
Reptiles					
Western River Cooter	*Pseudemys gorzugi*	ST	Eddy	0	+
Slevin's Bunchgrass Lizard	*Sceloporus slevini*	ST	Hidalgo	0	+
Dunes Sagebrush (Sand Dune) Lizard	*Sceloporus arenicolus*	FC SE	Southeast	0	+
Mountain Skink	*Eumeces callicephalus*	ST	Hidalgo	0	+
Spotted Canyon Whiptail	*Aspidoscelis burti stictogrammus*	ST	Hidalgo	0	+
Gray-checkered Whiptail	*Aspidoscelis dixoni*	SE	Hidalgo	0	+
Reticulate Gila Monster	*Heloderma suspectum suspectum*	SE	Southwest	0	+
Green Rat Snake	*Senticolis triaspis intermedia*	ST	Hidalgo	0	+
Plainbelly Water Snake	*Nerodia erythrogaster transversa*	SE	Eddy	0	+
Gray-banded Kingsnake	*Lampropeltis alterna*	SE	Eddy	0	+
Narrowhead Garter Snake	*Thamnophis rufipunctatus rufipunctatus*	ST	Southwest	0	+
Northern Mexican Garter Snake	*Thamnophis eques megalops*	FC SE	Southwest	0	+
Western Ribbon Snake	*Thamnophis proximus diabolicus*	ST	East	0	+
New Mexican ridge-nosed rattlesnake	*Crotalus willardi obscurus*	FT	Hidalgo	0	+
Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	ST	Southwest	0	+
Amphibians					
Jemez Mtns. Salamander	*Plethodon neomexicanus*	SE	Northwest Central	0	+
Sacramento Mtn. Salamander	*Aneides hardii*	ST	South-central	0	+
Mountain Toad	*Bufo boreas complex*	SE	Rio Arriba	0	+
Sonoran Desert Toad	*Bufo alvarius*	ST	Hidalgo	0	+
Great Plains Narrowmouth Toad	*Gastrophryne olivacea*	SE	Union/Luna	0	+
Chiricahua Leopard Frog	*Rana chiricahuensis*	FT	Southwest	0	+
Lowland Leopard Frog	*Rana yavapaiensis*	SE	Southwest	0	+
Fish					
Rio Grande Cutthroat Trout	*Oncorhynchus clarki virginalis*	FC	North-central	0	+
Gila Trout	*Oncorhynchus gilae*	FT ST	Southwest	0	+
Mexican Tetra	*Astyanax mexicanus*	ST	Southeast	0	+
Colorado Pikeminnow	*Ptychocheilus lucius*	FE SE	San Juan	0	0
Roundtail Chub	*Gila robusta*	SE	West	0	+
Gila Chub	*Gila intermedia*	FE SE	Southwest	0	+
Headwaters Chub	*Gila nigra*	FC	Southwest	0	+
Chihuahua Chub	*Gila nigrescens*	FT SE	Grant	0	+
Spikedace	*Meda fulgida*	FT SE	Southwest	0	+
Southern Redbelly Dace	*Phoxinus erythrogaster*	SE	Northeast	0	+
Suckermouth Minnow	*Phenacobius mirabilis*	ST	East	0	+
Rio Grande Silvery Minnow	*Hybognathus amarus*	FE SE	Central	0	+
Loach Minnow	*Tiaroga cobitis*	FT ST	Southwest	0	+
Peppered Chub	*Macrhybopsis tetranema*	ST	Quay	0	+
Pecos Bluntnose Shiner	*Notropis simus pecosensis*	FT SE	Southeast	0	+
Arkansas River Shiner	*Notropis girardi* (Native pop.)	FT SE	Northeast	0	+
Blue Sucker	*Cycleptus elongatus*	SE	Statewide	0	+
Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	FC SE	Northwest	0	0
Razorback Sucker	*Xyrauchen texanus*	FE	San Juan	0	+
Gray Redhorse	*Moxostoma congestum*	ST	Southeast	0	+
Pecos Pupfish	*Cyprinodon pecosensis*	ST	Southeast	0	+

White Sands Pupfish	*Cyprinodon tularosa*	ST	South-central	0	+
Pecos Gambusia	*Gambusia nobilis*	FE SE	South Southeast	0	+
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	FE ST	Grant	0	+
Bigscale Logperch	*Percina macrolepida* (Native pop.)	ST	Southeast	0	+
Greenthroat Darter	*Etheostoma lepidum*	ST	Southeast	0	+
Invertebrates					
Socorro Isopod	*Thermosphaeroma thermophilum*	FE SE	Socorro	0	+
Noel's Amphipod	*Gammarus desperatus*	FE SE	Chaves	0	+
Paper Pondshell	*Utterbackia imbecillis*	SE	San Miguel	0	0
Texas Hornshell	*Popenaias popeii*	FC SE	Eddy	0	+
Lake Fingernailclam	*Musculium lacustre*	ST	Colfax	0	+
Swamp Fingernailclam	*Musculium partumeium*	ST	Union	0	+
Long Fingernail Clam	*Musculium transversum*	ST	Northeast	0	0
Lilljeborg's Peaclam	*Pisidium lilljeborgi*	ST	Santa Fe	0	0
Sangre De Christo Peaclam	*Pisidium sanguinichristi*	ST	Taos	0	0
Koster's Springsnail	*Juturnia kosteri*	FE SE	Chaves	0	+
Alamosa Springsnail	*Pseudotryonia alamosae*	FE SE	Socorro	0	+
Chupadera Springsnail	*Pyrgulopsis chupaderae*	FC SE	Socorro	0	+
Gila Springsnail	*Pyrgulopsis gilae*	FC ST	Grant	0	+
New Mexico Hot Springsnail	*Pyrgulopsis thermalis*	FC ST	Grant	0	+
Pecos Springsnail	*Pyrgulopsis pecosensis*	ST	Eddy	0	+
Roswell Springsnail	*Pyrgulopsis roswellensis*	FE SE	Chaves	0	+
Socorro Springsnail	*Pyrgulopsis neomexicana*	FE SE	Socorro	0	+
Pecos Assiminea (Snail)	*Assiminea pecos*	FE SE	Chaves	0	+
Star Gyro (Snail)	*Gyraulus crista*	ST	Colfax	0	+
Ovate Vertigo (Snail)	*Vertigo ovata*	ST	Socorro	0	+
Shortneck Snaggletooth (Snail)	*Gastrocopta dalliana dalliana*	ST	Hidalgo	0	+
Wrinkled Marshsnail	*Stagnicola caperata*	SE	Chaves	0	+
Hacheta Grande Woodlandsnail	*Ashmunella hebardi*	ST	Hidalgo	0	+
Cooke's Peak Woodlandsnail	*Ashmunella macromphala*	ST	Luna	0	+
Mineral Creek Mountainsnail	*Oreohelix pilsbryi*	ST	Sierra	0	+
Dona Ana Talussnail	*Sonorella todseni*	ST	Dona Ana	0	+
Plants					
Sacramento prickly poppy	*Argemone pleiacantha pinnatisecta*	FE	Otero	0	+
Mancos Milk-vetch	*Astragalus humillimus*	FE	San Juan	0	0
Sacramento Mountains thistle	*Cirsium vinaceum*	FT	Otero	0	+
Lee pincushion cactus	*Coryphantha sneedii* v. *leei*	FT	Eddy	0	+
Sneed pincushion cactus	*Coryphantha sneedii* v.*sneedii*	FE	Southeast	0	+
Kuenzler hedgehog cactus	*Echinocereus fendleri* v. *kuenzleri*	FE	Southeast	0	+
Zuni fleabane	*Erigeron rhizomatus*	FT	West-central	0	0
Gypsum wild-buckwheat	*Eriogonum gypsophilum*	FT	Eddy	0	+
Todsen's pennyroyal	*Hedeoma todsenii*	FE	South-central	0	+
Pecos sunflower	*Helianthus paradoxus*	FT	Central W-central	0	+
Holy Ghost ipomopsis	*Ipomopsis sancti-spiritus*	FE	San Miguel	0	0
Knowlton's cactus	*Pediocactus knowltonii*	FE	San Juan	0	+
Mesa Verde cactus	Sclerocactus mesae-verdae	FT	San Juan	0	+

STATUS = F – Federal; S - State ; E – Endangered; T - Threatened ; C – Candidate; X Believed extirpated
FSDM Methods and Feral Swine Removal = (-) – Negative; 0 – none; (+) – Positive

White-sided Jackrabbit. This State threatened hare occurs in the United States only in extreme southern Hidalgo County, where it has been confirmed only in the Animas and South Playas valleys (Hubbard et al. 1985). The white-sided jackrabbit appears to be a virtual obligate of grasslands (Conley and Brown 1977). Although the species shares its range with the black-tailed jackrabbit, the two generally occupy different habitats (Conley and Brown 1977). In areas of pure grassland, the white-sided jackrabbit is found, but not the black-tailed jackrabbit. In areas where grassland is invaded by shrubs and forbs, black-tailed jackrabbits outnumber white-sided jackrabbits proportional to the extent of invasion. The white-sided jackrabbit feeds primarily on nutgrass (*Cyperus rotundus*) and various grasses, including buffalo-grass (*Buchloe dactyloides*) and other shortgrass plains species (Bednarz 1977 *cited in* Biota Information System of New Mexico (BISON-M) 2009). FSDM methods in occupied habitat that could take them are leghold traps and snares. WS avoids taking white-sided jackrabbits by using pan-tension devices on leghold traps and stops on snares when they are used in occupied habitat. WS has not taken a white-sided jackrabbit incidentally in at least the last 10 FYs. The take of black-tailed jackrabbits as a nontarget

decreased substantially with the use of pan-tension devices on leghold traps in predator damage management. WS anticipates that it will not take any white-sided jackrabbits because leghold trap use will be minimal in FSDM and snare are placed far enough above the ground and with a big enough loop to preclude capture.

Mexican Gray Wolf. The gray wolf, including the Mexican subspecies, was extirpated from much of the lower 48 continental United States in the first half of the twentieth century. The Mexican wolf population once inhabited areas in Arizona, New Mexico, Texas, and Mexico, but they were probably extirpated from the U.S. by 1970 with the last verified report of a wild wolf; and may altogether be extirpated now in Mexico. Fortunately, captive Mexican wolves were available for their recovery. They now have been reintroduced in Arizona and New Mexico as a "Nonessential/Experimental Population" under section 10(j) of the Endangered Species Act which is outlined in the Wolf Recovery Plan.

Some tools used in FSDM such as traps, snares, and pyrotechnics have the potential of taking a wolf. WS follows the conservation measures established in the 1998 Biological Opinion and Conference Opinion issued by USFWS (1998) ; this was actually two opinions - a BO for “naturally occurring wolves” and a Conference Opinion for the reintroduced nonessential-experimental wolves. WS does abide by both which provided conservation recommendations for WDM method use while working in the “occupied wolf range” for the “naturally occurring” and nonessential-experimental wolf populations. In the event that WS personnel sight a wolf or find evidence that indicates their likely presence in an area, such as scat and tracks, or WS is made aware of verified sightings, WS will initiate the same conservation measures as is conducted within the nonessential-experimental population zone area. Within the immediate area where wolves or verified sign has been found and documented by WS personnel, neck snares will not be used. WS personnel will be made aware of the presence of wolves, and shooting, including aerial hunting activities, will be minimized and limited to those personnel that have been trained to recognize the difference between wolves and coyotes. In addition, the USFWS Wolf Recovery Team will be notified of the presence of a wolf.

It is WS’s findings that FSDM activities may affect wolves. However, the methods used in FSDM methods are not likely to jeopardize wolf recovery, especially considering that wolves would most likely be from a nonessential-experimental population, and WS would initiate mitigation measures to avoid jeopardy should a wolf be found outside of its nonessential-experimental population range in New Mexico. The 1998 BO and Conference Opinion issued incidental take statements for the take of naturally occurring and reintroduced populations of wolves, but did not anticipate that any would be taken. WS in New Mexico abides by the 1998 BO and Conference Opinions (USFWS 1998).

Black-footed Ferret. The black-footed ferret once was found among prairie dog colonies of New Mexico, though it was likely rare (BISON-M 2009). The black-footed ferret has not been confirmed in New Mexico since 1934, but a few unverified sightings have occurred since that time. They were thought to be extinct nationally with the last known captive ferret dying in captivity in 1979. In 1981, a new population was found in northwestern Wyoming which was subsequently taken in to captivity when many of these ferrets began dying of distemper. The captive breeding program that was established with the 19 remaining ferrets and have produced over 3,000; they have been reintroduced into 6 states. Populations have been started in northwestern Arizona and Colorado. The black-footed ferrets appear to be surviving. It is doubtful, though remotely plausible, that an actual wild population still exists in New Mexico today. Black-footed ferrets could possibly be negatively affected by the use of leghold traps in FSDM. However, these will likely be rarely used and can be used with pan-tension devices to preclude capture to cause no effect. WS has never taken a black-footed ferret and does not anticipate such an occurrence in FSDM.

Marten. Marten in New Mexico are in the southern part of their range in the U.S. in forested and some alpine habitats in the San Juan and Sangre de Cristo mountains of north-central New Mexico. Martens occur in spruce-fir forests and marginal alpine habitat. Naturally occurring limited distribution in northern New Mexico, habitat loss (i.e., logging), and historic over-harvesting have likely played a role in their rarity. The tools used in FSDM that have the potential for taking them include the leg-hold trap. Because martens live where feral swine are not likely to colonize (high-altitude) and leghold traps will be used minimally for feral swine and can be modified to preclude capture of smaller nontarget species, WS does not anticipate that it will take one in FSDM. WS has not taken a marten in any WDM projects in the last 10 FYs.

