ENVIRONMENTAL ASSESSMENT

Management of Feral and Free-Ranging Cat Populations to Reduce Threats to Human Health and Safety and Impacts to Native Wildlife Species In the Commonwealth of Puerto Rico

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)
ANIMAL AND PLANT HEALTH INSPECTION SERVICE (APHIS)
WILDLIFE SERVICES (WS)

In Cooperation with:

UNITED STATES DEPARTMENT OF INTERIOR
National Park Service

CITY OF SAN JUAN

December 2003

TABLE OF CONTENTS

ACRONYMS iii

CHAPTER 1: PURPOSE AND NEED FOR ACTION

INTRODUCTION 1
1.1 NEED FOR ACTION 3
1.1.1 Need for Feral and Free-Ranging Cat Management to Protect Human Health & Safety 4
1.1.2 Need for Feral and Free-Ranging Cat Management to Protect Wildlife 6
1.1.3 Review of Feral and Free-Ranging Cat Control Measures in Scientific and Popular Literature 9
1.2 WILDLIFE SERVICES OBJECTIVES-PUERTO RICO 10
1.3 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS 11
1.4 DECISION TO BE MADE 11
1.5 SCOPE OF THIS EA ANALYSIS 12
1.6 AUTHORITY AND COMPLIANCE 12
1.6.1 Authority of Federal Agencies in Wildlife Damage Management in Puerto Rico 12
1.6.2 Compliance with Other Federal and Commonwealth of Puerto Rico Laws, Rules, and Regulations 17
1.7 A PREVIEW OF THE REMAINING CHAPTERS IN THIS EA 20

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

INTRODUCTION 21
2.1 AFFECTED ENVIRONMENT 21
2.2 ISSUES ADDRESSED IN DETAIL IN CHAPTER 4 21
2.2.1 Effects of Feral and Free-Ranging Cats on Human Health and Safety, and Native Wildlife 21
2.2.2 Effects on Target Species Populations 22
2.2.3 Effects of Control Methods on Nontarget Species Populations, Including T&E Species 22
2.2.4 Humaneness of Control Techniques 24
2.2.5 Effects of Control Methods on Human Health and Safety 25
2.2.6 Effects on the Aesthetic Values of Targeted Species and Protected T&E Species 25
2.3 ISSUES USED TO DEVELOP MITIGATION 26
2.3.1 Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" 27
2.3.2 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045) 27
2.4 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE 28
2.4.1 Legal Constraints on Implementation of Control 28
2.4.2 Cost Effectiveness of Control Methods 28

CHAPTER 3: ALTERNATIVES

INTRODUCTION....29
ALTERNATIVES ANALYZED IN DETAIL....29
3.1 DESCRIPTION OF THE ALTERNATIVES....29
3.1.1 Alternative 1 - No Action....29
3.1.2 Alternative 2 - Nonlethal Control Before Lethal Control....30
3.1.3 Alternative 3 - Nonlethal Control Only....30
3.1.4 Alternative 4 - Lethal Control Only....30
3.1.5 Alternative 5 - Integrated Wildlife Damage Management (Proposed Action)....32
3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE....32
3.2.1 Trap, Neuter, and Release (TNR) or Trap, Neuter, Vaccinate, and Release (TNVR) Alternative....32
3.2.2 Frightening Devices Alternative....33
3.2.3 Trap and Relocate Back into the Wild Alternative....33
3.2.4 Biological Control Alternative....34
3.2.5 Poisoning Alternative....34
3.3 MITIGATION AND SOP's FOR WILDLIFE DAMAGE MANAGEMENT TECHNIQUES....34
3.3.1 Mitigation Measures....34
3.3.2 Additional Mitigation Measures and SOPs for Wildlife Damage Management Techniques....35
3.4 ADDITIONAL MITIGATION MEASURES SPECIFIC TO THE ISSUES....35

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION....37
4.1 DETAILED ANALYSIS OF ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES....37
4.1.1 Effects of Feral and Free-Ranging Cat Populations on Human Health and Safety, and Native Wildlife....37
4.1.2 Effects on Target Species Populations....38
4.1.3 Effects of Control Methods on Nontarget Species Populations, Including T&E Species....40
4.1.4 Humaneness of Control Techniques....41
4.1.5 Effects of Control Methods on Human Health and Safety....43
4.1.6 Effects on the Aesthetic Values of Targeted Species and Protected T&E Species....44
4.2 CUMULATIVE IMPACTS....46

CHAPTER 5: LIST OF PREPARERS, REVIEWERS, AND CONSULTANTS....50

APPENDIX A: BIBLIOGRAPHY AND LITERATURE CITED....51

APPENDIX B: GLOSSARY....63

ACRONYMS

ADC	Animal Damage Control
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DOD	United States Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FDA	United States Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding Of No Significant Impact
FY	Fiscal Year
GAO	General Accounting Office
IPM	Integrated Pest Management
IWDM	Integrated Wildlife Damage Management
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NOA	Notice of Availability
NPS	National Park Service
NWR	National Wildlife Refuge, U.S. Fish and Wildlife Service
ROD	Record of Decision
SOP	Standard Operating Procedure
T&E	Threatened and Endangered Species
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFWS	U.S. Fish and Wildlife Service
WDM	Wildlife Damage Management
WS	Wildlife Services [formerly Animal Damage Control (ADC)]

CHAPTER 1: PURPOSE AND NEED FOR ACTION

INTRODUCTION

Across the world, natural systems are being substantially altered as human populations expand and encroach on wildlife habitats. Human uses and needs often compete with wildlife for space and resources, increasing the potential for conflicting human/wildlife interactions. In addition, segments of the public strive for protection for all native and non-native wildlife; this protection can create localized conflicts between humans and wildlife activities. The *Animal Damage Control* (ADC) *Programmatic Final Environmental Impact Statement* (FEIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (USDA 1997):

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

The United States Department of Agriculture (USDA) is directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary authority for the United States Department of Agriculture-Animal and Plant Health Inspection Service-Wildlife Services program is the Act of March 2, 1931, as amended (46 Stat. 1468; 7 U.S.C. 426-426b and 426c) and the Rural Development, Agriculture and Related Agencies Appropriations Act of 1988 (P.L. 100-202). USDA-Wildlife Services (WS) activities are conducted in cooperation with other federal, state, and local agencies, and private organizations and entities.

Wildlife damage management, or control, is defined as the alleviation of damage or other problems caused by, or related to the presence of wildlife (Leopold 1933, The Wildlife Society 1990, and Berryman 1991). The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as IPM or "Integrated Pest Management") in which a series of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, 1-7 of the *Animal Damage Control* (ADC) *Programmatic Final Environmental Impact Statement* (USDA 1997). These methods include the alteration of cultural practices as well as habitat and behavioral modification to prevent damage. The control of wildlife damage may also require the removal of an offending animal(s) or the reduction of localized populations of the offending species, through the application of lethal methods. Potential environmental impacts resulting from the application of various wildlife damage reduction techniques are evaluated in this environmental assessment.

According to the Animal and Plant Health Inspection Service procedures implementing the National Environmental Policy Act (NEPA), individual actions may be categorically excluded [7 C.F.R. 372.5(c), 60 Fed. Reg. 6,000, 6,003 (1995)]. However, in order to evaluate and determine if there may be any potentially significant or cumulative impacts from the described control program, the Wildlife Services Program in the Commonwealth of Puerto Rico has decided to prepare this environmental assessment (EA).

The purpose of this EA is to analyze the potential effects of the proposed control activities in the Commonwealth of Puerto Rico. This analysis relies predominately on existing federal and state agency

publications, information contained in scientific literature, and communications with other wildlife professionals. This EA also cites the *Animal Damage Control* (ADC) *Programmatic Final Environmental Impact Statement* (USDA 1997).

All control activities will be in compliance with relevant laws, regulations, policies, orders, and procedures, including the Endangered Species Act (ESA). Control activities will not negatively impact other protected flora or fauna. Notice of availability (NOA) of this document will be made consistent with the Agency's NEPA procedures in order to allow interested parties the opportunity to obtain and review this document and comment on the proposed management activities.

WILDLIFE SERVICES PROGRAM

Wildlife Services (WS) is a cooperatively funded and service oriented program. Before any operational wildlife damage management is conducted, *Agreements for Control* or *WS Work Plans* must be completed by WS and the land owner/administrator. WS cooperates with private property owners and managers and with appropriate natural resource 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 and Memorandums of Understanding (MOUs) between WS and other agencies.

Wildlife Services' mission, developed through its strategic planning process, is: 1) to provide leadership in wildlife damage management for the protection of American agriculture, endangered and threatened species, and natural resources, and 2) to safeguard public health and safety. The WS' Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- close cooperation with other federal and state agencies;
- training of wildlife damage management professionals;
- development and improvement of strategies to reduce losses and threats to publics from wildlife;
- collection, evaluation, and distribution of wildlife damage management information;
- cooperative wildlife damage management programs;
- informing and educating the public on how to reduce wildlife damage and;
- providing data and a source for limited-use management materials and equipment, including federal and state registered pesticides (USDA 1989).

PURPOSE

In 2001, the USDA, APHIS, WS met with officials from the National Parks Service, San Juan animal control services, and the San Juan Mayors Office to discuss issues concerning feral and free-ranging cats in the Old San Juan Historic District. All agencies represented at this meeting agreed that feral and free-ranging cats are a substantial health hazard and nuisance in the Old San Juan District and could potentially have a negative impact on tourism to this area. At this meeting it was agreed that an environmental assessment (EA) would be prepared prior to implementing a feral and free-ranging cat control plan to assist in the decision making process.

The USDA, APHIS, WS Program decided to broaden the scope of this EA to include the entire island of Puerto Rico, instead of restricting the scope to Old San Juan. This scope was decided to facilitate the timely response of WS to damage assistance requests received from other localities on the island.

PROPOSED ACTION

The WS proposed action for this EA is an Integrated Wildlife Damage Management approach to reduce human health and safety concerns, alleviate nuisance issues, and reduce impacts to native wildlife species resulting from feral and free-ranging cat populations within the urban and rural environments of the Commonwealth of Puerto Rico. This alternative would incorporate an integrated management program utilizing techniques described in Alternatives 2, 3, and 4 (see Chapter 3). This strategy would incorporate non-lethal and lethal control measures.

Management strategies involving exclusionary devices would be implemented by urban and natural resource management personnel in accordance with WS recommendations. Local population reduction of feral and free-ranging cats to reduce immediate health and safety concerns, alleviate nuisance issues, and potential predation to native wildlife would be implemented by WS personnel with assistance from urban and natural resource managers, as appropriate.

1.1 NEED FOR ACTION

The following is a list outlining some of the reasons why cat colonies should be controlled (Passanisi and Macdonald 1990): "1) the sheer abundance of cats in some areas, 2) the unpleasant site of cat corpses, or of individuals in poor condition, 3) the profusion of kittens, often in poor health - a female may produce 2 or 3 litters of up to 10 kittens per year, 4) annoying caterwauling, 5) nocturnal fighting, 6) trampling on, digging up, or defecating on gardens, vegetable patches, etc., 8) disturbing rubbish bins and scattering litter, 9) they will often enter homes and other buildings uninvited, 10) they will occasionally kill or scare birds, fish or other animals, 11) risk of attacks on babies in prams (baby carriage), children, or other pets, 12) the possible health risks from the transmission of various diseases from cats to pets or humans (particularly children), including ringworm, cat scratch fever and toxoplasmosis, 13) they may be breeding grounds for fleas, and 14) the foul smell and maggots/flies resulting from the excess food left around for feral cats by over-enthusiastic cat lovers".

Humans have brought about the extinction and endangerment of more animals and plants than any other single force of nature, and some contributions leading to extinctions have been caused by the release or escape of domesticated animals (i.e., house cats, dogs, hogs) into previously uninhabited environments. Day (1981) addresses at least 9 species of animals that have become extinct as a result of humans, habitat degradation, and the impacts of feral domesticated or imported pests. The following is a synopsis of species whose extinction is believe to have been influenced by European rats, hogs, domestic cats, and dogs: Rodriguez Day Gecko (*Phelsuma edwardnewtoni*; Rodriguez Island); Broad-faced Potoroo (*Potorous platyops*; Western Australia); Gilbert's Potoroo (*Potorous gilberti*; Western Australia); St. Francis Island Potoroo (*Potorous sp.*; St. Francis Island, Australia); Korean Crested Shelduck (*Tadorna (Pseudotadorna) cristata*; Korea); Heath Hen (*Tympanuchus cupido cupido*; New England, USA); Sandwich Rail (*Porzana sandwichensis*; Hawaii, USA); Jamaican Woodrail or Uniform Rail (*Aramides concolor concolor*; Jamaica); and the Dodo (*Raphus cucullatus*; Mauritius Island).

Wildlife professionals and lay persons often disagree as to what constitutes a feral animal. Van't Woudt (1990) uses three categories to classify the status of a domesticated animal observed in the wild: 1) an animal that stays in close proximity to its home or owner (tame); 2) an animal that may or may not have a home or owner but is reliant on humans for shelter and food (free-ranging); and 3) an animal that breeds and lives without human interactions (feral). For the purpose and scope of this EA, the WS Program in Puerto Rico will adopt Van't Woudt's (1990) definitions of tame, free-ranging, and feral domesticated animals, as described above. Additionally, WS will consider all domesticated species or breeds as feral or free-ranging animals when captured during control operations, unless an animal is readily identified with a collar and/or an identification tag.

Jurek (1994) has compiled a bibliography on feral and free-ranging cats and their impacts on wildlife, threats to human health and safety, etc. This bibliography includes 340 citations. Many of these citations are scientific in origin, others are from private publications produced by animal welfare groups. Most of the information to follow comes from citations presented in this bibliography. However, additional information on the subject comes from other extensive literature searches.

1.1.1 Need for Feral and Free-Ranging Cat Management to Protect Human Health & Safety

The domestic cat has been found to transmit *Toxoplasma gondii* to both domestic and wild animal species. Fitzgerald et al. (1984) documented that feral and free-ranging cats transmitted *T. gondii* to sheep in New Zealand, resulting in abortion in ewes. The authors also found *Sarcocystis* spp. contamination in the musculature of sheep. Dubey et al. (1995) found cats to be 68.3% positive for seroprevalence of *Toxoplasma gondii* on swine farms in Illinois and the major reservoir for this disease. The main sources for infecting cats are thought to be birds and mice. Cats were believed to be the cause of disease transmission (*T. gondii*) and the death of kangaroos, wallabies, and potaroos at the Knoxville Zoological Park in Tennessee (Patton et al. 1986).

Cats have been found to be important reservoirs and the only species known to allow for the completion of the life cycle for the protozoan parasite, *Toxoplasmosis gondii* (Dubey 1973; Teutsch et al. 1979). Both stray and domiciled cats are infected by this protozoan, but this infection is more common in stray cats. Stagno et al. (1980) found that school-aged children, in an Alabama Outbreak of *Toxoplasmosis*, were more likely to be infected than other age groups. Ingestion of oocysts deposited in cat feces was the means by which these children contracted the infection. Children with a history of geophagia had a greater chance of contracting this infection than children not exhibiting this behavior. These oocysts can remain viable in the soil for years. Frenkel (1973) felt that the disease was insignificant to adult humans, but the greatest threats was transplacental infections. Of the documented cases of maternal toxoplasmosis during pregnancy, 30-40% of the mothers transmitted this disease to their babies; of these babies, 5-24% died from the infection or complications there of.

> The index patient had unusual clinical manifestations including brain abscesses, progressive chorioretinitis, seizures, neurologic deficits, hepatosplenomegaly, pneumonitis, and eosinophilia (Stagna et al. 1980).

A study in France determined that stray cats serve as major reservoirs for the bacterium *Bartonella* spp. and *B. clarridgaiae*. Consequently, stray cats and their fleas (*Ctenocephalides felis*) are the only known vectors for infecting house bound cats and humans with this bacterium. Humans are not infected via the flea, but pet cats often are infected by flea bites. Human infections that may result from exposure of this bacterium via stray cats include: cat scratch disease in immunocompetent patients, bacillary angiomatosis, hepatic peliosis in immunocompromised patients, endocarditis, bacteremia, osteolytic lesions, pulmonary nodules, neuroretinitis, and neurologic diseases (Heller et al. 1997).

Diseases that may be communicable from free-ranging or feral cats to pet cats include feline panleukopenia (FPL) infection, feline calicivirus (FCV) infection, feline reovirus (FRV) infection, and feline syncytium-forming virus (FSV) infection (Gillespie and Scott 1973). Of the four feline diseases, feline panleukopenia is considered to be the most serious. Reif (1976) found that during the acute stages of feline panleukopenia, fleas were vectors of this disease to other cats. FPL infection is cyclic in nature, being more prevalent in July-September.

In a survey of pet cats and dogs on Air Force Bases in the United States, the most frequent zoonoses were hookworms, roundworms, tapeworms, and fleas. In human reported cases dermatomycoses, fleas,

scabies, Gram-positive bacterial infections, and rabies are the most important zooonotic threats (Warner 1984).