Jaguar. The jaguar is currently the largest felid native to the Western Hemisphere and is listed as endangered in New Mexico. Jaguars are large muscular cats with relatively short massive limbs, a deep-chested body, and cinnamon-buff in color with many black spots. Its range in North America includes Mexico and portions of the southwestern United States. A number of records of jaguars are known for New Mexico. Records of the jaguar in New Mexico have been attributed to the subspecies *P. o. arizonensis*. The historical range of the jaguar included portions of Arizona, New Mexico, and Texas. The current range is from central Mexico through Central America and into South America as far as northern Argentina. It is considered that the United States no longer contains established breeding populations which probably disappeared in the 1960s; a few males have been seen and photographed in Arizona and New Mexico. The jaguar prefers a warm tropical climate with wetlands, rarely being found in extensive arid areas. In March 1996, the presence of a jaguar was confirmed through photographs made in the Peloncillo Mountains of Arizona and New Mexico (Glenn 1996). Brown (1983) presented an analysis suggesting there was a resident breeding population of jaguars in the southwestern United States at least into the 20th century. USFWS (1990) recognized that the jaguar continues to occur in the American Southwest as an occasional wanderer from Mexico. A few male jaguars have been documented in southwestern Arizona since.

The jaguar was not part of the 1992 BO (USDA 1997) because it was not listed until 1994. However, WS initiated consultation and USFWS issued a BO and amendment in 1999 (USFWS 1999a, b). USFWS issued a may effect, but not likely to jeopardize with reasonable and prudent alternatives and measures opinion. WS in New Mexico abides by the reasonable and prudent alternatives and measures established the BO. USFWS also issued an incidental take statement in the opinion. However, WS has not had any effect on the jaguar since its listing and has not documented any sightings where WDM has been conducted in Hidalgo County. WS continues to work closely with USFWS and abides by the BO (USFWS 1999a, b) and, therefore, believes that no jaguar will be taken.

Bighorn Sheep. NMDGF lists several subpopulations of bighorn sheep as endangered. WS has not conducted FSDM in the range of any know populations of bighorn sheep, but potentially could considering the rapidly expanding feral swine population. Additionally, feral swine could compete with desert bighorn populations at watering holes. Feral swine tend to take over watering holes and foul the water in an area. Thus, removal would likely benefit the sheep populations. The primary FSDM tool of concern in the range of sheep would be the use of snares. WS anticipates that, without the use of snares in bighorn sheep range, no bighorn sheep will be taken.

Lesser Prairie-Chicken. This Federal candidate species tends to prefer fairly open sandy grasslands and shinnery-oak upland habitat in far eastern New Mexico where it feeds on insects and grains. Decline in this species has primarily been linked to a loss of habitat and potentially other factors (Arritt 1997). Predation keeps the population at lower abundance and WS has conducted some predator control to protect this species. This species can be negatively and positively affected by FSDM. The one FSDM method that could impact prairie chickens in FSDM is the leghold trap, but pan-tension devices are used

on traps to preclude capture. WS has not taken a Lesser Prairie-Chicken incidentally in at least the last 10 FYs. FSDM could have a positive benefit for the species from reduced nest destruction from feral swine.

Gould's Wild Turkey. In the Animas and Peloncillo Mountains in Hidalgo County, New Mexico, Gould's subspecies of the wild turkey, a State threatened species, can be found in areas predominated by live-oaks (*Quercus spp*.). They feed on acorns, fruits, wild onions (*Allium spp.*), grass seeds, and insects. The primary threats to this race of Wild Turkey in the State have been excessive removal of trees and other vegetation, overgrazing, loss or lack of water, poaching, and introduction of non-native turkeys and feral swine into their range (BISON-M 2009). The Gould's Wild Turkey could be adversely and positively affected by FSDM. FSDM methods of concern would be leghold traps and snares. Measures that reduce these risks are use of pan-tension devices and snare stops. WS has not taken a Gould's Wild Turkey incidentally in at least the last 10 FYs. The take of feral swine could benefit the turkey from a reduction in competition for food, such as mast, and depredation of their nests and young.

Bald Eagle. Bald Eagles, federally delisted, are generalized predators/scavengers primarily adapted to edges of aquatic habitats. They primarily feed on fish (taken both alive and as carrion), waterfowl, mammalian carrion, and small birds and mammals. The bald eagle is a wide-ranging raptor found in all 48 states during some point in its life cycle. It is a bird of aquatic ecosystems, frequenting estuaries, large lakes, rivers, reservoirs and some seacoast habitat. Bald eagles currently nest in 47 of 48 contiguous states including New Mexico, and numbers continue to increase from a low of about 500 nesting pairs in the mid-60s to over 6,000 pairs today with some nesting in New Mexico. They are now a very common winter resident in New Mexico. FSDM has minimal potential for negatively impacting the bald eagle. The FSDM methods in use by WS of concern are leghold traps and snares. WS continues to abide by the Reasonable and Prudent Methods and Alternatives in the USFWS BO (USDA 1997, Appendix F) to avoid jeopardy. WS in New Mexico has not taken a bald eagle incidentally in at least the last 10 FYs.

Species Not Listed in New Mexico, but a Potential Concern. A species not currently listed as a T&E species in New Mexico, but could be a concern is the Canada lynx.

> **Canada Lynx.** Canada lynx are medium-sized cats, with long legs, large, well-furred paws, long ear tufts, and a short, black-tipped tail. Adult males average about 30 pounds in weight and females average 19 pounds. The winter pelage of the lynx is dense and has a grizzled appearance with grayish-brown mixed with buff or pale brown fur on the back, and grayish-white or buff-white fur on the belly, legs, and feet. Summer pelage of the lynx is more reddish to gray-brown. The lynx's long legs and large feet make it highly adapted for hunting snowshoe hares (*Lepus americanus*), its primary prey, in deep snow. In the western United States, the distribution of lynx is associated with the southern boreal forests and subalpine coniferous forest; within these general forest types, lynx are most likely to persist in areas that receive deep snow. Colorado was considered the southern extreme of its range, and possibly northern New Mexico, but this was never documented. Canada lynx were recently reintroduced into southwestern Colorado and some of these introduced lynx have been seen in northern New Mexico. Currently, USFWS and NMDGF do not list the lynx on their endangered species lists and they are not protected under State law in New Mexico.
>
> When the lynx was considered for listing (Fed. Register Notice July 8, 1998 63:130 pp 36993-37013), USFWS stated "*Colorado represents the extreme southern edge of the range of the Canada lynx*." In addition, New Mexico was not considered a state in its listed range or a state where it was ever documented. However, the USFWS has been petitioned to list them. The lynx has now been documented in several of the northern Counties, all from the lynx released into Colorado (2 were shot near Chama by landowners protecting their livestock). The majority of radio-collared lynx that have been located in northern New Mexico appear to have been in high

altitude country (Shenk 2005), probably in characteristic terrain of subalpine forests in mountainous terrain. The Colorado Division of Wildlife is conducting a habitat analysis to determine habitat preference from their locations. FSDM will have little potential to adversely affect the lynx because feral swine will not likely ever be found in lynx habitat (high-altitude). FSDM methods of primary concern are leghold traps and snares. Because feral swine are not currently found in lynx habitat and feral swine are not likely to be found in the areas lynx have been found, we believe FSDM will have no effect on lynx.

Other Considerations. In contrast to adverse impacts on nontarget animals from direct take of feral swine through FSDM methods, some nontarget species may actually benefit from FSDM. Prime examples are the benefit to ground nesting bird species such as the Lesser Prairie-Chicken that results from any reduction in nest destruction or predation from feral swine activity, or the reduction of impacts to wetlands from feral swine wallowing where T&E species of fish, invertebrates, amphibians such as the Chiricahua leopard frog, and plants are present. However, even though these species could benefit, they would likely only truly benefit from FSDM directed to protect them where feral swine were considered a direct threat to them. In all, 99 species have been identified that could benefit from FSDM in areas where the 2 (feral swine and the T&E species) occupied the same area.

Another peripheral factor pertinent to assessing the risk of adverse effects to nontarget species of WS FSDM activities is the potential for adverse effects from not having professional assistance from programs like WS available to private entities and the State that express needs for such services. WS operates to assist individuals with damage from feral swine where a need exists. In the absence of a program, or where restrictions prohibit the delivery of an effective program, it is most likely that FSDM would be conducted by the State and other entities such as private individuals. Private FSDM activities are more likely to have higher risks to nontarget species because private activities may include the unwise or illegal use of FSDM methods. For example, Great-tailed Grackles were illegally poisoned in Texas with dicrotophos (Mitchell et al. 1984) and a corporation in Kentucky was fined for illegally using carbofuran to destroy unwanted predators including raptors at a private hunting club (Porter 2004). Similarly, on a Georgia quail plantation, predatory birds were being killed by eggs that had been injected with carbofuran (the Federal Wildlife Officer 2000); in Oklahoma, Federal agents charged 31 individuals with illegally trapping and killing hawks and owls to protect fighting chickens (USFWS 2003b). All of these examples represent ill-advised or illegal uses of methods to protect resources that could have impacted nontarget species. The Texas Department of Agriculture (2006) has a website and brochure devoted solely to preventing pesticide misuse in controlling agricultural pests. Similarly, the Department for Environment, Food and Rural Affairs (2004) in Britain has a "Campaign against Illegally Poisoning of Animals." Therefore, WS believes that it is in the best interest of the public, pets, and the environment that a professional FSDM program be available because private resource owners could elect to conduct their own control rather than use government services and simply out of frustration resort to inadvisable techniques (Treves and Naughton–Treves 2005).

2.2.3 Impacts on Public Safety, Pets, and the Environment

Some FSDM methods, and in particular the use of firearms, aerial hunting, traps, and snares by WS personnel, and these could pose a threat or cause injuries to people or pets, and possibly harm the environment. WS personnel routinely use firearms and aircraft to remove feral swine in damage situations. WS policy requires standard procedures for training, safe use, storage and transportation of firearms as prescribed by the WS Firearms Safety Training Manual (WS Directive 2.615, 04/07/06). The required firearms training is conducted biennially by National Rifle Association certified instructors. Hands-on firearms proficiency is evaluated in the field and candidates must pass a written exam. Therefore, firearms are handled in a safe manner with consideration given to the proper firearm to be utilized, the target density, backstop, and unique field conditions.

The use of aircraft by WS, which under the alternatives analyzed, include the use of helicopter or single engine fixed wing aircraft for the purposes of aerial survey, capture or aerial hunting. Pilots and gunners are certified by WS prior to engaging in such activities. In the 1990s, WS contracted an independent review of the program and initiated recommendations from the review. For the most part, all of the recommendations have been implemented. One recommendation was to train our pilots more rigorously. WS built and maintains and a National Aviation Training. The aviation safety program includes regular training for pilots and gunners as well as enhanced pilot training and evaluation. The National Aviation Training Center is beginning to provide pilots with more rigorous training which includes the use of simulators. These steps have ensured that WS will try to minimize accidents, especially those involving pilot error. Accidents involving mechanical error are harder to control, but WS has been responsible for notifying the Federal Aviation Administration of 2 discrepancies (identified aircraft problems), one involving turbine engines was issued to the public in an Airworthiness Directive.

Several issues have arisen in prior WS EAs that suggested WS aerial operations had significant risks from aircraft accidents to employees, the public, and the environment including the potential to start significant forest fires and petroleum product spills; lead from shooting could cause lead poisoning in people and wildlife; and it was felt that aircraft overflights could impact wildlife and the enjoyment of the outdoors from recreationists. These issues related to aerial hunting as a tool in WDM were addressed thoroughly in the Colorado and New Mexico Predator Damage Management EAs (WS 2005, 2006) and the analyses resulted in Findings of No Significant Impact. New Mexico WS anticipates that it will not use flying for feral swine as much as that for predator damage management and that all flying in New Mexico will likely be somewhat less than that analyzed in the Colorado EA. In addition, the New Mexico Predator EA (WS 2006) did not identify any other unique characteristics in New Mexico that would be impacted by aerial hunting. Thus, we believe that aerial hunting will not cause significant adverse impacts on the human environment. Based on a thorough Risk Assessment, APHIS concluded that, the use of aerial hunting is selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997).

On the other hand, feral swine are known reservoirs for several diseases transmittable to humans that pose a threat to people. Their rapidly expanding population also represents a threat to motorists and airplane passengers from vehicular collisions. These threats will likely increase as the population increases. Population increases and geographic distribution of feral swine will be discussed further in Chapter 4.

Another peripheral factor pertinent to assessing the risk of adverse effects of WS FSDM activities is the potential for adverse effects to people and pets from not having professional assistance from programs like WS available to private entities and the State that express needs for such services as discussed in Section 2.2.2. In the absence of a program, or where restrictions prohibit the delivery of an effective program, it is most likely that FSDM would be conducted by the State and other entities such as private individuals. Private FSDM activities are more likely to have higher risks to the public and pets because private activities may include the unwise or illegal use of FSDM methods (Treves and Naughton–Treves 2005).

2.2.4 Humaneness and Animal Welfare Concerns of Methods Used by WS

The issue of humaneness and animal welfare as it relates to killing or capturing wildlife is an important and very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns if "*. . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*" Suffering is described as a "*. . . highly unpleasant emotional response usually associated with pain and distress.*" However, suffering "*. . . can occur without pain . . .*" and "*. . . pain*

can occur without suffering . . ." (American Veterinary Medical Association 1987). Because suffering carries with it the implication of a time frame, a case could be made for ". . . little or no suffering where death comes immediately . . ." (California Department of Fish and Game 1991), such as shooting. Defining pain as a component of humaneness and animal welfare in FSDM methods used by WS appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would ". . . *probably be causes for pain in other animals . . .*" (American Veterinary Medical Association 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (California Department of Fish and Game 1991). Pain and suffering, as it relates to damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering since ". . . *neither medical nor veterinary curricula explicitly address suffering or its relief*" (California Department of Fish and Game 1991).

The American Veterinary Medical Association states, "... *euthanasia is the act of inducing humane death in an animal*" and "... *the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness*." (Beaver et al. 2001). Some people would prefer accepted methods of euthanasia to be used when killing all animals, including wild and feral animals. The American Veterinary Medical Association states, "For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but use terms such as killing, collecting or harvesting, recognizing that a distress-free death may not be possible." (Beaver et al. 2001).

Some individuals and groups are opposed to some management actions of WS. WS personnel are experienced and professional in their use of management methods. This experience and professionalism allows WS personnel to use equipment and techniques that are as humane as possible within the constraints of current technology. Professional FSDM activities are often more humane than nature itself (i.e., death from starvation) because these activities can produce quicker deaths that cause less 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 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness. People concerned with animal welfare often express that they would like to see animal suffering minimized as much as possible and that unnecessary suffering be eliminated. The interpretation of what is unnecessary suffering is the point to debate (Schmidt 1989).