Several cases of feline plague, caused by the bacterium (*Yersinia pestis*), has been clinically documented in New Mexico and various other areas of the western United States. It is believed that cats become infected by feeding on rats or by the bite of infected fleas; humans then acquire the disease from draining abscesses, bites, or pneumonic discharges from a cat or from the bite of an infected flea (Eidson et al. 1988). The authors suggest that by controlling free-ranging of cats would help reduce the risk of feline plague and subsequent cases of human plague.

Cats have been proven to be reservoirs for *Borrelia burgdorferi*, a spirochete that can infect humans and many domesticated and wild animals. This spirochete is transmitted through the bite of the *Ixodes dammini* tick. Clinical conditions associated with borreliosis general consist of joint disorders and lameness. Limiting a pet's exposure to areas inhabited by ticks (or exposure to free-ranging pets and wildlife) is the best prevention.

Another bacterium often associated with free-ranging cats that commonly feed on garbage or come into contact with other contaminated sources is *Salmonella typhimurium* DT104 (Wall et al. 1996). Cats are also known to become contaminated by covering feces. "Salmonellae appear to be shed in large numbers from the buccal cavity of symptomatic cats and their grooming habits can lead to the coat of the animal becoming contaminated." With the abundance of cats in households and elsewhere, contamination of humans through contact with infected cats may become more common.

In areas where dog rabies has been eliminated, but rabies in wildlife has not, cats often are the most significant animal transmitting rabies to humans (Eng and Fishbein 1990; Krebs et al. 1996; Vaughn 1979). In West Germany, cat rabies accounted for 7.9% of the total number of rabid animals; cats made up 20.7% of the documented human exposures to rabies. During the same time period in Potsdam, Germany, 55.3% of human exposure to rabies was from cats. In most of the world where dog rabies has not been eradicated, cat rabies is of lesser importance (Vaughn 1979).

In Puerto Rico, domesticated dogs and cats make up a substantial number of the domesticated animal cases, while the mongoose (*Herpestes auropunctatus*) makes up the highest number of cases in wild animal reservoirs and total number of cases. In 1995, 2 cases of rabid cats were reported in Puerto Rico; 13 cases of rabies in dogs were reported; and 23 cases in mongoose (Krebs et al. 1996). In 1996, 4 cases of rabid cats were reported in Puerto Rico; 12 cases of rabies in dogs were reported; and 36 cases in mongoose (Krebs et al. 1997). In 1997, 1 case of rabid cats was reported in Puerto Rico; 15 cases of rabies in dogs were reported; and 53 cases in mongoose (Krebs et al. 1998). In 1998, 1 case of rabid cats was reported in Puerto Rico; 12 cases of rabies in dogs were reported; and 35 cases in mongoose (Krebs et al. 1999). In 1999, 1 case of rabid cats was reported in Puerto Rico; 11 cases of rabies in dogs were reported; and 59 cases in mongoose (Krebs et al. 2000). In 2000, 1 case of rabid cats was reported in Puerto Rico; 15 cases of rabies in dogs were reported; and 59 cases in mongoose (Krebs et al. 2001).

Rabies has been documented in Caribbean Islands other than Puerto Rico since the early twentieth century. Between 1963-1983, Cuba had 2408 documented cases of humans bitten by rabid animals (dogs - 1371; cats - 542; mongooses - 384; others - 111). Between 1927-1984, the total number of reported cases for rabid animals equaled 9,920. The 9,920 reported cases were broken down as follows: dogs - 7918; cats - 977; mongooses - 572; bovines - 249; others - 204. Records from Grenada, between 1952-1984, total 1436 cases of rabies on the island. Grenada rabies for this time period included the following species: humans - 4; opossums - 1; bats - 3; mongooses - 934; dogs - 155; cats - 22; livestock -

295; unknowns - 22. Haiti and the Dominican Republic also have reports of feral cat rabies, but documentation for these cases is incomplete (Everard and Everard 1992).

Rabies post-exposure treatments for humans costs Ontario, Canada more than $1 million annually; other rabies expenses tally $15 million annually (Rosatte 1985). The red fox (*Vulpes vulpes*) and the striped skunk (*Mephitis mephitis*) are the main reservoirs for rabies in Ontario and the main sources of infection for domestic animals. However, more than half of the human exposure to rabies in Ontario is attributed to cats and dogs (55%; 1,114/2,027).

1.1.2 Need for Feral and Free-Ranging Cat Management to Protect Wildlife

AVIAN CASE STUDIES

The domestic cat has been one of the most important biological factors (not including humans) causing the depletion or extinct of both island and mainland bird species. In a survey of the impacts of biological invasions on six island reserves, feral cats were identified in all six of the islands surveyed. On these islands, cats had a varying degree of impact depending on the environment and vulnerable species present. Islands surveyed were found in the jurisdiction of the following countries: New Zealand, Scotland, Portugal, United States of America, Seychelles, and Ecuador (Brockie et al. 1988). Jackson (1978) reports cats as the most significant factor, next to habitat destruction, contributing to the extinction of bird species. Jackson (1978) reports that at least 33 species (forms) have become extinct as a result of cat predation.

The diet of feral and free-ranging cats varies depending on availability, abundance, and geographic location. In a survey of New Zealand scientific literature, Fitzgerald (1990) concluded that prey selection of feral and free-ranging cats is dependent on availability. The author found that cats on mainland situations fed most heavily on mammals; where as, cats on islands fed almost exclusively on birds (particularly seabirds). Feral and free-ranging cats are known to prey on birds as large as mallard ducks (Figley and VanDruff 1982) and young brown pelicans (Anderson et al. 1989) and mammals as large as hares and rabbits. Many of these cat populations rely heavily on humans, either for handouts and/or garbage.

Introduced cats are the most substantial predators for seabirds (Moors and Atkinson 1984; Williams 1984). On Jarvis and Howard Islands in the Central Pacific cats were significant predators of seabirds (Kirkpatrick and Rauzon 1986). Snetsinger (1994) found the remains of native bird species in 68% of feral cat scat and mammal remains in 89% in Hawaii. Ashmole (1963) found cats to be the most significant predators of Wideawakes or sooty terns (*Sterna fuscata*) on Ascension Island.

Merton (1978) found 15 biologically important islands in New Zealand colonized by cats. Cats are implicated in the extinction of 6 endemic bird species and 70 local extinction. The black petrel (*Procellaria parkinsoni*) is on the verge of extinction because of cat predation. Cats are documented to be significant predators of island birds in the Marcquarie Island and other sub-arctic islands (Jonestone 1985; Jones 1977). Warham (1967) found that feral cats were the main factor in declines of burrow-nesting white-headed petrels (*Pterodroma lessoni*) on Marcquarie Island in the Esperance District, Tasmania (roughly 800 miles southeast of mainland). Marshall (1961) found feral cats just as destructive to nesting shorebirds on Little Barrier Island, New Zealand.

Feral cats have been implicated in the extinction and near extinction of 6 island birds off Mexico's West Coast. Four of these species were found on the island of Guadalupe, 160 miles west of Mexico and included: Guadalupe towhee, flicker, wren, and petrel (Jehl 1972). Jehl and Parkes (1983) implicated

feral and free-ranging cats with the extinction of the Socorro dove and near eradication of the Socorro mockingbird on Socorro Island, 400 km south by southwest of the tip of the Baja Peninsula, Mexico.

Ground nesting parrots on islands have evolved in the absence of mammalian predators, thus, these birds are extremely vulnerable to cat predation. Bryant (1991) found the endangered ground parrot *Pezoporus wallicus* to be severely impacted by feral cats in Tasmania. In the Bahama Islands, Gnam (1990) and Gnam and Burchsted (1991) found similar impacts from feral cats and the endangered Bahama Parrot (*Amazona bahamensis*).

Feral and free-ranging cats are implicated as significant predators of birds in fragmented chaparral habitats in California. Especially when coyote populations are suppressed (Soule 1988). Local extinctions of Chaparrel-dependant birds is attributed to habitat loss and increased predation from domesticated cats and foxes. Grinnell (1914) identified feral and free-ranging cats as significant threats to bird communities.

Churcher and Lawton (1989) observed 77 well fed free-ranging cats in a Britain village for 1 year. The authors estimated that 30% to 50% of a cat's catch was birds and that the cats had significantly affected house sparrow populations within the village. Based on information acquired in this study, it was estimated that more than 20 million birds are killed by cats in Britain each year. Overall, more than 70 million animals are taken annually.

MAMMALIAN CASE STUDIES

In mainland situations, cats feed most heavily on mammal species; however, birds still make up a significant portion of the diet. Pearson (1971) found that cats were serious predators of California voles and that the greatest pressure on voles occurred when vole numbers were lowest. Liberg (1984) found that cats in southern Sweden fed predominantly on native mammals. Prey use was based more on availability than abundance. Langham (1990) found that mammals made up 74% of diets of New Zealand farmland feral cats; twenty-four percent were birds. In forested areas, feral cats preyed on exotic bird species 5% of the 24% and farmland cats fed only 24 % of 24% by weight. Cats fed most heavily on the most abundant species and groups. A study on a southern Illinois farmstead concluded that well fed cats preferred microtine rodents, however, they also consumed birds (George 1978). Microtine rodents are particularly susceptible to over harvest by cats and other predators (Pearson 1964). Common and Burner (1972) found that small mammals were the primary food item for feral cats in Victoria, Australia. Prey selection was directly related to proximity of cats to human habitation. Pearson (1964) found rodents composed a large portion of a cat's diet.

Fitzgerald (1980) found mammals to be the most important prey in the Orongorongo Valley, on the North Island of New Zealand. Bird and mammalian species preyed on differed seasonally. It is believed that cats in these rural areas may be controlling populations of some exotic species; howe ver the reproductive rate of the exotic mammals at the study site was lower than elsewhere because of the po or habitat. Another experiment in New Zealand involved a low density rabbit population in a relatively poor habitat type (Gibb et al. 1969). Feral cats appeared to be controlling this population of rabbits even with a high rate of reproductive effort.

Childs (1991) and Childs (1986) found that urban/city cats use of rats is size limiting. Few rats of reproductive size or age were preyed on by domesticated cats. In rural areas, rats were more vulnerable to cat predation for longer periods of time. The duration of susceptibility of rats to predation is attributed to abundance of garbage and artificial food sources in the urban/city environment. Artificial feeding of cats also reduces predation to non-native rodents because of size differences in urban rats. In rural

setting, cats can control rat populations for longer durations but ultimate suppression of population growth is achieved via chemicals (poisons). Jackson (1951) found feral and free-ranging cats in Baltimore, Maryland urban areas were insignificant predators of Norway rats (*Rattus norvegicus*). The largest percentage of ingested food was comprised of garbage. It was estimated that a cat in the study area would consume roughly 28 rats per year.

Newsome et al. (1989) found, in a predator-removal experiment in Australia, that predators seldom impact prey populations when environmental conditions are favorable; however, once impacted by external factors and prey numbers drop, predators can suppress and keep prey populations suppressed at low levels.

Corbett (1978) found that feral cats in Scotland were solitary and often territorial; whereas free-ranging cats were social and often lacked territories. This social difference is believed to be a result of prey availability and human association (i.e., food, cover, protection, etc.)

Biologists responsible for the restoration of endangered and threatened animals find it critical to limit the threats associated with predation (Fellers and Drost 1995). More critical to this effort than the impacts of native predators are the threats of non-native predators (i.e., feral cats, rats, etc.) Christian (1975) found that well fed free-ranging cats did not have the same selective factors as native predators. In New Zealand, Fitzgerald et al. (1984) determined that cats were significant predators of the endangered kakapo. Wildlife biologists in the United States have expressed sincere concern over the abundance of feral and free-ranging cats in areas harboring endangered beach mice (Holler 1992; Holliman 1983; Humphrey and Barbour 1981).

Reptiles are thought to provide an important food source when birds and mammals are less abundant, and in some situations cats have been observed to prey on threatened species of reptiles. Domesticated cats (*Felis catus*) and dogs have been identified as significant nest and/or hatchling predators of sea turtles. A study in Aldabra Atoll, Seychelles, found feral cat predation to have a significant impact on green turtle hatchlings. Seabrook (1989) found a positive correlation in cat activity and green turtle nesting at Aldabra Atoll ($r=646$, d.f.=21, $P<0.001$). Cats are known to have contributed to the near extirpation of the West Indian rock iguana (*Cyclura carinata*) on Pine Cay in the Caicos Islands (Iverson 1978).

COMPETITION CASE STUDIES

Impacts from cat predation are not always direct, but indirect in the form of competition for food resources. Hunter (1990) found that cats competed with island avian predators in the sub-Antarctic Marion Island system for avian prey. George (1974) speculated that domestic cats were not a direct limiting factor on bird populations. However, the author did find evidence indicating cats indirectly could effect some birds-of-prey by competing for a limited resource (primarily microtine rodents).

1.1.3 Review of Feral and Free-Ranging Cat Control Measures in Scientific and Popular Literature

In Great Britain, United States of America, Commonwealth of Puerto Rico, and many other countries ownership and responsibility of unlicensed cats and dogs living in the wild state is placed on the person whose property the animal resides (Passanisi and Mcdonald 1990).

> When comparing the merits and deficiencies of extermination with those of neutering, Peter Ablett, Environmental Health Officer (EHO) in Herfordshire (Britain), expressed the view that 'People do not want the nuisance they complain of removed and then

returned in a slightly modified form. By the time someone feels so strongly as to complain to the EHO ...it is a complete and final solution to the nuisance they seek and not its perpetuation..' This quote is in Passanisi and Macdonald (1990).

Over the last several decades cat colonies have been a growing issue on many university campuses (i.e., Stanford University, Florida Atlantic University, etc.). Colonies at universities present a major dilemma because cats are acquired and abandoned on a frequent basis. For example, cats are abandoned during Spring Break, Christmas, other holidays, between semesters, and for 3 consecutive months at the end of a school's fiscal year (Rosenblatt 1992). Students protest the control of these colonies but the colonies are poorly maintained and are often neglected for long periods of time.

Remfry (1985) evaluated the trap, neuter, and release method in Britain. The author found that the colony seldom dies out, it stabilizes to some extent depending on whether the trapping and neutering continues for new cats entering the colony. When cats die or a vacancy is created, other cats move in. This is a continual endeavor as long as there are cat feeders. Many proponents of the TNR approach are under the belief that the extermination of a colony is not probable and the complete control of cat colonies and the concept of "no reproduction" is almost always a failure because of trap shy individual cats (Passanisi and Macdonald 1990). The main reason TNR and TNVR programs are so popular with cat protection groups is that these programs perpetuate the life of a colony, perhaps indefinitely.

Neville (1989) found that neutering cats, as a control method, can be successful depending on the management objective. Neutering does reduce the number of litters born each year, but trapping and neutering must be maintained year to year for new immigrants. The cats' numbers do remain more stable than if left unaltered, but cats may remain on the site indefinitely. In some situations, Neville (1989) realizes that feral and free-ranging cats need to be completely removed from the site. However, most cat colonies are developed with the intention of perpetuating feral and free-ranging cat populations in a non-natural environment.

Several animal welfare groups, such as the Massachusetts Society for the Prevention of Cruelty to Animals (MSPCA), Humane Society of the United States (HSUS), oppose the trap, neuter, vaccinate, and release programs. These groups feel that the cats should be in homes and do not receive the care they need, either emotionally or physically (Maggitti 1989).

Clifton (1992) sampled 17 distinct colonies in Connecticut and found that female cats had higher mortality rates than males. This trend was found in numerous scientific studies and is not easily explained. It is believed that by altering a cat, its life span may be greatly increased, both in the wild and in homes. Additionally, this study also suggests that some degree of protection would be received from rabies and distemper. The study claims that cats are protected from rabies and as a result, humans are too. But the study says nothing about the cats that are not captured and vaccinated, and it is universally known that not all cats are successfully captured every year, thus, not all are vaccinated every year. Vaccinating animals is an annual endeavor.

Matheson (1944) found that cat numbers in Britain were highest in the older and often, more impoverished parts of large cities. Areas of a city with more modern developments generally had fewer cats. The prevalence of cats in certain areas may be related to the economic well-being of such areas and the lack of regulations governing pet ownership or lack-there-of.

Veitch (1985) found that cats could be eradicated from offshore islands of New Zealand. He found that in order to be successful, a variety of methods were often needed to completely rid the islands of cats (Veitch 1983). Methods used ranged from poisoning (compound 1080), introducing feline enteritis into

cat population (biological control), trapping, and shooting. Eradication was the only approach to alleviate cat-caused problems from the islands (i.e., predation). The author found that the use of feline enteritis would be effective only on small island populations that had not previously been effected by the virus. Cat populations on large land masses have this virus cycle through the population periodically creating a level of immunity, thus the virus would not be effective at reducing mainland populations.

Van Rensburg et al. (1987) found that the artificial introduction of feline panleucopaenia to feral cats on Marion Island caused the cat population to drop from 3,409 to 615 over a 5-year period, annual rate of decrease of 29%. After the 5-year period the authors found that the decline was less and on the verge of stabilizing (8% annual decrease). It was concluded that biologic al control could achieve some degree of success, but to eradicate feral cats other methods would be needed.