Humaneness, as perceived by the livestock industry and pet owners, requires that domestic animals be protected from predatory birds because humans have bred many of the natural defense capabilities out of domestic animals. It has been argued that man has a moral obligation to protect these animals from all predators (USDA 1997). 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 manner is unacceptable to many people.

Thus, the decision-making process involves tradeoffs between the above aspects of pain and humaneness. Objective SOPs to minimize impacts from this issue must consider not only the welfare of wild animals, but also the welfare of humans if damage management methods were not used. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity of management devices through research and development of pan-tension devices, break-away snares, and chemical immobilization/euthanasia procedures that minimize pain. Research continues to improve selectivity, practicality, and humaneness of management devices (USDA 1997). Until new findings and products are found to be practical, a certain amount of animal suffering will occur if FSDM objectives are to be met in those situations where nonlethal FSDM methods are ineffective or impractical. 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 the No Federal FSDM Alternative since suffering experienced by livestock preyed upon by feral swine is reduced if FSDM is successful in abating predation. Measures to reduce pain and stress in animals and SOPs used to maximize humaneness are listed in Chapter 3.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

2.3.1 Appropriateness of Preparing an EA and not an EIS for Such a Large Area

Some individuals might question whether preparing an EA for an area as large as New Mexico would meet the NEPA requirements for site specificity. Comparatively, FSDM is currently a minor component of WS activities, though, it may expand greatly should funding become available because the problem has increased exponentially in the last decade.

WS's mission is to manage damage caused by wildlife, not overall wildlife populations. As an agency that exists to manage specific types of damage, WS can predict the types of locations or situations where damage is likely to occur. However, due to any number of variable circumstances, WS has no absolute control over when a request for FSDM assistance will be received nor can WS predict specific, individual times and locations of most feral swine damage situations. Therefore, WS must be ready and able to provide assistance on short notice. The missions of other federal and state wildlife management agencies generally concentrate on management for wildlife abundance and are not equipped or prepared to prevent feral swine damage problems without resorting to extreme and extensive population management strategies that, in most cases, would not be prudent or affordable. Given the feral swine population, the increase in requests for assistance and program activity monitoring, WS believes this EA addresses most potential needs at any given location. If a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire state provides a better analysis than multiple EAs covering smaller zones.

2.3.2 WS's Impact on Biodiversity

WS does not attempt to eradicate any native wildlife species in New Mexico. WS operates in accordance with international, federal and state laws, and regulations enacted to ensure species viability. Impacts on target and nontarget species populations because of WS's lethal FSDM activities are minor as will be shown in section 4.1. The impacts of WS on biodiversity are not significant nationwide or statewide (USDA 1997). In the case of local feral swine populations, the goal may be to eliminate a local population or several populations because feral swine are not part of the mix of native wildlife species, and, therefore, not an essential component of the native biodiversity. A reduction in feral swine populations could help native wildlife, thereby maintaining or restoring biodiversity.

2.3.3 Wildlife Damage Is a Cost of Doing Business—a "Threshold of Loss" Should Be Established before Lethal FSDM Is Allowed

WS is aware that some people feel federal WDM should not be allowed until economic losses reach some arbitrary pre-determined threshold level. Although some damage can be tolerated by most resource owners, WS has the legal direction to respond to requests for WDM, and it is program policy to aid each requester with the goal of minimizing losses. WS uses the WS Decision Model (Slate et al. 1992) thought process discussed in Chapter 3 to determine appropriate strategies. 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 wildlife is threatened, to establish a need for WDM (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as percentage of loss of a herd to justify the need for WDM actions.

2.3.4 American Indian and Cultural Resource Concerns

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. WS 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 on tribal properties. In addition, this EA will be made available to all tribes in the state to solicit their review and comment prior to issuing a decision. As was discussed in Section 1.7.2, WS FSDM actions are not undertakings as defined by the NHPA.

2.3.5 Cost-effectiveness of FSDM

Does the value of damage avoided equal or exceed the cost of providing FSDM? CEQ regulations (40 CFR 1502.23) do not require a formal, monetized cost-benefit analysis to comply with NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. USDA (1997) stated that:

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

2.3.6 Concerns that the Proposed Action May Be "Highly Controversial" and Its Effects May Be "Highly Uncertain," Both of Which Would Require That an EIS Be Prepared

The failure of any particular special interest group to agree with every act of a Federal agency does not create a controversy, and NEPA does not require the courts to resolve disagreements among various scientists as to the methodology used by an agency to carry out its mission (Marsh vs. Oregon Natural Resource Council, 490 US 360, 378 (1989)[2]). As has been noted in other EAs (WS 2006), "*The effects on the quality of the human environment are not highly controversial. Although there is some opposition to* [wildlife damage management], *this action is not highly controversial in terms of size, nature, or effect*." If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared.

[2] Court cases not given in Literature Cited section.

CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 ALTERNATIVES ANALYZED IN DETAIL

This EA will analyze four alternatives in detail in this EA:

- Alternative 1 - Continue the Current WS FSDM Program (the Proposed Action/No Action Alternative)
- Alternative 2 - Nonlethal FSDM Methods Used by WS
- Alternative 3 - Technical Assistance Only
- Alternative 4 - No Federal WS FSDM Program

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Alternative 1 - Continue the Current Federal Program (No Action/Proposed Action)

The No Action alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action alternative is the continuation of an ongoing program and, as defined here, is consistent with the CEQ's definition (CEQ 1981).

The proposed action is to continue the current portion of WS operations that responds to requests for FSDM, and in response to increasing distribution of feral swine throughout New Mexico, prepare for increased conflicts with agricultural and natural resources, property, and threats to human health and safety in New Mexico. To meet these goals WS would have the objective of responding to all requests for assistance with, at a minimum, technical assistance or self-help advice, or where appropriate and when cooperative or congressional funding is available, direct damage management assistance in which professional WS personnel conduct FSDM. An IWDM approach would be implemented which would allow the use of all available legal techniques, used singly or in combination, to meet the need of each requestor for resolving conflicts with feral swine. Agricultural producers and others requesting assistance would be provided with information regarding the use of effective nonlethal and lethal techniques. Lethal methods used by WS would include shooting, aerial hunting, trapping, snaring, or euthanasia following live capture by trapping. Nonlethal methods used by WS may include fencing barriers and deterrents. In many situations, the implementation of nonlethal methods such as fencing would be the responsibility of the requestor to implement. FSDM by WS would be allowed in the state, when requested, on private property sites or public facilities where a need has been documented, upon completion of an Agreement for Control. All management actions would comply with appropriate federal, state, and local laws.

3.2.2 Alternative 2 - Nonlethal FSDM Methods Used by WS

This alternative would require WS to use nonlethal methods only to resolve feral swine damage problems. Persons receiving assistance using only nonlethal methods could still resort to lethal methods that were available to them. Section 3.3.1.3 describes nonlethal methods available for use by WS under this alternative and the lethal techniques that could be used by State agency personnel and private individuals should they determine that the strategies implemented by WS had not been effective.

3.2.3 Alternative 3 - Technical Assistance Only

This alternative would not allow for WS operational FSDM in New Mexico. WS would only provide technical assistance and make recommendations when requested. Producers, property owners, State and local agency personnel, or others could conduct FSDM using snares, cage traps, shooting, or any nonlethal method that is legal. Section 3.3.1.3 describes FSDM methods that could be employed by private individuals or other agencies after receiving technical assistance advice under this alternative.

3.2.4 Alternative 4 - No Federal WS FSDM Program

This alternative would eliminate federal involvement in FSDM in New Mexico. WS would not provide direct operational or technical assistance and requestors of WS services would have to conduct their own FSDM without WS input, or possibly get it through a State program. This alternative was discussed in detail in USDA (1997). Section 3.3.1.3 describes FSDM methods that could be employed by private individuals or other agencies under this alternative. However, information on future developments in nonlethal and lethal management techniques that culminate from WS-National Wildlife Research Center (NWRC), the world leader in developing tools for WDM, would also not be available to producers or resource owners.

3.3 FSDM METHODS AND STRATEGIES AVAILABLE TO WS IN NEW MEXICO

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2 and 3 described above. Alternative 4 would terminate both WS technical assistance and operational FSDM by WS.

3.3.1 Alternative 1 - Continue the WS Program

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially to achieve a cumulative effect. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective manner while minimizing the potentially harmful effects on humans, target and nontarget species, and the environment. IWDM may incorporate cultural practices (i.e., animal husbandry), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), wildlife management (i.e., frightening feral swine from a damage areas, the removal of feral swine with traps, snare or shooting directed at individual offending animals, local population reduction, or, in the case of feral swine, eradication of an entire population), or any combination of these, depending on the circumstances of the specific damage problem.

3.3.1.1 The IWDM Strategies That WS Employs.

Technical Assistance Recommendations

"Technical assistance," as used herein, is information, demonstrations, and advice on available and appropriate WDM methods. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application.

Under APHIS NEPA Implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in

this EA because it is an important component of the IWDM approach to resolving wildlife damage problems.

Direct Damage Management Assistance

This is the implementation or supervision of damage management activities by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when Agreements for Control or other comparable instruments provide for WS direct damage management. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve complex wildlife damage problems.

3.3.1.2 WS Decision Making. WS personnel are frequently contacted after requesters have tried or considered both nonlethal and lethal methods and found them to be ineffective for any number of reasons. Misapplied or inappropriate methods are often impractical, too costly, time consuming or inadequate for reducing damage to an acceptable level. WS personnel assess the problem, evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. This conscience thought process for evaluating and responding to damage complaints is the WS Decision Model (Slate et al. 1992). In the model, most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The WS Decision Model is not a documented process, but a mental problem-solving process common to most if not all professions.

3.3.1.3 Methods Available for Use. WS has been conducting WDM in the United States for about 90 years. WS has modified WDM activities to reflect societal values and minimize impacts to people, wildlife, and the environment. The efforts have involved research and development of new field methods and the implementation of effective strategies to resolve wildlife damage. WS personnel use a wide range of methods in FSDM and strategies are based on applied IWDM principles. Some techniques suggested for use by resource owners, by other entities or individuals, to stop feral swine damage may not be considered by WS if they are biologically unsound, legally questionable, or ineffective.:

Resource Management

Resource management includes a variety of practices that may be used by agriculture producers to reduce their exposure to potential feral swine depredation losses. Implementation of these practices is appropriate when the potential for depredation can be reduced without significantly increasing the cost of production or diminishing the resource owner's ability to achieve land management and production goals. Changes in resource management are recommended through the technical assistance extended to producers when the change appears to present a continuing means of averting losses.

Animal Husbandry. This general category includes modifications in the level of care and attention given to poultry and livestock, shifts in the timing of breeding and births, selection of less vulnerable livestock species to be produced where predation is too great, and the introduction of human custodians or guarding animals to protect livestock. The level of care or attention given to livestock may range from daily to seasonal. Generally, as the frequency and intensity of livestock handling increases so does the degree of protection. In operations where livestock are left unattended for extended periods, the risk of depredation is greatest. The risk of depredation can be reduced when operations permit nightly gathering

so livestock are unavailable during the hours when predators are most active. Additionally, the risk of depredation is usually greatest with immature livestock. This risk diminishes can be minimized by holding expectant females in pens or sheds to protect births and by holding newborn livestock in pens for the first 2 weeks. Shifts in breeding schedules can also reduce the risk of depredation by altering the timing of births to coincide with the greatest availability of natural prey to predators or to avoid seasonal concentrations of feral swine (e.g., when deep snows cause temporary migrations to lower valleys). The use of human custodians and guarding animals can also provide significant protection in some instances. The presence of herders to accompany bands of sheep on open range may help ward off feral swine. Guard animals have also proven successful in many sheep and goat operations.

Altering animal husbandry to reduce wildlife damage has many limitations. Nightly gathering may not be possible where livestock are in many fenced pastures and where grazing conditions require livestock to scatter. Hiring extra herders, building secure holding pens, and adjusting the timing of births is usually expensive. The timing of births may be related to weather or seasonal marketing of young livestock. The expense associated with a change in husbandry practice may exceed the savings.

Guard Animals. Guard animals are used in WDM to protect a variety of resources and can provide significant protection at times. Guard animals (i.e., dogs, burros, and llamas) have proven successful in many sheep and goat operations. The effectiveness of guarding animals may not be sufficient in areas where there is a high density of wildlife to be deterred, where the resource, such as sheep foraging on open range, is widely scattered, or where the guard animal to resource ratios are less than recommended. WS often recommends the use of guard animals, primarily guard dogs for predators including feral swine. However, WS has not had an operational guard animal program for feral swine.

Several breeds of dogs such as the Great Pyrenees and Komondor have been used to protect sheep and goats as well as other resources damaged by feral swine. However, the supply and longevity of proven guard dogs is generally quite limited. Resource owners typically must purchase and rear their own guarding dog. Therefore, a 4 to 8 month lag-time is necessary to raise a guarding dog before it becomes an effective deterrent to wildlife such as coyotes and feral swine. Since 25% to 30% of dogs are unsuccessful, the first dog raised as a protector may not be useful. Guard dogs may be ineffective for a number of reasons, but usually because they kill the livestock they are protecting, or because they do not stay with the livestock or other resource they are intended to guard. Guard dogs can harass and kill nontarget wildlife while protecting resources (Timm and Schmidt 1986). They do have the potential for capturing any of the mammalian and avian T&E predators if they tried to depredate on the resource being protected (i.e., lambs).

Habitat Management. Localized habitat management is often an integral part of WDM. The type, quality, and quantity of habitat are directly related to the wildlife produced or attracted to an area. Habitat can be managed to not produce or attract certain wildlife species. For example, vegetation can be planted that is unpalatable to certain wildlife species or trees and shrubs can be pruned or cleared to make an area unattractive. Ponds or other water sources can be eliminated to reduce certain wildlife species. Habitat management is typically aimed at eliminating nesting, roosting, loafing, or feeding sites used by particular species. Limitations of habitat management as a method of reducing wildlife damage are determined by the characteristics of the species involved, the nature of the damage, economic feasibility, and other factors. Legal constraints may also exist which preclude altering particular habitats. Most habitat management recommended by WS is aimed at reducing wildlife aircraft strike hazards at airports such as reducing cover and water attractants near runways.