Domm and Messersmith (1990) used of three differ ent methods to eradicate feral cats from North West Island, Australia. The first attempt used cage traps with little success (8-tra pped cats). The second method involved shooting, using shotguns. Ninety-five cats were removed by this method. The final method involved poisoning with 1080. Poisoning removed the remaining cats; only 2 dead cats were found following baiting. The authors found that low cost eradication of cats is possible in some situations, particularly in small or confined areas.

Remfry (1978) evaluated the efficacy of administering megestrol acetate to prevent oestrus in a feral cat colony in Britain. This process involved feeding cats the right dosage of drug on a weekly basis. The author doubted the practicality of this method for controlling cat rep roduction over long periods of time, mainly because of the diligence required to administer the drug weekly.

Loughborough (1932) states that requiring cats to be licensed does not alleviate all problems associated with feral or free-range cats, but it does instill responsibility in those caring for cats. It is critical that stray cats be treated the same as stray dogs, that is any cat that is found off its owners' property will be pickup by county animal services personnel and held until the owner picks the cat up, the cat is adopted, or the cat is euthanized because of the lack of ownership.

1.2 WILDLIFE SERVICES OBJECTIVES - PUERTO RICO

The need to manage feral and free-ranging cats to resolve human health and safety concerns, nuisance issues, and impacts to native wildlife species in the Commonwealth of Puerto Rico was used by WS, with input from the City of San Juan and the NPS, to define the objectives for the WS program in Puerto Rico. WS' objectives for the management of feral and free-ranging cats in the urban areas of Puerto Rico and for cooperative agreements and agreements for control in rural areas within the Commonwealth of Puerto Rico are to:

- Respond to 100% of the requests for assistance with the appropriate action (technical assistance or direct control) as determined by WS personnel, applying the ADC Decision Model (Slate et al. 1992).

- Reduce and eliminate feral and free-ranging cat populations to the greatest extent possible, on properties with a federal WS operational program.

- Reduce or eliminate human health and safety, and nuisance issues concerning feral and free-ranging cats to the greatest extent possible, on properties with a federal WS operational program.

- Reduce the impact of feral and free-ranging cats on native wildlife species, on properties with a federal WS operational program.

- Live-capture all cats possible, within control areas, before resorting to lethal methods and transfer all live-trapped cats to animal shelters.

- Maintain the lethal take of nontarget animals by WS personnel during damage management to less than 1% of the total animals taken.

1.3 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

ADC Programmatic EIS. WS [formerly known as Animal Damage Control (ADC)] has issued a Final Environmental Impact Statement (FEIS) on the National APHIS/WS program (USDA 1997). Pertinent and current information available in the Final EIS has been incorporated by reference into this EA.

1.4 DECISION TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, is responsible for the scope, content, and decisions made. The City of San Juan and the NPS DOD provided input throughout the EA preparation process to ensure an interdisciplinary approach according to NEPA and agency mandates, policies, and regulations.

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

- Should human health and safety concerns be allowed to continue without a WS feral and free-ranging cat management program?

- Should nuisance cat issues be allowed to continue without a WS feral and free-ranging cat management program?

- Should cat impacts on native wildlife be allowed to continue without a WS feral and free-ranging cat management program?

- If so, how should WS fulfill its legislative responsibilities to protect natural resources and human health and safety in Puerto Rico?

- Would the proposed action have significant impacts requiring an EIS analysis?

1.5 SCOPE OF THIS EA ANALYSIS

Actions Analyzed. This EA evaluates planned feral and free-ranging cat damage management to protect human health and safety, alleviate nuisance issues, and protect native wildlife in the Commonwealth of Puerto Rico. Additional NEPA documentation would be required to conduct wildlife damage management that is outside the scope of this EA, should the need arise.

Period for Which this EA is Valid. This EA would remain valid until WS and other appropriate agencies determine that new needs for action, changed conditions or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be

supplemented pursuant to NEPA. Review of the EA would be conducted each year at the time of the wildlife damage management work planning process by the WS, City of San Juan and the NPS and other appropriate agencies and/or entities to ensure that the EA is sufficient.

Site Specificity. This EA addresses all lands under cooperative agreement, agreement for control, WS Work Plans or other comparable documents in Puerto Rico. These lands are under the jurisdiction of federal, state, county, municipal and private administration/ownership. It also addresses the impacts of feral and free-ranging cat damage management on areas where additional agreements may be signed in the future. Because the proposed action is to reduce feral and free-ranging cat damage and because the program's goals and directives are to provide services when requested, within available funding and workforce, it is conceivable that additional wildlife damage management efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply whenever wildlife damage and resulting management occur, and are treated as such. The standard ADC Decision Model (Slate et al. 1992, USDA 1997) would be the site-specific procedure for individual actions conducted by WS in Puerto Rico.

Summary of Public Involvement. Issues related to the proposed action were initially developed by an interdisciplinary team process involving the City of San Juan and the NPS. A Multi-agency Team of WS, City of San Juan, and the NPS personnel refined these issues, prepared objectives and identified preliminary alternatives.

Potential environmental impacts of the Proposed Action and Alternatives in relation to these issues are discussed in Chapter 4.

As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.6 AUTHORITY AND COMPLIANCE

1.6.1 Authority of Federal Agencies in Wildlife Damage Management in Puerto Rico

Wildlife Services Legislative Mandate - Act of 1931.

The USDA is directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services program is the Act of 1931 (7 U.S.C. 426-426c; 46 Stat. 1468), as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, which 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 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.*"

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

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

U.S. Department of Interior, Fish and Wildlife Service Legislative Mandate.

The U. S. Fish and Wildlife Service's (USFWS) authority for action is based on the Migratory Bird Treaty Act of 1918 (as amended), which implements treaties with the United States, Great Britain (for Canada), the United Mexican States, Japan, and the Soviet Union. Section 3 of this Act authorized the Secretary of Agriculture:

"From time to time, having due regard to the zones of temperature and distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the convention to allow hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President".

The authority of the Secretary of Agriculture with respect to the Migratory Bird Treaty was transferred to the Secretary of the Interior in 1939 pursuant to Reorganization Plan No. II. Section 4(f), 4 Fed. Reg. 2731, 53 Stat. 1433.

> **CFR 50 Subchapter C - The National Wildlife Refuge System - Part 30 - Feral Animals - Subpart B-30.11 - Control of feral animals**. (a) Feral animals, including horses, burros, cattle, swine, sheep, goats, reindeer, dogs, and cats, without ownership that have reverted to the wild from a domestic state may be taken by authorized Federal or state personnel or by private persons operating under permit in accordance with applicable provisions of Federal or State law or regulation.

U.S. Department of Interior, National Park Service Legislative Mandate.

The primary statutory authority for the National Park Service is provided in the *National Park Service Organic Act of 1916*. Through this act, Congress established the National Park Service and mandated that it "shall promote and regulate the use of the federal areas known as national parks, monuments, and reservations...by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of

future generations." The Organic Act authorizes the Secretary to promulgate rules and regulations necessary for the management of the parks. This authority, among others, provides the basis for the regulations in 36 CFR 1.

Endangered, Threatened, and Rare Species Management. The National Park Service. *Management Policies* 2000, Section 4.4.2.3 Management of Threatened or Endangered Plants and Animals, page 35, prescribes management of endangered, threatened, and candidate species and states that:

"The Service will fully meet its obligations under the NPS Organic Act and the Endangered Species to both pro-actively conserve listed species and prevent detrimental effects on these species. To meet these obligations, the Service will...Undertake active management programs to ...control detrimental non-native species...

The Service will determine all management actions for the protection and perpetuation of federally, state, or locally listed species through the park management planning process, and will include consultation with lead federal and state agencies as appropriate."

Exotic Species Management. **National Park Service *Management Policies* 2001** addresses exotic species management on page 37 in **Section 4.4.4.1 Introduction or Maintenance of Exotic Species** where it states that: "In general, new exotic species will not be introduced or maintained to meet specific, identified management needs when all feasible and prudent measures to minimize the risk of harm have been taken...

Furthermore, **Section 4.4.4.2 Removal of Exotic Species Already Present** states that: "All exotic plant and animal species that are not maintained to meet an identified park purpose will be managed - up to and including eradication - if (1) control is prudent and feasible, and (2) the exotic species:

- Interferes with natural processes and the perpetuation of natural features, native species or natural habitats; or
- Disrupts the genetic integrity of native species; or
- Disrupts the accurate presentation of a cultural landscape; or
- Damages cultural resources; or Significantly hampers the management of park or adjacent lands; or
- Poses a public health hazard as advised the U.S. Public Health Service (which includes the Centers for Disease Control and the NPS Public Health Program); or
- Creates a hazard to public safety."

Department of the Navy - Policy Letter Preventing Feral Cat and Dog Populations On Navy Property (5090, Ser N456M/1U595820, 10 Jan 2002).

Reference Regulations:

(a) SECNAVINST 6401-1a, of 16 AUG 94, Veterinary Health Services
(b) AFPMB TIM #37, Guidelines for Reducing Feral/Stray Cat Populations on Military Installations in the United States
(c) OPNAVINST 6250.4B, dtd 276 Aug. 1998, Pest Management Programs
(d) Executive Order 13112 of 3 Feb 1999, Invasive Species

1. This letter clarifies the application of reference (a) regarding the prevention of free roaming (also called wild, feral or stray) cat and dog populations on Navy installations. The objective is to prevent injury or disease to Navy personnel, and eliminate adverse impacts on native wildlife. It requires Navy commands to institute pro-active pet management procedures in order to prevent establishment of free roaming cat and dog populations. Free roaming cats and dogs pose a potential public health threat to wildlife including endangered species and migratory birds.

2. Existing policy at Paragraph 4-2c(4) of reference (a) states "Dogs, cats, and other privately-owned or stray animals will not be permitted to run at large on military reservations." Consistent with this policy, Navy commands must ensure the humane capture and removal of free roaming cats and dogs. Consistent with this requirement , Trap/Neuter/Release (TNR) programs will no longer be established on Navy land. All existing TNR programs on Navy land must be terminated no later than 1 January 2003.

3. Responsible pet ownership is a key factor in eliminating free roaming cat and dog populations. In consultation with supporting Army Veterinary Office, installations shall implement appropriate pet management measures to preclude establishment of feral cat/dog populations, including, but not limited to the following:

Require installation residents to keep and feed pet animals indoors or under close supervision when outdoors (such as on leash and collar or other physical control device - cage, fenced yard etc.).

Encourage neutering or spaying of cats and dogs before they reach reproductive age (exceptions to this policy can be made on a case by case basis as determined by the Installation Commander).

Require routine vaccinations of cats and dogs for rabies and other diseases as required by federal, state and local laws and ord(i)nances. A current vaccination record is required at time of registration of pets.

Require microchipping registration (or other system of pet identification approved by supporting veterinary office) of all pet cats and dogs brought onto installations. Installation residents must register cats and dogs and have pets wear registration or identification tags at all times.

Prohibit the feeding of feral animals on the installation.

Provide educational materials to pet owners regarding installation regulations and general pet management.

Enforce prohibition of abandonment of animals on installations.

Comply with all humane and animal control regulations at the federal, state and local level (and their equivalents in host nation countries).

4. Effective prevention, management and elimination of feral cat and dog populations requires close coordination and cooperation between natural resources, pest management, security, veterinary, and housing personnel to develop and implement an effective and humane program.

Reference (b) provides information for preventing free roaming cat populations on military installations. General pest management guidelines are detailed in reference (c). Every effort should be made to work with other federal, state and local agencies to support reference (a) and reference (d) by eliminating free roaming cat and dog populations on Navy land. Navy commands should work with local animal control agencies to determine the best approach for the ultimate disposition of the captured animals. Every effort should be made, if pract ical, to find homes for adoptable feral cats and dogs.

U.S. Air Force - Policy Directive (AFPD) 32-70, Environmental Quality, and Department of Defense Instruction (DODI) 4715.3, Environmental Conservation Program.

> **Fish and Wildlife Management Component Plans (6.1.).** The fish and wildlife management component plan in the INRMP (Integrated Natural Resources Management Plan) addresses the management of game and nongame species on an installation.....
>
> Category I installations shall develop a fish and wildlife management component plan to the INRMP. To comply with the Sikes Act (16 USC 67 a-1[b]), United States military reservations must use professionally trained fish and wildlife management personnel to develop, implement, and enforce their fish and wildlife management programs (6.1.2.).
>
> **Hunting, Fishing, and Trapping Programs (6.3.).** If practical, develop hunting, fishing, and trapping programs for recreation and wildlife population control.... The Sikes Act stipulates that these fees be used on the installation where they are collected, and must be used for the protection, conservation, and management of fish and wildlife, including habitat improvement and related activities.....
>
> **Wildlife Damage Control (6.6.).** MAJCOMs (Major Commands) authorize emergency control measures only when wildlife endangers installation operations or the public health. The Animal and Plant Health Inspection Service (APHIS), the USFWS, and the state fish and wildlife agency should be notified as soon as practicable (6.6.2.).
>
> **Regulatory Basis (7.1.).** The Endangered Species Act (Public Law 93-205) requires protection and conservation of federally listed T/E plants and animals and their habitats. Installations that know that they have T/E species or habitat critical for such species must include a T/E species component plan in the INRMP. An installation's overall ecosystem management strategy must provide for the protection and recovery of T/E species.
>
> When practical, give the same protection to candidate species that you do for species that are already listed. Although the Endangered Species Act does not require it, give the same protection to state-listed T/E or rare species when practical (7.1.1.).

1.6.2 Compliance with Other Federal and Commonwealth of Puerto Rico Laws, Rules, and Regulations

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

Commonwealth of Puerto Rico

Law

To add Articles 2, 3, 4, and 5 to law Num. 24 of March 7, 1912, amended, to require, as prerequisite to the adoption of dogs and cats obtained in an animal shelter, the sterilization of the same; to establish a special fund to educate on subject, and other means.

Exposure Of Motives

The population of stray dogs and cats, continues to increase dramatically in Puerto Rico. The current programs and mechanisms used to control population of such are inadequate.

Part of the problem in the overpopulation of dogs and cats is attributed to people whom acquire pets, lose control over them, allowing them to go stray. The reproduction without control of these animals worsens the situation in Puerto Rico.

While animal shelters have the intention of finding homes where these animals can be properly cared for, the Legislature understands that the responsibility towards pets commences before the adoption process is initiated. (Hence, this law requires that animal shelters do not give away or sell cats or dogs for adoption without prior sterilization). The animal shelter must provide a written certification that the animal has been sterilized*, at the time of adoption. On the other hand, it is forbidden that anyone receive a cat or dog from a shelter without a certificate of sterilization.

Therefore, the Legislature states that the person performing the adoption must cover the sterilization costs. Hence, shelters are authorized to recover the costs for sterilization required by law, from the person(s) adopting the dogs or cats already sterilized.

Finally, the Legislature understands that education on subject, on the log run, is the indicated means to decrease the over population of cats and dogs in Puerto Rico. For this purpose, the Legislature creates a special fund named "Funds for the Education for the Reproductive Control of Animals", with the purpose to pay for expenses for public education, at the elementary level, as well as similar programs directed to the general public. The responsibility to utilize these funds falls under the Secretary of Health and Education. Collections from fines imposed to people whom violate this law will be credited to this fund.

Law 36 - To provide the establishment and operations of animal shelters in the Common Wealth of Puerto Rico.

Law

To provide the establishment and operations of Regional Animal Shelters in the Commonwealth of Puerto Rico.

Exposure of Motives

The purpose of the present measure is to exercise the necessary control in the animal population in Puerto Rico, by establishing Regional Animal Shelters for all jurisdictions and towns of the

Commonwealth of Puerto Rico. Said shelters will function as adoption centers and as low cost sterilization clinics for animals. This will offer the interested community and lovers of animals an adequate place to obtain a pet that will meet the health requirements desired, at the same time it offers the animal the opportunity to find a home surrounded in an environment of love and family. The services of these shelters will also provide attention to pets, throughout the different sites.

The Regional Shelters will emphasize the nativity control in animals with the object to help reduce the grave problem of over population of animals existing in the country. In this manner, the number of animals available for adoption will be better balanced with the number of homes willing to adopt. Clearly, the problem of animal overpopulation cannot be resolved by picking up all stray or sick animals from the streets, while the owners allow free reproduction of the same and get rid of those they do not wish to keep. Besides the situation it creates in the communities, it is unjust and cruel to animals to allow them to be born then sacrifice them.

Undoubtedly, before the aforementioned situation, it is far better to develop a program of shelters for animals as indicated in the present Law.

National Environmental Policy Act (NEPA).

Environmental documents pursuant to NEPA must be completed before work plans consistent with the NEPA decision can be implemented. WS also coordinates specific projects and programs with other agencies. The purpose of these contacts is to coordinate any wildlife damage management that may affect resources managed by these agencies or affect other areas of mutual concern.

Endangered Species Act (ESA).

It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act [Sec. 7(a)(1)]. WS conducts Section 7 consultations with the FWS to use the expertise of the FWS 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)].

Migratory Bird Treaty Act (MBTA).

The MBTA provides the USFWS regulatory authority to protect species of birds that migrate outside the United States. The law prohibits any "take" of the species, except as permitted by the USFWS or by federal agencies within the scope of their authority; therefore the USFWS issues permits for managing wildlife damage situations.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The United States Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA.