Habitat management does have the potential to have an effect on all T&E species if present in an area, especially where a T&E species is present that uses the habitat to be modified. If WS determines habitat management would be appropriate to reduce feral swine damage or the threat of damage at a site, such as

an airport where wetlands often should be removed, WS will ensure that the cooperator is aware for the need to address T&E species impacts. Habitat management instigated by WS will only be conducted following a consultation with USFWS on a site-specific basis where T&E species are present. Any efforts to mitigate identified effects will be the responsibility of the landowner, but must be agreed upon before WS will commence WDM activities. This will ensure that WS habitat management activities will not have an adverse impact on T&E species and their habitat.

Modification of Human Behavior. WS may recommend alteration of human behavior to resolve potential conflicts between humans and wildlife. For example, WS may recommend the elimination of feeding of wildlife that occurs in parks and forests near suburban areas or golf courses. This includes inadvertent feeding allowed by improper disposal of garbage. Feral swine adapt well to living near human settlements, but their proximity to humans may result in damage to property. However, it is difficult to consistently enforce no-feeding regulations and to effectively educate all people concerning the potential liabilities of feeding wildlife.

Another problem with feral swine is that people move them to expand their population to increase hunting and harvest opportunities. WS along with most resource agencies and County laws discourage this practice because it can greatly expand the feral swine population.

Physical Exclusion

Physical exclusion methods restrict the access of feral swine to resources. These methods provide a means of appropriate and effective prevention of wildlife damage in many situations. Physical exclusion methods used or recommended by WS are described in the following section. Physical exclusion methods impede the use of areas by many wildlife species, so use of these methods must be considered with care especially in areas where migratory mammals, such as mule deer (*Odocoileus hemionus*), pass.

Fencing. Fences are widely used to prevent damage. Predator exclusion fences constructed of woven wire or multiple strands of electrified wire are also effective in some areas for feral swine, but fencing does have limitations. Even an electrified fence may not be swine-proof and the expense exceeds the benefit in most cases. If large areas are fenced, the feral swine have to be removed from the enclosed area to make it useful. Some fences inadvertently trap, catch or affect the movement of non-target wildlife. Lastly, fencing is not practical or legal in some areas (e.g., restricting access to public land).

Wildlife Management

Reducing wildlife damage through wildlife management is achieved through the use of a myriad of techniques. The objective of this approach is to alter the behavior of or repel the target species, remove specific individuals from the population, reduce local population densities, or suppress/extirpate exotic species populations to eliminate or reduce the potential for loss or damage to property and natural resources.

Frightening Devices. Frightening devices are used to repel feral swine from an area where they are a damage risk (i.e., airport, crops). The success of frightening methods depends on the swine's fear of, and subsequent aversion to, offensive stimuli. A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. Over time, animals often habituate to commonly used scare tactics and ignore them. In addition, in many cases animals frightened from one location become a problem at another. Scaring devices, for the most part, are directed at specific target species by WS Specialists working in the field. However, several of these devices, such as scarecrows and propane exploders can be automated.

Harassment and other scaring devices and techniques to frighten animals are probably the oldest methods of combating wildlife damage. These devices may be either auditory or visual and generally only provide short-term relief from damage. A number of sophisticated techniques have been developed to scare or harass wildlife from an area. The use of noise-making devices is the most popular and commonly used. Other methods include harassment with visual stimuli (e.g., scarecrows, human effigies, balloons, Mylar® tape, and wind socks), vehicles, people, or dogs. These are used to frighten swine from the immediate vicinity of the damage prone area. As with other WDM efforts, these techniques tend to be more effective when used collectively in a varied regime rather than individually. However, the continued success of these methods frequently requires reinforcement by limited shooting (see Shooting).

Propane Exploders operate on propane gas and are designed to produce loud explosions at controllable intervals. They are strategically located (i.e., elevated above the vegetation) in areas of high feral swine use to frighten them from the problem site. Because animals are known to habituate to sounds, exploders must be moved frequently and used in conjunction with other scare devices. Exploders can be left in an area after dispersal is complete to discourage animals from returning.

Pyrotechnics, shell-crackers and scare cartridges, are commonly used to repel wildlife. Shell-crackers are 12 gauge shotgun shells containing firecrackers that are projected up to 75 yards in the air before exploding. They can be used to frighten feral swine and are most often used for scaring them to prevent crop depredations. The purpose is to produce an explosion between feral swine and their objective, the crop. Noise bombs, whistle bombs, racket bombs, and rocket bombs are fired from 15 millimeter flare pistols. They are used similarly to shell-crackers but are projected for shorter distances. Noise bombs are firecrackers that travel about 75 feet before exploding. Whistle bombs are similar to noise bombs, but whistle in flight but do not explode. They produce a noticeable response because of the trail of smoke and fire, as well as the whistling sound. Racket bombs make a screaming noise in flight and do not explode. Rocket bombs are similar to noise bombs but may travel up to 150 yards before exploding.

Lights, such as strobe, barricade, and revolving units, are used with mixed results to frighten wildlife. Brilliant lights, similar to those used on aircraft, are most effective in frightening night feeding mammals. These extremely bright-flashing lights have a blinding effect, causing confusion that reduces the animal's ability to locate its food or roosting spot. However, most predators rapidly become accustomed to such lights and their long-term effectiveness is questionable. In general, the type of light, the number of units, and their location are determined by the size of the area to be protected and by the power source available.

Other Scaring Devices are available to scare wildlife. The Electronic Guard (siren strobe-light device), a battery-powered, portable unit that houses a strobe light and siren has been developed by NWRC. The device activates automatically at nightfall and is programmed to discharge periodically throughout the night. Efficacy of strobe-sirens is highly variable, but in certain situations, this device has been used successfully to reduce coyote and bear depredation on sheep. The technique has proven most successful when used at "bedding grounds" where sheep gather to sleep for the night. The device, however, is a short-term tool used to deter predation until livestock can be moved to another pasture, brought to market, or other predator damage management methods are implemented.

Chemical Repellents. Chemical repellents are nonlethal chemical formulations used to discourage or disrupt particular behaviors of wildlife. Chemical repellents are categorized by their delivery mechanism: olfactory, taste, and tactile. Olfactory repellents must be inhaled to be effective. These are normally gases, or volatile liquids and granules, and require application to areas or surfaces that need protecting.

Taste repellents are compounds (i.e., liquids, dusts, granules) that are normally applied to trees, shrubs, and other materials that are likely to be eaten or gnawed by the target species. Tactile repellents are normally thick, liquid-based substances which are applied to areas or surfaces to discourage travel of wildlife by causing irritation such as to the feet. Most repellents are ineffective or are short-lived in reducing or eliminating damage caused by wildlife, therefore, are not used very often by WS. Chemical repellents available commercially for mammals contain a variety of active ingredients such as powdered or putrescent egg concentrate (i.e., Deer Away®), bone tar oil (i.e., Magic Circle Deer Repellent®), denatonium saccharide (i.e., Ro-Pel®), capsaicin from hot pepper (i.e., Hot Sauce®, Miller®), ammonium soaps (i.e., Hinder®) and sodium salts of higher fatty acids (i.e., Bye Deer®), tobacco dust (i.e., F&B Rabbit and Dog Chaser®), and zinc dimethyldithiocarbamate (i.e., Earl May Ziram). These compounds are relatively nontoxic to the environment with the amount of active ingredient used in the different formulations, especially following label instructions. Many of the active ingredients in repellents are listed on the EPA's 25b exempt list, and have reduced registration requirements because of their relatively low risk to the environment. Most of the above repellents have labels with, at most, a "Caution" statement and can be purchased by the general public and used for feral swine.

Capture or Take Methods. Several methods are available to capture or take offending animals. The appropriateness and efficacy of any technique will depend on a variety of factors.

Cage Traps come in a variety of styles for WDM to target different species. The most commonly known cage traps used in the current program are box traps. Box traps are usually rectangular, made from wood or heavy gauge wire mesh. These traps are used to capture animals alive and can often be used where many lethal or more dangerous tools would be too hazardous. Box traps are well suited for use in residential areas. Other types of cage traps are corral traps and drive-traps. Often, feral swine are allowed to feed in a cage until they get used to coming and going. Finally, a trip wire that closes the entrance, a one-way door, or other device is set to capture the feral swine when they come to feed; these will often capture multiple feral swine at one location. Cage traps usually work best when baited with foods attractive to the target animal. They are used to capture animals ranging in size from mice to deer, but are usually impractical in capturing most large animals. However, large cage traps do work well for capturing feral swine, provided the traps can be transported by vehicle to the damage sites. Cage traps for feral swine are large with heavy gauge wire with a swinging entrance. They are very effective at catching large numbers of them.

Snares made of wire or cables are among the oldest existing WDM tools. They can be used effectively to catch most species including feral swine. They are generally not affected by inclement weather. Snares may be employed as either lethal or live-capture devices depending on how or where they are set. Snares set to capture feral swine by the neck are usually lethal but stops can be attached to the cable to make the snare a live capture device. Snares positioned to capture the animal around the body can be a useful live-capture device, but they are more often used as lethal control techniques. Snares can also be used to capture feral swine by the legs, but leg-snares are not often set for feral swine. Snares can be effectively used wherever a target animal moves through a restricted lane of travel (e.g., trails through vegetation). When a feral swine moves forward into the loop formed by the cable, the noose tightens and it is held. The catch-pole snare is used to capture or safely handle problem animals. This device consists of a hollow pipe with an internal cable or rope that forms an adjustable noose at one end. The free end of the cable or rope extends through a locking mechanism on the end opposite of the noose. By pulling on the free end of the cable or rope, the size of the noose is reduced sufficiently to hold an animal. Catch poles are used primarily to remove live animals from traps without danger to or from the captured animal. Snares are used to take feral swine, but can also take nontargets

of similar size. These are not used in areas occupied by large mammalian T&E species such as the Mexican wolf and jaguar.

Leghold Traps are versatile and used by WS in New Mexico for capturing many species, primarily predators. Leghold traps are not normally set for feral swine, but could be. Traps are often set for other animals such as coyotes, but take a feral pig. Larger swine can easily pull free from leghold traps, but smaller ones may be held. These traps can be used to live-capture a variety of animals, but feral swine taken would be euthanized.

Leghold traps are set in a variety of methods, often determined by the target. Traps placed in the travel lanes of the targeted animal, using location to determine trap placement rather than attractants, are known as *"blind sets."* More frequently, traps are placed as *"baited"* or *"scented"* sets. These trap sets use an attractant consisting of visual attractants (e.g. feathers) or food bases, such as fetid meat, urine, or musk, to attract the animal. In some situations a "draw station" such as a carcass, animal parts, or a large piece of meat is used to attract target predators. In this approach, one to several traps is placed in the vicinity of the draw station. APHIS-WS program policy prohibits the placement of traps closer than 30 feet to a draw station or visible bait (with the exception of traps placed for bears, cougars, or raptors) for the protection of scavenging birds. Advantages of the leg-hold trap are: 1) they can be set under a wide variety of conditions; 2) some targets can be relocated after capture; 3) nontarget captures can be released if it is deemed that they will survive; 4) traps can have padded jaws to reduce foot damage to predators, and 4) pan-tension devices can be used to reduce the probability of capturing nontarget animals smaller than the target species (Turkowski et al. 1984, Phillips and Gruver 1996). Disadvantages of using leghold traps include the difficulty of keeping them in operation during rain, snow, or freezing weather, and they lack selectivity where nontarget species are of a similar or slightly heavier weight as the target species (animals much larger than the target species usually can pull themselves free from leghold traps). Leghold traps have the potential to take some T&E species in New Mexico, and therefore, may affect them. Additionally, the type of attractant, bait or visual lure, used at a trap set could also increase the risk to particular nontarget species. For example, baits made with fruits, rotting vegetables, sour cream, or cream cheese to attract feral swine could potentially attract other species such as raccoons (*Procyon lotor*) and white-nosed coati (*Nasua narica*).

Before leghold traps are employed, their limitations must be considered. Injury to target and nontarget animals, including livestock, may occur. Weather and the skill of the user will often determine the success or failure of the leghold trap in preventing or stopping wildlife damage. Various tension devices can be used to prevent animals smaller than target animals from springing the trap. Trap placement and bait selection can also contribute to minimizing nontarget take. However, livestock and nontarget animals may still be captured even with pan-tension devices and effective trap placement. These traps, though, usually permit the release of nontarget animals. Leghold traps pose a threat to a few T&E species and, therefore, measures to reduce their impact such as use of padded jaws and daily trap check are in place to protect these species.

Shooting is conducted with rifles, shotguns, and air guns and is very selective for the target species. Shooting is sometimes used as the primary FSDM method in many feral swine control operations. Often, though, shooting is only used opportunistically where a WS Specialist sees the target swine in the damage area at random. Shooting is limited to locations where it is legal and safe to discharge firearms. Shooting can also be used in conjunction with spotlighting.

Lethal reinforcement through shooting is often necessary to ensure the continued success in swine scaring and harassment efforts (see the discussion on shooting under Frightening Devices). In

situations where the feeding instinct is strong, feral swine can quickly adapt to scaring and harassment efforts unless the FSDM program is periodically supplemented by shooting.

Aerial Shooting or aerial hunting (shooting from an aircraft) is a commonly used FSDM method. Aerial hunting is species specific and can be used for immediate control to reduce livestock and natural resource losses if weather, terrain, and cover conditions are favorable. Fixed-wing aircraft are most frequently used in flat and gently rolling terrain whereas helicopters, with better maneuverability, have greater utility and are safer over rugged terrain and timbered areas. In broken timber or deciduous cover, aerial hunting is more effective in winter when snow cover improves visibility and leaves have fallen. The WS program aircraft-use policy helps ensure that aerial hunting is conducted in a safe and environmentally sound manner, in accordance with federal and state laws. Pilots and aircraft must be certified under established WS program procedures and only properly trained WS employees are approved as gunners.