Investigational New Animal Drug (INAD).

The Food and Drug Administration (FDA) grants permission to use investigational new animal drugs [21 Code of Federal Regulations (CFR), Part 511].

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

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

WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by APHIS-WS are regulated by the EPA through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), FDA, FDACS, Memorandum Of Understanding (MOU) with Federal natural resource 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 to target individuals or populations, 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.

National Historic Preservation Act (NHPA) of 1966. As amended.

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires 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 will be conducted only at the tribe's request and under signed agreement; thus, the tribes will have control over any potential conflict with cultural resources on tribal properties.

Each of the WDM methods described in this EA 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 hist oric properties. Therefore, the methods that would be used by WS under the proposed action are not 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 an alternative selected as a result of a decision on this EA, then site-specific consultation are required by Section 106 of the NHPA would be conducted as necessary.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

Children may suffer disproportionately from environmnetal health and safety risks for many reasons. Wildlife damage management as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that childlren would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

1.7 A PREVIEW OF THE REMAINING CHAPTERS IN THIS EA

This EA is composed of five chapters and two appendices. Chapter 2 discusses and analyzes the issues and affected environment. Chapter 3 contains a description of each alternative, alternatives not considered in detail, and mitigation and SOPs. Chapter 4 analyzes the environmental impacts associated with each alternative considered in detail. Chapter 5 contains the list of preparers of this EA. Appendix A is the literature cited in the EA and Appendix B is the glossary of the EA.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

INTRODUCTION

Chapter 2 contains a discussion of the issues, including those that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), and those that were used to develop mitigation measures and SOPs, and the issues that will not be considered in detail with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4.

Issues are concerns of the public and/or of professional communities about potential environmental problems that might occur from a proposed federal action. Such issues must be considered in the NEPA decision process. Issues relating to the management of wildlife damage were raised during the scoping process in preparing the programmatic WS FEIS (USDA 1997) and were considered in the preparation of this EA. These issues are fully evaluated within the FEIS, which analyzed specific data relevant to the WS Program in Puerto Rico.

2.1 AFFECTED ENVIRONMENT

The areas of the proposed action include urban and rural areas where free-ranging and feral cat problems are of concern to landowners, city managers, and/or resource managers. Control areas may include federal, state, county, city, private, or other lands, where WS assistance has been requested by a landowner or manager to control feral and free-ranging cat to protect human health and safety, alleviate nuisance issues, and reduce impacts to wildlife species. The control areas would also include property in or adjacent to identified sites where feral and free-ranging cat activities posed a threat to human health and safety. Feral and free-ranging cat damage control would be conducted when requested by a landowner or manager, and only on properties with a Cooperative Agreement with Wildlife Services.

2.2 ISSUES ADDRESSED IN DETAIL IN CHAPTER 4

Following are issues that have been identified as areas of concern requiring consideration in this EA.

- Effects of Feral and Free-Ranging Cats on Human Health and Safety, and Native Wildlife
- Effects on Target Species Populations
- Effects of Control Methods on Nontarget Species Populations, Including T&E Species
- Humaneness of Control Methods
- Effects of Control Methods on Human Health and Safety
- Effects on the Aesthetic Values of Targeted Species and Protected T&E Species

2.2.1 Effects of Feral and Free-Ranging Cats on Human Health and Safety, and Native Wildlife

Some people are concerned about the threats to human health and safety created by feral and free-ranging cat populations in urban and rural areas, and other people are concerned with the cats' impacts on native wildlife within the Commonwealth of Puerto Rico, especially Endangered, Threatened, Species of Special Concern (T&E). These publics are concerned as to

whether the proposed action or any of the alternatives would reduce such damage, as described, to acceptable levels.

2.2.2 Effects on Target Species Populations

Some persons are concerned that the proposed action or any of the alternatives would result in the loss of local feral and free-ranging cat populations or could have a cumulative adverse impact on island wide populations. Furthermore, some persons are concerned that the proposed action or any of the alternatives would result in adverse impacts to properly licensed and kept house cats.

Based on the best information available and the species proposed for control work, WS does not anticipate that its limited program will significantly effect any species, regional population, island wide population, or effect species populations on adjoining islands (no significant cumulative impact) under any of the alternatives. The species proposed for control is of domesticated origin, non-migratory, and considered common to abundant; in many urban areas feral and free-ranging cat numbers are great enough to create a nuisance and health hazard. On an annual basis, it is anticipated that WS would live capture and transport to local animal shelters, no more than 500 feral and free-ranging cats; annually, the lethal removal of feral and free-ranging cats, by WS, should not exceed twenty-five percent of all cats slated for removal. It is possible that WS control operations may temporarily increase the health of target species and increase long-term health of indoor cat populations in the localized work areas.

2.2.3 Effects of Control Methods on Nontarget Species Populations, Including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the potential for control methods used in the proposed action or any of the alternatives to inadvertently capture or remove nontarget animals or potentially cause adverse impacts to nontarget species populations, particularly T&E species and indoor pets. WS's mitigation and SOPs are designed to reduce the effects on nontarget species' populations and are presented in Chapter 3. To reduce the risks of adverse affects to nontarget species, WS would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of capturing nontarget species. Before initiating trapping, WS would select trapping locations which are extensively used by the target species and use baits or lures which are preferred by the target species.

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mit igation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of WDM methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997, Appendix F). WS is also in the process of reinit iating Section 7 consultation at the program level to assure that potential effects on T& E species have been adequately addressed.

WS has reviewed the list of T&E species for Puerto Rico has determined that WS WDM activities will not likely adversely affect any species protected by the Puerto Rican Government or the United States Endangered Species Act. This determination was concurred with by the

Puerto Rican government (C. Maysonet-Negrón, Dept. of Natural and Environmental Resources, Administrator) and the USFWS (D. Flemming, USFWS, Ecological Services).

The following species are listed by the USFWS as endangered or threatened in the Common Wealth of Puerto Rico:
Puerto Rico (75 listings)

E=Endangered T=Threatened

Animals -- 26

E	Anole, Culebra Island giant (*Anolis roosevelti*)
E	Blackbird, yellow-shouldered (*Agelaius xanthomus*)
T	Boa, Mona (*Epicrates monensis monensis*)
E	Boa, Puerto Rican (*Epicrates inornatus*)
E	Boa, Virgin Islands tree (*Epicrates monensis granti*)
T	Coqui, golden (*Eleutherodactylus jasperi*)
E	Gecko, Monito (*Sphaerodactylus micropithecus*)
T	Guajon (*Eleutherodactylus cooki*)
E	Hawk, Puerto Rican broad-winged (*Buteo platypterus brunnescens*)
E	Hawk, Puerto Rican sharp-shinned (*Accipiter striatus venator*)
T	Iguana, Mona ground (*Cyclura stejnegeri*)
E	Manatee, West Indian (*Trichechus manatus*)
E	Nightjar, Puerto Rican (*Caprimulgus noctitherus*)
E	Parrot, Puerto Rican (*Amazona vittata*)
E	Pelican, brown (*Pelecanus occidentalis*)
E	Pigeon, Puerto Rican plain (*Columba inornata wetmorei*)
T	Plover, piping (*Charadrius melodus*)
T	Sea turtle, green (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Seal, Caribbean monk (*Monachus tropicalis*)
T	Tern, roseate (*Sterna dougallii dougallii*)
T	Toad, Puerto Rican crested (*Peltophryne lemur*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, sperm (*Physeter catodon* (=macrocephalus))

Plants -- 49

E	Adiantum vivesii (No common name)
E	Aristida chaseae (No common name)
E	Pelos del diablo (*Aristida portoricensis*)
E	Auerodendron pauciflorum (No common name)
E	Palo de ramon (*Banara vanderbiltii*)
E	Boxwood, Vahl's (*Buxus vahlii*)
E	Capa rosa (*Callicarpa ampla*)
E	Calyptranthes thomasiana (No common name)
T	Manaca, palma de (*Calyptronoma rivalis*)