The issue of aircraft overflights, the inadvertent harassment of wildlife from the noise and sight of aircraft, has created concerns of disturbing wildlife in numerous WS EAs. A number of studies have looked at responses of various wildlife species to aircraft overflights. The National Park Service reviewed studies on the effects of aircraft overflights on wildlife. The report revealed that a number of studies have documented responses by certain wildlife species that suggest adverse impacts could occur. Few, if any studies, have proven that aircraft overflights cause significant adverse impacts on wildlife populations, although the report stated it is possible to draw the conclusion that impacts to populations are occurring. It appears that some species will frequently or, at least occasionally, show adverse responses to even minor overflight occurrences. In general, it appears that the more serious potential impacts occur when overflights are frequent such as hourly and over long periods of time which represents “chronic exposure.” Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. WS aerial hunting operations occur in relatively remote rangeland areas where tree cover is at most scattered to allow for visibility of target animals from the air. In addition, WS spends relatively little time over any one area.

WS has actively used fixed-wing aircraft and some helicopters for aerial hunting in areas inhabited by wildlife for years. The fixed-wing aircraft used by WS are relatively quiet whereas the helicopter is somewhat noisier. WS conducts aerial WDM activities on areas only under agreement and concentrates efforts during certain times of the year to specific areas such as lambing grounds. WS Predator EAs that have looked at the issue of aerial hunting overflights on wildlife have found that WS has annually flown less than 10 min./mi.^{2} on properties under agreement; in other words, WS flies very little over any one property under agreement in any given year. As a result, no known problems to date have occurred with WS aerial hunting overflights on wildlife nor are they anticipated in the future.

Hunting Dogs are frequently used in WDM to locate, pursue, or decoy animals. WS uses trailing or tracking dogs, decoy dogs, detector dogs, and trap-line companion dogs. Training and maintaining suitable dogs requires considerable skill, effort, and expense. There must be sufficient WDM needs for dogs to make the effort of training worthwhile.

Tracking Dogs or trailing dogs are commonly used to track and “tree” target feral swine. Dogs commonly used are different breeds of hounds such as blue tick, red-bone, and Walker. They become familiar with the scent of the animal they are to track and follow, and will strike (howl) when they smell them. Tracking dogs are trained not to follow the scent of nontarget species. WS Specialists find the track of the target species and put their dogs on it. Typically, if the track is not too old, the dogs can follow the trail and bay the animal. When the dogs bay the animal, it

usually seeks refuge in a thicket on the ground at bay. The dogs stay with the animal until the WS Specialists arrives and dispatches, tranquilizes, or releases it, depending on the situation. A possibility exists that dogs will switch to a fresher trail of a nontarget species while pursuing the target species. This usually occurs with dogs that are trained to follow other animals as well. However, this is a non-desirable trait for hunting dogs and dog handlers watch for, and provide training to prevent this behavior.

Chemical Immobilizing and Euthanizing Drugs are important tools for managing wildlife. Under certain circumstances, WS personnel are involved in the capture of animals where the safety of the animal, personnel, or the public are compromised and chemical immobilization provides a good solution to reduce these risks. WS employees that use immobilizing drugs are certified to use them and follow the guidelines established in the WS Field Operational Manual for the Use of Immobilization and Euthanasia Drugs. Telazol® (tiletamine), and Ketamine/Xylazine are immobilizing agents used by WS to capture and remove wild animals. These are typically used in urban, recreational, and residential areas where the safe removal of a problem animal is most easily accomplished with a drug delivery system (e.g., darts from rifle, pistol, or blow guns, syringe pole, or hand-fed baits). Immobilization is usually followed by euthanasia. Euthanasia is usually performed with drugs such as Beuthanasia-D® or Fatal-Plus® which contain forms of sodium phenobarbital. Euthanized animals are disposed of by incineration or deep burial to avoid secondary hazards. Drugs are monitored closely and stored in locked boxes or cabinets according to WS policies, and Department of Justice, Drug Enforcement Administration or Food and FDA guidelines. Most drugs fall under restricted-use categories and must be used under the appropriate license from the U.S. Department of Justice, Drug Enforcement Administration which WS does hold.

Chemosterilants and Contraception cause loss of fecundity in wildlife. Contraceptive measures for wildlife can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation, and immunocontraception (i.e., the use of contraceptive vaccines). These techniques would require that each individual animal receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of oral contraception, hormone implantation, or immunocontraception would be subject to approval by Federal and State regulatory agencies. These methods are generally not practical for WS operational FSDM activities because: (1) surgical sterilization would require that each animal be captured and sterilization conducted by licensed veterinarians and would therefore be extremely labor intensive and expensive; (2) population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1988); and (3) there are currently not any Federally or State approved chemosterilants available for operational use in feral swine damage management.

As alternative methods of delivering sterilants are developed, sterilization may prove to be a more practical tool in some circumstances. Reduction of local populations could conceivably be achieved through natural mortality combined with reduced fecundity. In essence, no animals would be killed directly with this sterilization, just their potential for reproducing would be eliminated. A disadvantage to contraception is that the animals would continue to cause damage, especially for overabundant wildlife populations unless it was combined with another technique to reduce the population in the damage area. Populations of animals that commonly disperse and have that opportunity would not be as affected by contraception techniques.

Immunocontraceptive vaccines are emerging in WDM and may be applicable in some damage management situations. The two most promising drugs for immunocontraception of large mammals are GonaCon™ Immunocontraceptive Vaccine and Porcine Zona Pellucida. However,

the goal for most feral swine populations in New Mexico is eradication, so these drugs, even if registered, would be of limited use and more suited for overabundant native species such as white-tailed deer (*Odocoileus virginianus*).

3.3.2 Alternative 2 - Nonlethal Methods Used by WS

This alternative would require WS to use nonlethal methods only to resolve feral swine damage problems. WS under this alternative would mostly use exclusion and frightening devices. Chemosterilants such as GonaCon™ could possibly be used if registered for such. WS could give resource owners information on lethal techniques, but it is likely they would use shooting as their primary defense against feral swine damage. The primary methods used under this alternative by the resource owner would be resource management (animal husbandry, herders, and guard dogs), exclusion (fencing), and wildlife management methods (frightening devices, repellents, and shooting).

3.3.3 Alternative 3 - Technical Assistance Only

This alternative would not allow for WS operational FSDM in New Mexico. WS would only provide technical assistance and make recommendations when requested. Producers, property owners, agency personnel, or others could conduct FSDM using traps, shooting, or any nonlethal method that is legal. WS would provide information on all the available techniques discussed in Section 3.3.1.3, but some of the methods would not likely be used such as aerial hunting and chemosterilants.

3.3.4 Alternative 4 - No Federal WS FSDM Program

This alternative would eliminate federal involvement in New Mexico, and, therefore, WS would not use any methods to control feral swine, but private individuals and agency personnel could use any of the techniques listed in Section 3.3.1.3. Some of the methods would not likely be used by the general public including aerial hunting and contraceptives. Under this alternative, the public would have the highest likelihood of using methods deemed ineffective, illegal, or inadvisable.

3.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered but not analyzed in detail and are discussed.

3.4.1 Compensation for Feral Swine Damage Losses

The Compensation Alternative would require the establishment of a system to reimburse persons impacted by feral swine damage. This alternative was eliminated from further analysis because no federal or state laws currently exist to authorize such action. Under such an alternative, WS would not provide any direct control or technical assistance. Aside from lack of legal authority, analysis of this alternative USDA (1997) indicated that the concept had many drawbacks:

- It would require larger expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation. A compensation program would likely cost several times as much as the current program.
- Compensation would most likely be below full market value. It is difficult to make timely responses to all requests to assess and confirm damage, and certain types of damage could not be conclusively verified. For example, it would be impossible to prove conclusively in individual situations that feral swine were responsible for disease outbreaks even though they may actually have been responsible. Thus, a compensation program that requires verification would not meet its objective for mitigating such losses.
- Compensation would give little incentive to resource owners to limit damage through improved cultural, husbandry, or other practices and management strategies.
- Not all resource owners would rely completely on a compensation program and lethal control would most likely continue as permitted by state law.
- Compensation is not practical for reducing threats to human health and safety.

3.4.2 Lethal FSDM Only By WS

Under this alternative, WS would not conduct any nonlethal control for feral swine in the State, but would rely solely on lethal FSDM methods. This alternative was eliminated from further analysis because many situations can be resolved effectively through nonlethal means and be quite cost-effective. For example, fencing in urban areas, can often deter feral swine from entering and damaging resources and not have a dramatic effect on nontarget wildlife. WS has used nonlethal methods exclusively as an effective means to resolving damage. The Lethal FSDM Only Alternative does not interface with the overall concept of IWDM, where multiple methods can achieve a desired cumulative effect. Restricting that portion of the program to lethal methods only would likely not be socially acceptable to various agencies, groups and individuals. For feral swine in areas where the eradication of a local population is desirable, most methods used would be lethal, but WS would still be given the option of using nonlethal control methods in given areas while eradication were being implemented.

3.4.3 Relocation Rather Than Killing Problem Wildlife

Translocation is not appropriate for FSDM because feral swine are nonnative and some counties have adopted laws against such activities. Any decisions on relocation of wildlife by WS are coordinated with NMDGF or USFWS and consultation with the appropriate land management agency(ies) or manager associated with proposed release sites. None of these agencies would want feral swine relocated. It should also be noted that the American Veterinary Medical Association, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists oppose the relocation of mammals due to the potential for disease transmission to a healthy local population. This is particularly true for mammals such as the feral swine (Center for Disease Control 1990). Relocation of wildlife is also discouraged by APHIS-WS policy (WS Directive 2.501) because many factors can affect the outcome (stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats), not to mention that they are an invasive species.

3.4.4 Develop a Statewide Bounty Program for Feral Swine

Bounties have been used in many states for over 150 years for a variety of animals, and in particular, coyotes. Among coyote bounty case histories, no documented evidence exist that bounty programs have temporarily or permanently reduced coyote numbers or abundance in any state (Bartel and Brunson 2003). Kansas enacted a $2 bounty on coyotes in 1877 and it remained in place until 1970. This bounty cost the state approximately $100,000 per year. After 93 years and approximately 9.3 million dollars in bounty payments, the results were overwhelmingly conclusive that the bounty system did not control coyotes and it did not control damage to poultry or livestock (Henderson 1987). Although feral swine are very different then coyotes, biologists believe them to be equally or even more difficult to control than coyotes and unaffected by a bounty program.

Although nearly every state in the country has abandoned the idea of a bounty for predator control, Utah recently re-enacted a bounty on coyotes. Bartel and Brunson (2003) conducted a survey of the Utah bounty participants to determine the effectiveness of the program and to determine what motivated the bounty participants. The study determined that the bounty program did not produce the desired results in terms of increasing hunter participation or reducing the coyote population. They found little evidence that new hunters or trappers were recruited by the bounty program and the survey showed that the income from the bounty was the least important reason for participating. Enjoying the outdoors was the number one reason they participated. This implies that the people who participate in a bounty program are the ones that are likely to participate in hunting and trapping regardless of a bounty. Therefore the bounty was not enough of an incentive to recruit new hunters and it was not enough of an incentive for current hunters to increase their efforts significantly.

Texas has the highest population of feral swine in the country. Feral swine numbers in Texas are estimated at 1.5 million animals. Research yielded only one case in Texas where a bounty was attempted for feral swine. Van Zandt County attempted a bounty on feral swine in 2003-2004. They paid $7 for each set of matched ears that came into the county extension office. We contacted the extension office in that county to discuss the success of the program. According to the County Extension Specialist (B. Cummins, Tex. Coop. Ext., pers. comm. 2008) that administered the program, the program was a failure. The County paid out over $16,000 in bounties in 18 months with no apparent decrease in feral swine numbers or damage. The bounty program was discontinued and the County is now seeking state funding to develop a control program with WS.

A bounty on feral hogs would likely cause some severe conflicts with the current strategy to control feral swine in New Mexico. First, by giving a value to feral swine in New Mexico it could provide an incentive to merely maintain current populations and could easily encourage more illegal releases of feral swine. Secondly, a bounty would make obtaining permission from landowners much more difficult to conduct FSDM because a landowner might see feral swine as having value and deny access to their property. Public hunting is not an effective means of control and due to the nature of feral swine (scatter under extreme hunting pressure), a bounty would likely achieve little control while scattering feral swine to new areas. Additionally, a bounty program would likely result in fewer quality disease samples from harvested animals which would decrease overall disease surveillance.

3.5 STANDARD OPERATING PROCEDURES FOR FSDM METHODS

An SOP is any aspect of an action that serves to prevent, reduce, or compensate for negative impacts that otherwise might result from that action. The current program, nationwide and in New Mexico, uses many such SOPs. Many WS SOPs are discussed in depth in USDA (1997, Chapt. 5). The key SOPs are incorporated into all alternatives as applicable, except the no federal program alternative (Alternative 2). Most SOPs are instituted to abate specific issues while some are more general and relate to the overall program. SOPs include those recommended or required by regulatory agencies such as EPA and these are listed where appropriate. Additionally, specific measures to protect resources such as T&E species that are managed by cooperating agencies (USFWS and NMDGF) are included in the lists below.

3.5.1 General SOPs Used by WS in FSDM

- WS FSDM activities in New Mexico are consistent with USDA (1997) SOPs.
- WS complies with all applicable laws and regulations that pertain to conducting FSDM on private and public lands.
- WS coordinates with agency officials for work on public lands to identify and resolve any issues of concern with FSDM.
- WS coordinates with tribal officials for work on tribal lands to identify and resolve any issues of concern with FSDM.
- The use of FSDM methods such as traps and shooting conform to applicable rules and regulations administered by the State.
- WS personnel adhere to all label requirements for chemical toxicants, repellents, and immobilization, euthanasia, and contraceptive drugs. EPA/FDA approved labels provide information on preventing exposure to people, pets, and T&E species along with environmental considerations that must be followed. WS personnel abide by these. These restrictions invariably preclude or reduce exposure to nontarget species, the public, pets, and the environment.
- The WS Decision Model (Slate et al. 1992) thought process as discussed in Section 1.6.4 which is designed to identify effective WDM and their impacts, is consistently used.
- WS currently has agreements for FSDM on just less than 1% of the land area in New Mexico. This could be increased several-fold if the population continues to expand. However, this gives an indication of potential for exposure to the public with the use of FDM methods.

3.5.2 WS SOPs Specific to the Issues

The following is a summary of the SOPs used by WS that are specific to the issues listed in Chapter 2 of this document.

3.5.2.1 Effects on Target Feral Swine Populations.

- WS Specialists use specific trap types, lures, and placements that are most conducive for capturing the target animal.

- WS FSDM kill is monitored. WS provides data on total take of target animal numbers to other agencies (i.e., USFWS, NMDGF) as appropriate.

- WS will not relocate feral swine because they are an invasive species and NMDGF would not support such actions because of concerns regarding the impact of feral swine on native wildlife (L. Rios, SW Area Operations, NMDGF., pers. comm.. 2008).

3.5.2.2 Effects on Nontarget Species Populations, Including T&E Species.

- WS personnel are highly experienced and trained to select the most appropriate FSDM method(s) for taking problem feral swine with little impact on nontarget species.

- WS personnel work with research programs such as NWRC to continually improve and refine the selectivity of management devices, thereby reducing nontarget take.

- Leghold trap under-pan tension devices and foot snare trigger tension devices are used throughout the Program to reduce the capture of nontarget wildlife that weigh less than the target species.

- Nontarget animals captured in traps or with any other FSDM method are released at the capture site unless it is determined by WS Specialists that the animal is not capable of self maintenance.

- ***Measures to Reduce the Potential Take of Specific T&E Species***

  - Reasonable and prudent alternatives and measures are established through consultation with USFWS and implemented to avoid adverse impacts to T&E species.

  - When working in an area that has T&E species or has the potential for T&E species to be exposed to FSDM methods, WS personnel will know how to identify T&E species (e.g. jaguar) sign, and apply FSDM methods accordingly.

  - WS has adopted and implemented conservation measures outlined in the BO and Conference Opinion (USFWS 1998) to protect the Mexican gray wolf, the potentially natural occurring and reintroduced populations.

  - WS has adopted and implemented all reasonable and prudent alternatives and measures to protect the jaguar issued in a BO and amendment (USFWS 1999a, b). WS in coordination with USFWS has mapped potential jaguar habitat in New Mexico.

  - Federal and State T&E species of concern in New Mexico include the white-sided jackrabbit, marten, black footed ferret, Lesser Prairie-Chicken, and Gould's Wild Turkey. Traps and foot-snares will be set with pan-tension devices to preclude capture of these species. Neck snares will be equipped with stops in Hidalgo County where the turkey or jackrabbit could be taken with these to preclude capture.

  - WS continues to implement the reasonable and prudent alternatives and measures and their terms and conditions to protect bald eagles that were identified by USFWS in their 1992 BO (USDA 1997, Appendix F).

3.5.2.3 Impacts on Public Safety, Pets, and the Environment.

- A formal risk assessment (USDA 1997, Appendix P and Q) concluded that hazards to the public from FSDM devices and activities are low.

- All chemical pesticides, repellents in FSDM, are registered with EPA and NMDA. WS employees will comply with each pesticide's directions and labeling, in addition to EPA and NMDA rules and regulations.

- WS Specialists who use restricted-use chemicals (i.e., pesticides or drugs) are trained and certified by program personnel or other experts in the safe and effective use of these materials under EPA, Drug Enforcement Administration, FDA, or NMDA approved programs according to laws such as NMDA's Pesticide Control Act 76-4-1 thru 39, New Mexico Agricultural Code 21.17.50, 21.17.53, and 21.17.56. WS employees who use chemicals participate in continuing education programs to keep abreast of developments and to maintain their certifications.

- WS Specialists who use firearms and pyrotechnics are trained and certified by experts in the safe and effective use of these materials.

- Training and certification is required of pilots and crew members for aerial hunting projects. This training includes training in the use of personal protective equipment, emergency procedures in the event of an aerial accident, target identification, and additional firearms training specific to aircraft. Commercial rated pilots must pass a Class II physical exam as defined by the Federal Aviation Administration and are subjected to recurrent WS safety training for low-level aircraft. Aircraft are inspected to meet or exceed Part 135 Federal Aviation Administration aircraft standards.

- Conspicuous, bilingual warning signs, alerting people to the presence of traps or other FSDM methods, are placed at major access points when they are set in the field.

3.5.2.4 Humaneness of FSDM Methods Used by WS,

- Chemical immobilization and euthanasia procedures that do not cause pain or undue stress are used by certified WS personnel when practical and where safe.

- WS personnel attempt to kill captured target animals that are slated for lethal removal as quickly and humanely as possible. In most field situations, cervical dislocation is performed which causes rapid unconsciousness followed by cessation of heart function and respiration which is in concert with the American Veterinary Medical Association's (1987) definition of euthanasia (Beaver et al. 2001). In some situations, accepted chemical immobilization and euthanasia methods are used.

- Cage and padded-jaw leghold traps are set and inspected according to WS policy.

- Research continues with the goal of improving the humaneness of FSDM devices.

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. This chapter analyzes the environmental consequences of each alternative from Chapter 3 in relation to the issues identified for detailed analysis in Chapter 2. This section analyzes the environmental consequences of each alternative in comparison with the proposed action to determine if the real or potential impacts would be greater, lesser, or the same. Therefore, the proposed action or current program alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The background and baseline information presented in the analysis of the current program alternative also applies to the analysis of each of the other alternatives.

The following resource values within the state are not expected to be negatively impacted by any of the alternatives analyzed: soils, geology, minerals, floodplains, wetlands, visual resources, air quality, aquatic resources and range. These resources will not be analyzed further.

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

The proposed project will not cause major ground disturbance, will not cause any physical destruction or damage to property, does not cause any alterations of property, wildlife habitat, or landscapes, and does not involve the sale, lease, or transfer of ownership of any property. The proposed methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. (See Section 1.7.2.3).

4.1 ENVIRONMENTAL CONSEQUENCES OF FSDM FOR ISSUES ANALYZED IN DETAIL

NEPA requires federal agencies to determine whether their actions have a "*significant impact on the quality of the human environment*." The environmental consequences of the 4 alternatives are discussed below with emphasis on the issues presented in Chapter 2. The comparison of alternatives will be used to make a selection of the most appropriate alternative for WS FSDM activities. The alternatives selected for detailed assessment provide the best range of alternatives that could potentially meet the purpose and the need of FSDM in New Mexico as identified in Chapter 1.

4.1.1 Effects of FSDM on Feral Swine Populations

The authority for management of feral swine in New Mexico is the New Mexico Livestock Board and NMDA. These agencies and other State agencies such as NMDGF would prefer that feral swine be eradicated from the State because it is an invasive species and could cause considerable damage.

An aspect, perhaps overriding, that is germane to the determination of "significance" under NEPA is the effect of a federal action on the *status quo* for the environment. States have the authority to manage populations of wildlife species as they see fit, except for migratory and T&E species. However, management direction for a given species can vary among states, and state management actions are not subject to NEPA compliance. Therefore, the *status quo* for the environment with respect to state-managed wildlife species is the management direction established by the States. Federal actions that are in accordance with state management have no effect on the *status quo*.

4.1.1.1 Alternative 1 - Continue the Current WS FSDM Program (the Proposed Action). WS uses nonlethal and lethal methods as needed for appropriate biologically sound, effective FSDM. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997).

Magnitude is described in USDA (1997) as *". . . a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. Often eradication of introduced or invasive species would be a desirable alternative. However, considering the financial resources that eradication would require, it is unlikely that this could be accomplished in the near future. FSDM conducted by WS from FY04 to FY08 resulted in the take of 7, 21, 32, 62, and 77 or an average of 40 taken annually. As the take shows, feral swine take has increased and WS expects this number to increase several-fold because of their dramatic increase in the state and the desire to eradicate them before the cause significant damage to wildlife and other resources.

Feral swine, being non-indigenous and because they cause damage to a variety of resources and negatively impact and compete with native flora and fauna, are considered by many wildlife professionals to be an undesirable component of North American wild and native ecosystems. Any reduction in feral swine populations in North America, even to the extent of complete eradication, is desirable and would have a beneficial impact to native wildlife and the agricultural community. However, as previously mentioned, eradication of feral swine is not likely to be achieved by WS because they are well established and it would require considerable expense and manpower to accomplish this goal.

4.1.1.2 Alternative 2 - Nonlethal FSDM Methods Used by WS. Under this alternative, WS would not lethally remove any feral swine because no lethal methods would be used. Without WS conducting some level of lethal FSDM activities, private efforts would likely increase. Non-lethal methods used by WS, such as propane cannons, would continue. However, those methods are only effective for a short time and ineffective in some situations, particularly without lethal reinforcement. Under this alternative, WS would not kill any feral swine because lethal methods would not be used. Nonlethal activities conducted by WS might intensify, but most likely would result in similar levels of nonlethal FSDM activities as conducted under Alternative 1 because feral swine removal will be likely objective of many wildlife management agencies and of resource owners that are suffering damage even with the use of nonlethal methods. It is likely that State agencies and private individuals and entities would see WS as ineffective in achieving population objectives. Thus, these agencies and private individuals would likely increase lethal efforts to reduce feral swine. Depending on the level of effort, the lethal take of feral swine would likely be less, than that under the proposed action. WS could offer advice on lethal FSDM methods that could be used. The primary difference in the level of take would be that aerial hunting would not likely be used as much and, thus, the efficiency of feral swine removal would be reduced. As a result, more effort by non-federal entities with lethal FSDM methods would likely be needed to take the same number of feral swine and, therefore, it is likely less would be taken. This could be viewed as good or bad depending on the objective of feral swine management. For the goal of complete eradication from areas, it is likely this would not be achieved. It is more likely that the level of take would result in the status quo, an increase in the feral swine population in New Mexico. One note, even though many private individuals would receive assistance from WS and information on available FSDM techniques, some individuals may resort to the use of illegal or ill-advised FSDM methods simply out of frustration (see Section 2.2.3). However, it is anticipated that the number that would use these methods would be less than Alternative 4 because those that received information from WS would most likely use acceptable methods.

4.1.1.3 Alternative 3 - Technical Assistance Only. Under this alternative, WS would have no impact on feral swine populations in of New Mexico because WS would be limited to only providing advice on FSDM. Private efforts to reduce or prevent feral swine damage and disease transmission risks would

likely increase, similar to Alternative 2, but possibly slightly more because WS would not provide any assistance. State efforts would likely intensify to reduce damage and take would likely increase. However, it is expected that take would be equal to or less than that of the Proposed Action, but likely identical to that under Alternative 2.

4.1.1.4 Alternative 4 - No Federal WS FSDM Program. Under this alternative, WS would have no impact on feral swine damage in the state. As previously discussed, private and state efforts to reduce or prevent feral swine damage and disease transmission risks would likely increase which could result in similar take to that under Alternatives 2 and 3, but likely less or equal to the Proposed Action Alternative. The use of illegal or ill-advised methods to control feral swine would be highest under this alternative which would lead to unknown impacts on the feral swine population.

4.1.2 Effects on Nontarget Species Populations, Including T&E Species

Nontarget species can be impacted by FSDM whether implemented by WS, other agencies, or the public. Impacts can range from direct take while implementing FSDM methods (e.g., deer caught in cage traps for feral swine) to indirect impacts resulting from implementing FSDM methods (e.g., deer entangled in fences meant only to keep feral swine out of an area and not an intended use of the method) and not implementing FSDM (reduction of a ground-nesting bird species in a given area where feral swine have not been controlled as discussed in Section 1.3.2). Measures are often incorporated into FSDM to reduce impacts to nontarget species. Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of FSDM tools for resolving bird damage problems. However, the FSDM methods used to resolve damage must be legal and biologically sound. Often, but not always, impacts to nontarget species can be minimized. Where impacts occur, they are mostly of low magnitude in terms of nontarget species populations. Following is a discussion of the various impacts under the alternatives.

4.1.2.1 Alternative 1 - Continue the Current WS FSDM Program (the Proposed Action). While every precaution is taken to safeguard against taking nontarget species, at times changes in behavioral patterns and other unanticipated events can result in the incidental take of unintended species. These occurrences happen, but should not affect the overall populations of any species under the current program. Most methods utilized for FSDM are highly selective, but methods such as traps, snares, and fences have the potential for taking nontargets. From FY04 to FY08, WS did not take any nontarget species while conducting FSDM in NM. This would be expected to be low because of the selectivity of the methods primarily used by WS in FSDM, aerial hunting, shooting, and large neck snares. Species such as mule deer and raccoons (*Procyon lotor*) are examples of species that could be taken. However, as suggested by no take for the last 5 FYs, it is not expected that the nontarget take would be high. Additionally, methods such as cage traps designed for feral swine often allow non-targets to be released unharmed, but none was freed from FY04 to FY08. WS (2006) looked at nontarget take in predator damage management for New Mexico and found that nontarget take was not significant to those species taken or reasonably be expected to be taken. The nontarget take in FSDM is expected to be similar to the species taken in predator damage management, but at a much reduced level. Intuitively, the minimal take of nontargets in FSDM would not impact any of the species populations that WS would anticipate taking.

WS uses SOPs to avoid take of T&E and sensitive species and monitors any such take. Species that WS could take were discussed in Section 2.2.2 and listed in Table 2. SOPs that WS follows to minimize the potential for take were discussed in Section 3.5.2.2. WS in New Mexico has not taken a T&E or sensitive species incidental to FSDM and does not anticipate such an occurrence following the Reasonable and Prudent Alternatives and Measures and Terms and Conditions of BOs obtained from USFWS for those species anticipated could potentially be taken. Thus, we expect that risks exist, but are very minimal.

On the other hand, a fully integrated FSDM program implemented by WS would likely reduce the unwise or illegal use of methods to reduce feral swine damage, as discussed in Section 2.2.2. These activities could result in negative, but unknown, impacts on nontarget wildlife, including T&E species. Treves and Naughton-Treves (2005) and the International Association of Fish and Wildlife Agencies (2004) discuss the need for WDM and that an accountable government agency is best suited to take the lead in such activities because it increases the tolerance for wildlife by those being impacted by their damage and has the least impacts on wildlife overall.

Control operations as proposed under this alternative could reduce depredation and competition between native wildlife species and feral swine. As discussed in section 1.3.2, many nontarget species could benefit from FSDM, but primarily if the goal of FSDM was eradication of feral swine from areas where they had the potential to impact such species. Ground nesting birds, small mammals, and herpetofauna were identified as species that would benefit. Other possible positive impacts to New Mexico wildlife include reduced competition for mast foods with Wild Turkey, mule deer, and black bears (*Ursus americanus*) such as reduced oak tree densities in the Madrean Encinal habitat in the Bootheel region of New Mexico. Additionally, feral swine wallowing and rooting activities can destroy the habitat of T&E fish, invertebrates, and plants.

4.1.2.2 Alternative 2 – Nonlethal FSDM Methods Used by WS. Under this alternative, WS take of nontarget animals would probably be less than that of the proposed action because no lethal FSDM would be conducted by WS. However, nontarget take would not differ substantially from the current program because the current program has not taken any nontarget animals (it is expected that it could average 1% of target take). The State and private entities would likely increase FSDM activities which would result in the take of nontarget animals. It is expected that nontarget take would actually increase under this alternative because aerial hunting, one of the most selective and efficient methods for feral swine removal, would not be used as frequently. On the other hand, if feral swine were not removed from areas, impacts to native wildlife including T&E species would be expected to increase dependant on the level of FSDM implemented by the State, especially if the population were allowed to continue to expand. Finally, if feral swine damage problems were not effectively resolved by nonlethal control methods, private entities would likely resort to implementing lethal FSDM such as use of shooting. This could result in less experienced persons implementing control methods and could lead to greater take of nontarget wildlife than the proposed action. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants and other methods which could lead to unknown impacts on local nontarget species populations, including T&E species, as discussed in Section 2.2.2. It is anticipated that this alternative would likely have a much higher overall impact on nontarget species than Alternative 1.

4.1.2.3 Alternative 3 - Technical Assistance Only. Alternative 3 would not allow any WS direct operational FSDM in New Mexico. There would be no impact on nontarget species, including T&E species, by WS activities from this alternative. Technical assistance or self-help information would be provided at the request of producers and others. Although technical support might lead to private parties using FSDM more selectively than that which might occur under Alternative 4, private efforts to reduce or prevent depredations could still result in less experienced persons implementing control methods leading to greater take of nontarget wildlife than under the proposed action. It is hypothetically possible that, similar to but probably less than under 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 some T&E species.

4.1.2.4 Alternative 4 - No Federal WS FSDM Program. Alternative 4 would not allow WS or any other federal agency to conduct FSDM in New Mexico or provide advice on the correct use of FSDM methods. Thus, WS would have no impact on nontarget or T&E species under this alternative. However,

parties with feral swine damage problems would likely resort to whatever means of control they had available to them. It is expected that nontarget take would be highest under this alternative because many methods could be used ineffectively without instruction on their proper use. Private efforts to reduce or prevent depredations would likely result in less experienced persons implementing control methods which could lead to greater take of nontarget wildlife than under the proposed action. 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 some T&E species. Finally, feral swine would be least likely to be controlled efficiently under this alternative and, thus, their impacts would be greatest under this alternative. It is anticipated that impacts to nontarget wildlife including T&E species would be highest under this alternative.

4.1.3 Impacts on Public Safety, Pets, and the Environment

The public, pets, and the environment could potentially be impacted by FSDM whether implemented by WS, other agencies, or the public. Impacts can range from direct injury while implementing FSDM methods to indirect impacts resulting from implementing FSDM methods (e.g., impacts to water quality from illegal chemical use by frustrated landowners). Measures are often incorporated into FSDM to minimize or nullify risks to the public, pets, and the environment. Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of FSDM tools for resolving feral swine damage problems. However, the FSDM methods used to resolve feral swine damage must be legal and biologically sound. Following is a discussion of the various impacts under the Alternatives.

4.1.3.1 Alternative 1 - Continue the Current WS FSDM Program (the Proposed Action). FSDM methods that might raise safety concerns include the use of firearms, aerial hunting, snares, leghold traps, pyrotechnics for hazing, cage traps, and chemical repellents, drugs, and reproductive inhibitors. WS poses minimal threat to people, pets and the environment with FSDM methods such as shooting, hazing with pyrotechnics, trapping, and use of chemicals (USDA 1997-Appendix P&Q). All firearm and pyrotechnic safety precautions are followed by WS when conducting FSDM and WS complies with all applicable laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles is used to reduce feral swine damage when lethal methods are determined to be appropriate. Shooting is selective for target species. Firearms are only used by WS personnel who are experienced in handling and using them. Firearm use is very sensitive and a public concern because firearms can be misused. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are provided safety and handling training as prescribed in the WS Firearms Safety Manual and continuing education training on firearms safety and handling is required biennially by all employees who use firearms (WS Directive 2.615). WS Specialists, who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the Lautenberg Amendment. WS also follows safety precautions and WS Policies when using pyrotechnics. WS has had no accidents involving the use of firearms or pyrotechnics, but acknowledges that there is always a risk.

WS uses cage traps and snares, and potentially leghold traps in FSDM. These are strategically placed to minimize exposure to the public and pets. Appropriate signs are posted on all properties where these traps are set to alert the public of their presence. WS has not had any incidents using mechanical methods with the public or pets using FSDM methods. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no significant impact on human and safety from WS's use of FSDM mechanical methods is expected.

WS personnel that may use chemical drugs for immobilization and euthanasia are certified through WS to use them. WS personnel abide by WS policies and SOPs, and federal and state laws and regulations when using FSDM methods that have potential risks. The same would apply to immunocontraceptives should

they become registered for use in New Mexico. USDA (1997) conducted a risk assessment on WS's use of FSDM chemical methods and concluded that they had minimal hazards to the public, pets, and the environment. Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods 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 1997). WS has not used any chemicals in FSDM in New Mexico and, therefore, would not have any incidents involving the public or pets.

Thus, WS poses minimal risks to public and pet health and safety when implementing FSDM. In fact, WS can reduce public safety hazards. This alternative would reduce threats to public and pet health and safety and the environment by removing feral swine from sites where they pose a potential hazard, such as to aircraft or have the potential of transmitting a disease.

4.1.3.2 Alternative 2 - Nonlethal FSDM Methods Used by WS. Alternative 2 would not allow WS to use lethal FSDM methods. WS would only implement nonlethal methods such as harassment with shooting firearms and pyrotechnics, live traps, repellents, tranquilizing drugs, and reproductive inhibitors. As discussed under Alternative 1, use of these FSDM devices is not anticipated to have more than minimal risks to the public, pets, and the environment. The public is often especially concerned with the use of chemicals. The nonlethal chemicals that could be used by WS in FSDM were discussed above and not expected to impact the public, pets, or the environment. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or FDA. Any operational use of chemical repellents and tranquilizer drugs would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations and FDA rules which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are built-in mitigation measures that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Under this alternative, risks to human safety from WS's use of firearms on the ground or from aircraft would be nullified. However, increased use of firearms and other methods by untrained, less experienced private individuals would probably occur. People that see WS as ineffective implementing nonlethal FSDM methods may resort to conducting FSDM themselves with little or no information or training on the use of other methods. Therefore, risks to human and pet safety would probably increase under this alternative because people that had received assistance from WS in the past may resort to the unwise or illegal use of methods. Additionally, as discussed in Section 2.2.2, the illegal use of toxicants could lead to hazards to people, pets, and the environment.

On the other hand, human and pet health and safety risks associated with feral swine would likely increase under this alternative. Disease (Hutton et al. 2006) and other risks that could impact people and pets could be higher or about the same depending on the level of effort expended by State agencies and the public on reducing feral swine populations. Therefore, it is believed that risks associated with FSDM methods would likely increase under this alternative.

4.1.3.3 Alternative 3 - Technical Assistance Only. Under this alternative, risks to human and pet health and safety and the environment from WS using firearms or aircraft would not occur. Increased use of firearms by less experienced and trained private individuals would probably occur without WS direct operational assistance which would likely increase human safety risks, similar to Alternative 2. Also, as under Alternative 2, people frustrated from a lack of an organized control effort could resort to the unwise or illegal use of methods that could have an effect on human safety, pets, and the environment. Similar to Alternative 2, risks to people and pets associated with feral swine such as from disease would likely increase, but would be dependent on the level of effort expended by the State agencies and the public. Thus, it is likely that this alternative would have similar risks as Alternative 2.

4.1.3.4 Alternative 4 - No Federal WS FSDM Program. Under this alternative, risks to human safety from WS's use of firearms or aircraft would be nullified, thus it would be less than the current program alternative. However, WS's current FSDM program has an excellent safety record in which no accidents involving the use of these methods have occurred that have resulted in a member of the public being harmed. The elimination a federal program would increase use of firearms and other FSDM methods by untrained, less experienced private individuals under this alternative, which would likely increase human and pet safety risks. Without proper training and instruction on the use of these methods, it is likely that some would be used improperly, and, therefore, the risks for the public, pets, and the environment would be greater and even higher than under Alternatives 2 and 3. Additionally, the illegal use of methods such as illegal toxicants would be highest under this alternative and could impact human and pet safety, and the environment. Finally, this alternative would likely result in the lowest number of feral swine taken. Fewer feral swine taken could increase risks to people and pets from disease and other conflicts. Greater numbers of feral swine would cause increased damage to the environment such as wetlands and wildlife impacts. Overall, this alternative would have the highest risks for the public, pets, and the environment.

4.1.4 Humaneness and Animal Welfare Concerns of Methods Used by WS

4.1.4.1 Alternative 1 - Continue the Current WS FSDM Program (The Proposed Action). Under this alternative, methods viewed by some persons as inhumane would be employed. Despite WS Policies and SOPs designed to maximize humaneness as described in section 2.2.4, the perceived stress and trauma associated with being held in snares or other devices until the WS Biologist or Specialist arrives at the site to dispatch the animal, or, as in the case of an unharmed nontarget, to release it, is unacceptable to some persons. WS personnel are experienced, trained and professional in their use of management methods, in order to be as humane as possible under the constraints of current technology, workforce and funding.

4.1.4.2 Alternative 2 - Nonlethal FSDM Methods Used by WS. The amount of suffering by target and nontarget wildlife by WS under this alternative would be less than under the proposed action since lethal control activity by WS would not be allowed. However, use of traps and shooting by private individuals and state agency personnel would probably increase if depredation losses were not satisfactorily reduced by WS. This could result in less experienced persons implementing use of traps and snares without modifications which are used to exclude smaller nontarget animals. Increased 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 could lead to animal suffering. Thus, WS believes that the same or more animal suffering would occur under this alternative as under Alternative 1.

4.1.4.3 Alternative 3 - Technical Assistance Only. Under this alternative, methods viewed by some persons as inhumane would not be employed by WS, but would likely be employed by private individuals. Use of traps and shooting by private individuals would probably increase. This could result in less experienced persons implementing use of traps and snares without modifications which are used to exclude smaller nontarget animals. 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. Thus, WS believes that the same or more animal suffering would occur under this alternative as under Alternative 1.

4.1.4.4 Alternative 4 - No Federal WS FSDM Program. Alternative 4 would not allow any WS FSDM in the State. Impacts regarding the issue of humaneness under this alternative would likely be similar to those under Alternative 3. Under this alternative, methods viewed by some persons as inhumane would not be employed by WS, but would likely be employed by private individuals. Use of traps and shooting by private individuals would probably increase, and proportionately without instruction or training. This

could result in even more less experienced persons implementing use of traps and snares without modifications which are used to exclude smaller nontarget animals than under Alternatives 2 or 3. 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. WS believes that this alternative would result in the highest suffering by target and nontarget wildlife, more than Alternatives 1, 2, and 3.

4.2 SUMMARY AND CONCLUSION

The environmental effects of implementing FSDM correspond with those raised and discussed in detail in Chapter 4 of USDA (1997). Impacts associated with activities under consideration here are not expected to be "significant." Based on experience, impacts of the FSDM methods and strategies considered in this document are very limited in nature. The addition of those impacts to others associated with past, present, and reasonably foreseeable future actions, as described in USDA (1997), will not result in cumulatively significant environmental impacts. Monitoring the impacts of the program on the populations of both target and nontarget species will continue. All feral swine control activities that may take place will comply with relevant laws, regulations, policies, orders, and procedures, including the Endangered Species Act, Migratory Bird Treaty Act, and FIFRA. A summary of the overall effects of the FSDM alternatives relative to the issues is given in Table 3. The current program alternative provides the lowest overall negative environmental consequences combined with the highest positive effects.

Table3. A summary of the environmental consequences of each program alternative relative to each issue.

Issue		**Alternative 1**		**Alternative 2**		**Alternative 3**		**Alternative 4**	
Impact by:		WS	Public	WS	Public	WS	Public	WS	Public
Target Spp.		+	0	0	0	0	0	0	0
Nontarget Spp.	**Adverse**	0	0	0	-	0	-	0	-
	Beneficial	+	0	0	0	0	0	0	0
Risks to People, Pets, & Environment	**Adverse**	0	0	0	-	0	-	0	-
	Beneficial	+	0	+	0	+	0	0	0
Humaneness		-	0	0	-	0	-	0	-

"0" = None or Minimal; “-“ = Negative; "+" = Positive

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED

5.1 LIST OF PREPARERS/REVIEWERS

Keel Price, Wildlife Biologist /NM District Supervisor, USDA-APHIS-WS
Brian Archuleta, Wildlife Biologist /NM District Supervisor, USDA-APHIS-WS
Thomas C. Hall, Wildlife Biologist/Environmental Coordinator, USDA-APHIS-WS

5.2 LIST OF PERSONS CONSULTED

Terrell Baker, Range Improvement Task Force Coordinator, Coop. Ext. Svc., NM State University
Myles Culbertson, New Mexico Livestock Board
Paul Ettestad, DVM, MS, State Public Health Veterinarian, NMDH
R. J. Kirkpatrick, Wildlife Biologist, NMDGF
Louis Rios, Chief, SW Area Operations NMDGF
John Sherman, Wildlife Program Lead, NM State Office, BLM
Samuel Smallidge, Range Management Specialist, Coop. Ext. Svc., NM State University
Keith Smith, Division of Government Research, University of New Mexico
Bud Starnes, Wildlife Resource & Policy Specialist, NMDA
Tod Stevenson, Director, NMDGF
Gail Tunberg, Wildlife Program Leader, USFS SW Region
Sandy Wright, Wildlife Strike Data Base Manager, USDA-APHIS-WS, Sandusky, Ohio

5.3 LITERATURE CITED

Amass, S. 1998. Swine diseases that have affected humans. Purdue Animal Issues Briefing, Purdue Univ., West Lafayette, Indiana.

American Veterinary Medical Association. 1987. Panel Report on the Colloquium on Recognition and Alleviation of Animal Pain and Distress. J. Amer. Vet. Med. Assoc. 191:1186-1189.

Arritt, S. 1997. Little grouse on the prairie: reversing the decline of lesser prairie-chickens. New Mex. Partners Conserving Endang. Spp., Cons. Serv. Div., NMDGF.

Baber, D. W. and B. E. Coblentz. 1987. Diet, nutrition, and conception in feral pigs on Santa Catalina Island. J. Wildl. Manage. 51(2):306-317

Barrett, R. H. 1978. The feral hog on the Dye Creek Ranch, California. Hilgardia 46(9):283-355.

Bartel, R. A. and M. W. Brunson. 2003. Effects of Utah's coyote bounty program on harvester behavior. Wildl. Soc. Bull. 31(3):736-743.

Beach, R. 1993. Depredation problems involving feral hogs. Pp. 67-75 *in* C.W. Hanselka and J.F. Cadenhead, eds. Feral Swine: A Compendium for Resource Managers. Texas Agric. Ext. Serv., College Station.

Beaver, B.V., W. Reed, S. Leary, B. McKiernan, F. Bain, R. Schultz, B. T. Bennett, P. Pascoe, E. Shull, L.C. Cork, R. Francis-Floyd, K. D. Amass, R. Johnson, R.H. Schmidt, W. Underwood, G. W. Thornton, and B. Kohn. 2001. 2000 report of the American Veterinary Medical Association panel on euthanasia. J. Amer. Vet. Med. Assoc. 218:669-696.

Biota Information System of New Mexico (BISON-M). 2009. Species reports. @ http://www.bison-m.org/. *Last visited 04/06/2009.*

Bratton, S. P. 1974. An integrated ecological approach to the management of European wild boar (*Sus scrofa*) in Great Smokey Mountains. National Park Serv. Manage. Rept. No. 3. Pp 3-7.

Brown, D. E. 1983. On the status of the jaguar in the Southwest. SW Nat. 28:459-460.

California Department of Fish and Game. 1991. Final environmental document - bear hunting. Sections 265, 365, 366, 367, 367.5. Title 14 Calif. Code of Regs. Calif. Dept. of Fish and Game, April 25, 1991. 13pp.

Centers for Disease Control. 1990. Morbidity and mortality weekly report. Compendium of Rabies Control. 39, No. RR-4: 6.

Conley, W. and W. C. Brown. 1977. Habitat partitioning between the jackrabbits *Lepus callotis* and *L. californicus*. NMDGF, Santa Fe, contract 516-65-23 Final Rpt.. Pp. 1-14

Corn, J.L., P.K. Swiderek, B.O. Blackburn, G.A. Erickson, A.B. Thiermann, and V.F. Nettles. 1986. Survey of selected diseases in wild swine in Texas. J. Am. Vet. Med. Assoc. 189:1029-1032.

Council for Environmental Quality (CEQ). 1981. Forty most asked questions concerning CEQ's National Environmental Policy Act regulations. (40 CFR 1500-1508) Fed. Reg. 46(55):18026-18038.

Davidson, W. R., and V. R. Nettles. 1997. Field Manual Of Wildlife Diseases In The Southeastern United States. 2nd edit. Southeastern Coop. Wildl. Disease Study. Univ. Georgia, Athens. 417 pp.

Department for Environment, Food and Rural Affairs. 2004. Campaign against accidental or illegal poisoning. British Dept. Environ., Food, and Rural Affairs. @ http://www.caip-uk.info/default.aspx. *Last accessed 04/06/2009*.

Dolbeer, R. A. 1988. Management of fruit bat and rat populations in the Maldive Islands, Indian Ocean. Proc. Vert. Pest Conf. 13:112-118.

Federal Wildlife Officer, The . 2000. Macon, GA, investigations. Federal Wildlife Officers Association Fall Newsletter 13(4):1.

Forrester, D. J. 1991. Parasites And Diseases Of Wild Mammals In Florida. Univ. Fla. Press. Gainesville. 455 pp.

Glenn, W. 1996. Eyes of Fire, Encounter with a Borderlands Jaguar. Printer Corner Press. El Paso, TX. Sept. 3.

Henderson, F. R. 1987. How to trap a coyote. Kansas State Univ., Coop. Ext. Serv., Publ. C-660. 12 pp.

Henry, S. 2003. Biosecurity, control and eradication strategies for PRRS and Aujesky's disease. National Instit. Animal Agric. Ann. Meeting Proc. @ http://animalagriculture.org/Proceedings/2003AMProceedings.asp. *Last visited 04/06/2009.*

Hubalek, Z., F. Treml, Z. Juricova, M. Hundy, J. Halouzka, V. Janik, D. Bill. 2002. Serological survey of the wild boar (*Sus scrofa*) for tularemia and brucellosis in south Moravia, Czech Republic. Vet. Med. – Czech, 47(2-3): 60-66.

Hubbard, J.P., M.C. Conway, and J.W. Eley. 1985. White-sided jackrabbit (*Lepus callotis*). NMDGF, Handbook Spec. End. in New Mexico: MAMM/LE/LE/CA:1-2.

Hutton, T., T. DeLiberto, S. Owen, and B. Morrison. 2006. Disease Risks Associated with Increasing Feral Swine numbers and Distribution. Midwest Assoc. Fish & Wildl. Agencies, Wildl. & Fish Committee. 15 pp.

International Association of Fish and Wildlife Agencies. 2004. The potential costs of losing hunting and trapping

as wildlife management tools. Animal Use Committee, IAFWA, Wash., DC. 46 pp.

Lipscomb, D. 1989. Impacts of feral hogs on longleaf pine regeneration. S. J. of Applied Forestry. 13:177-181.

Miller, J.E. 1993. A national perspective on feral swine. Pp 9-16. *in* C.W. Hanselka and J.F. Cadenhead, editors. Feral swine: a compendium for resource managers. Texas Agricultural Extension Service, College Station.

Mitchell, C. A., D. H. White, E. J. Kolbe, R. C. Biever. 1984. Dicrotophos poisoning of Great-tailed Grackles in Texas. J. Wildl. Dis. 20: 256–257.

New Mexico Agricultural Statistics Service. 2009. State hogs and pigs. USDA/NMDA, NM Agric. Stat. Serv., Albuquerque. @ http://www.nass.usda.gov/Statistics_by_State/New_Mexico/index.asp. *Last accessed 04/06/2009.*.

Phillips, R. L., and K. S. Gruver. 1996. Selectivity and effectiveness of the Paw-I-Trip pan tension device on 3 types of traps. Wild. Soc. Bull. 24:119-122.

Pimentel, D., L. Lach, R. Zuniga, and D. Morrison. 1999. Environmental and economic costs associated with non-indigenous species in the United States. College Agric. & Life Sci.. Cornell Univ., Ithaca, NY 14850-0901. @ http://www.news.cornell.edu/releases/Jan99/species_costs.html. *Last visited 04/06/2009.*

Porter, Scott. 2004. Corporation fined for poisoning bald eagle in KY. Wildl. Law News Quarterly 2:14.

Saliki, J.T., S.J. Rodgers, and G. Eskew. 1998. Serosurvey of selected viral and bacterial diseases in wild swine in Oklahoma. J. Wildl. Dis. 34(4):834-838.

Samuel, W. M., M. J. Pybus, and A. A. Kocan, eds. 2001. Parasitic Diseases of Wild Mammals. Iowa State Univ. Press, Ames. 559 pp.

Schley, L. and T. J. Roper. 2003. Diet of wild boar (*Sus scrofa*) in Western Europe with particular reference to consumption of agricultural crops. Mammal Review 33(1):43-56.

Schmidt, R. 1989. Wildlife management and animal welfare. Trans. N. America Wildl. & Nat. Res. Conf. 54:468-475.

Seward, N. W., K. C. VerCauteren, G. W. Witmer, and R. M. Engeman. 2004. Feral swine impacts on agriculture and the environment. Sheep & Goat Research J. 19: 34-40.

Shenk, T. 2005. General locations of lynx (*Lynx canadensis*) reintroduced to southwestern Colorado from February 4, 1999 through February 1, 2005. Colo. Div. Wildlife, Rpt. April. 13 pp.

Singer, F. J., W. T. Swank, and E. E. C. Clebsch. 1982. Some ecosystem responses to European wild boar rooting in a deciduous forest. USDI, NPS, SERO, Research/Resources Manage. Report No. 54. Atlanta, GA. 31 pp.

Singer, F. J., W. T. Swank and E. E. Clebsch. 1984. Effects of wild pig rooting in a deciduous forest. J. Wildl. Manage. 48(2):464-473.

Slate, D.A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. N. A. Wildl. Nat. Res. Conf 57:51-62.

Springer, M. D. 1977. Ecological and economic aspects of wild hogs in Texas. Pp. 37-46. *In* G. W. Wood, ed. Research and Management of Wild Hog Populations. The Belle W. Baruch Forestry Sci. Inst., Clemson Univ., Georgetown, SC.

Stevens, R. L. 2006. The Feral Hog in Oklahoma. Revision. Samuel Robert Noble Foundation, Ardmore, OK. 33 pp. @ http://www.noble.org/ag/wildlife/feralhogs/CDVersion.pdf. *Last accessed 04/06/2009.*

Tate, J. 1984. Techniques in controlling wild hogs in great Smoky Mountains National Park. Proc. Research and Resources Manage. Rpt. SRE-72. U.S. Dept. Interior, National Park Serv., SE Reg. Office, Atlanta, GA. .

Texas Department of Agriculture. 2006. Preventing pesticide misuse in controlling animal pests. Agric. Dept., Austin, TX . @ http://www.agr.state.tx.us. *Last accessed 04/06/2009.*

Timm, R. M., and R. H. Schmidt. 1986. Management problems encountered with livestock guarding dogs on the University of California, Hopland Field Station. Proc. Great Plains Wildl. Damage Cont. Workshop 9:54-58.

Treves, A., and L. Naughton-Treves. 2005. Evaluating lethal control in the management of human-wildlife conflict. Pp. 86-106. *In* People and Wildlife: Conflict or Coexistence. R. Woodroffe, S. Thirgood, A. Rabinowitz, eds. Univ. Cambridge Press, United Kingdom.

Turkowski, F. J., A. R. Armistead and S. B. Linhart. 1984. Selectivity and effectiveness of pan tension devices for coyote foothold traps. J. Wildl. Manage. 48:700-708.

U.S. Department of Agriculture (USDA). 1997. Animal Damage Control Program Final Environmental Impact Statement. (*Revised*) USDA-APHIS-WS, Operational Support Staff, 4700 River Rd., Unit 87, Room 2D-07.3, Riverdale, MD 20737-1234. 314 pp + App.

U.S. Fish and Wildlife Service (USFWS). 1990. Listed cats of Texas and Arizona: recovery plan (with emphasis on ocelot). USFWS, Albuquerque, NM. 131 pp.

_____ USFWS. 1998. Biological Opinion on Mexican gray wolf. Letter to USDA-APHIS-WS from USFWS. May 27. 16 pp. + App.

_____ USFWS. 1999a. Biological Opinion on the Jaguar. Letter to USDA-APHIS-WS from USFWS. June 22. 20pp + App.

_____ USFWS. 1999b. Biological Opinion on the Jaguar, amendment. Letter to USDA-APHIS-WS from USFWS. Dec. 6. 6 pp + App.

_____ USFWS. 2003a. Letter of concurrence with the USDA-APHIS-Wildlife Services Biological Assessment of impacts of wildlife damage management on T&E species in New Mexico. From J. Nicholopoulos, USWFS State Supervisor, to A. Lara, State Director. June 18, 2003. 5pp

_____ USFWS. 2003b. Service agents issue citations in Oklahoma. USFWS News Release Nov. 4, 2003. @ http://www.fws.gov/news/NewsReleases/. 2pp. *Last accessed 04/06/2009.*.

Wade, D. A. and J. E. Bowns. 1982. Procedures for evaluating predation on livestock and wildlife. Texas Agri. Ext. Serv. & TX Agric. Exp. Sta., Texas A&M Univ./US Dept. Interior-USFWS Pub. B-1429. 42 pp.

Wildlife Services (WS). 2003. Biological Assessment for the management of wildlife damage in New Mexico to protect agricultural and natural resources, property, and human health and safety: Analysis of potential impacts on threatened and endangered species. USDA-APHIS-WS, 8441 Washington NE, Albuquerque, NM 87113-1001. 66 pp.

_____ WS. 2005. Predator damage management in Colorado. Environmental Assessment, Finding of No Significant Impact, and Record of Decision. 12/16/05. USDA-APHIS-WS, 12345 West Alameda Pkwy., Suite 210, Lakewood, CO 80228. 246 pp.

_____ WS. 2006. Predator damage management in New Mexico. Environmental Assessment, Finding of No Significant Impact, and Record of Decision. 12/16/05. USDA-APHIS-WS, 8441 Washington NE, Albuquerque, NM 87113-1001. 187 pp.

_____ WS. 2009. Feral Swine Damage Management in Kansas. Environmental Assessment, Finding of No Significant Impact, and Decision. 02/06/09. USDA-APHIS-WS, 4070 Fort Riley Blvd., Manhattan, KS 66506. 46 pp.

Williams, E. S., and I. K. Barker, eds. 2001. Infectious Diseases of Wild Mammals. 3rd ed. Iowa State Univ. Press, Ames. 576 pp.

Wood, G. W. and R. E. Brenneman. 1980. Feral hog movements and habitat use in coastal South Carolina. J. Wildl. Manage., 44(2):420-427.

Wood, G. W. and T. E. Lynn, Jr. 1977. Wild hogs in Southern forests. S. J. Appl. Forestry 1(2):16-17.

Wood, G.W. and D.N. Roark. 1980. Food habits of feral hogs in Coastal South Carolina. J. Wildl. Manage., 44(2):506-511.