E	Catesbaea melanocarpa (No common name)
E	Chamaecrista glandulosa var. mirabilis (No common name)
E	Cordia bellonis (No common name)
E	Palo de nigua (*Cornutia obovata*)
E	Cranichis ricartii (No common name)
E	Higuero de sierra (*Crescentia portoricensis*)
E	Fern, Elfin tree (*Cyathea dryopteroides*)
E	Daphnopsis hellerana (No common name)
E	Elaphoglossum serpens (No common name)
E	Uvillo (*Eugenia haematocarpa*)
E	Eugenia woodburyana (No common name)
T	Gesneria pauciflora (No common name)
E	Goetzea, beautiful (*Goetzea elegans*)
T	Higo, chumbo (*Harrisia portoricensis*)
E	Holly, Cook's (*Ilex cookii*)
E	Ilex sintenisii (No common name)
E	Walnut, West Indian or nogal (*Juglans jamaicensis*)
E	Lepanthes eltoroensis (No common name)
E	Leptocereus grantianus (No common name)
E	Lyonia truncata var. proctorii (No common name)
E	Mitracarpus maxwelliae (No common name)
E	Mitracarpus polycladus (No common name)
E	Myrcia paganii (No common name)
E	Palo de rosa (Ottoschulzia rhodoxylon)
E	Peperomia, Wheeler's (Peperomia wheeleri)
E	Chupacallos (Pleodendron macranthum)
E	Polystichum calderonense (No common name)
T	Schoepfia arenaria (No common name)
E	Erubia (Solanum drymophilum)
T	Cobana negra (Stahlia monosperma)
E	Palo de jazmin (Styrax portoricensis)
E	Tectaria estremerana (No common name)
E	Palo colorado (Ternstroemia luquillensis)
E	Ternstroemia subsessilis (No common name)
E	Thelypteris inabonensis (No common name)
E	Thelypteris verecunda (No common name)
E	Thelypteris yaucoensis (No common name)
E	Bariaco (Trichilia triacantha)
E	Vernonia proctorii (No common name)
E	Prickly-ash, St. Thomas (Zanthoxylum thomasianum)

2.2.4 Humaneness of Control Techniques

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important, but very complex concept that can be interpreted in a variety of ways. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. Animal welfare organizations are concerned that some methods used to manage wildlife damage expose animals to unnecessary pain and suffering. Research suggests that with some methods, such as restraint in leghold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that

had been chased by dogs for about five minutes as those restrained in traps (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

The decision making process involves tradeoffs between managing damage and the aspect of humaneness. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology, yet provide sufficient damage management to resolve problems.

WS has improved the selectivity of management devices through research and development such as pan tension devices for traps and breakaway snares. Research is continuing to bring new findings and products into practical use. Until such time as new findings and products are found to be practical, a certain amount of alleged animal suffering will occur if management objectives are to be met in those situations where nonlethal control methods are not practical.

WS personnel in Puerto Rico are experienced and professional in their use of management methods. Consequently, control methods are implemented in the most humane manner possible under the constraints of current technology. Mitigation measures and SOPs used to maximize humaneness are listed in Chapter 3.

2.2.5 Effects of Control Methods on Human Health and Safety

A common concern is whether the proposed action or any of the alternatives pose an increased threat to human health and safety. Specifically, there is concern that the lethal methods potentially used in feral and free-ranging cat removal (i.e., shooting) may be hazardous to humans.

Firearm use in wildlife damage control can be a publicly sensitive issue. Safety issues related to the misuse of firearms and the potential human hazards associated with firearms use are concerns both to the public and WS. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees who use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. Additionally, WS runs thorough background checks on all new employees entering the agency and the WS Program conducts annual firearms training for its personnel.

2.2.6 Effects on the Aesthetic Values of Targeted Species and Protected T&E Species

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American and International public shares a similar bond with animals and/or wildlife in general, and in modern societies a large percentage of households have indoor or outdoor pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal

attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

There is some concern that the proposed action or the alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale, etc.), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing, etc.), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems [e.g., ecological, existence, bequest values (Bishop 1987)]. Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using parts of or the entire animal) or non-consumptive use [viewing the animal in nature or in a zoo, photography (Decker and Goff 1987)]. Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Some people have an idealistic view of wildlife and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to wildlife damage management want WS to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

WS only conducts feral and free-ranging cat damage management at the request of the affected property owner or resource manager. If WS received requests from an individual or official for feral and free-ranging cat damage management, WS would address the issues/concerns and consideration would be given as to the extent of WS involvement. Management actions would be carried out in a caring, humane, and professional manner.

2.3 ISSUES USED TO DEVELOP MITIGATION

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

Environmental Justice (EJ) is a movement promoting the fair treatment of all races, income, and culture with respect to the development, implementation, and enforcement of environmental

laws, regulations, and policies. Fair treatment implies that no person or group of people should endure a disproportionate share of the negative environmental impacts resulting either directly or indirectly from the activities conducted to execute this country's domestic and foreign policies or programs. EJ 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. (The EJ movement is also known as Environmental Equity -- which is the equal treatment of all individuals, groups or communities regardless of race, ethnicity, or economic status, from environmental hazards).

Environmental Justice is a priority both within the USDA/APHIS and WS. Executive Order 12898 requires federal agencies to make EJ part of their mission, and to identify and address disproportionately high 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. APHIS-WS developed a strategy that: 1) identifies major programs and areas of emphasis to meet the intent of the Executive Order, 2) minimize any adverse effects on the human health and environment of minorities and low-income persons or populations, and 3) carries out the APHIS mission. To that end, APHIS operates according to the following principles: 1) promote outreach and partnerships with all stakeholders, 2) identify the impacts of APHIS activities on minority and low-income populations, 3) streamline government, 4) improve the day-to-day operations, and 5) foster nondiscrimination in APHIS programs. In addition, APHIS plans to implement Executive Order 12898 through its compliance with the provisions of NEPA.

All APHIS-WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure EJ. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by APHIS-WS are regulated by the EPA through FIFRA, by MOUs with federal natural resource management agencies, and program directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used following label directions, they are selective to target individuals or populations and such use has negligible impacts on the environment (USDA 1997, Appendix P). The APHIS-WS operational program, discussed in this document, 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 or low-income persons or populations.

2.3.2 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045).

WS prioritizes the identification and assessment of environmental health and safety risks that may disproportionately affect children. Children may suffer disproportionately from environmental health and safety risks for many reasons, including their physical and mental status. WS has concluded that the proposed management program would not create an environmental health or safety risks to children because the program would only make use of legally available and approved damage management methods applied where such methods are highly unlikely to adversely affect children.

2.4 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

2.4.1 Legal Constraints on Implementation of Control.

WS is required to follow and adhere to all federal and state regulations. The methods proposed for use in feral and free-ranging cat damage management are all permitted by federal and state laws, or the appropriate exemptions/permits will be obtained.

2.4.2 Cost Effectiveness of Control Methods.

The methods determined to be most effective in controlling feral and free-ranging cat damage and proven to be most cost effective will receive the greatest application. Additionally, control operations may be constrained by cooperator monies and/or objectives and needs.

CHAPTER 3 : ALTERNATIVES

INTRODUCTION

Alternatives were developed for consideration using the ADC Decision Model as described in Chapter 2 (pages 20-35), Appendix J (Methods of Control), Appendix N (Examples of ADC Decision Model), and Appendix P (Risk Assessment of Wildlife Damage Control Methods Used by the USDA, Wildlife Services Program) of the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997).

Chapter 3 contains a discussion of the project alternatives, including those that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), and alternatives considered but not analyzed in detail, with rationale, and mitigation measures and SOPs for wildlife damage management techniques (WDM). Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Evaluation of the affected environments will be addressed in more detail in Chapter 4.

ALTERNATIVES ANALYZED IN DETAIL

Alternative 1 - No Action - This alternative precludes any and all WDM activities by WS to protect human health and safety, alleviate nuisance issues, and protect native wildlife species from impacts associated with feral and free-ranging cat populations in the Commonwealth of Puerto Rico.

Alternative 2 - Nonlethal Control Before Lethal Control - This alternative would not allow the use of lethal control by WS until all available nonlethal methods had been applied and determined to be inadequate in each damage situation.

Alternative 3 - Nonlethal Control Only - This alternative would involve the use of nonlethal management techniques only by WS.

Alternative 4 - Lethal Control Only - This alternative would involve the use of lethal management techniques only by WS.

Alternative 5 - Integrated Wildlife Damage Management (the Proposed Action) - This alternative would incorporate an integrated approach to wildlife damage management using components of the wildlife damage management techniques and methods addressed in Alternatives 2, 3, and 4, as deemed appropriate by WS and other participating entities.

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 Alternative 1 - No Action

This alternative precludes any and all WDM activities by WS to protect human health and safety, alleviate nuisance issues, and protect native wildlife species from impacts of feral and free-ranging cats in the Commonwealth of Puerto Rico. A city and/or natural resource manager or any other public or private entity directed at preventing or reducing the impacts of feral and free-ranging cats on human health and safety and native wildlife species could conduct WDM practices in the absence of WS involvement.

3.1.2 Alternative 2 - Nonlethal Control Before Lethal Control

This Alternative would require that all methods or techniques described on 3.1.3 be applied and determined to be inadequate in each damage situation prior to the implementation of any of the methods or techniques described in 3.1.4. This would be the case regardless of the severity or intensity of hazards and concerns associated with feral and free-ranging cat populations on the resources proposed for protection in this EA.

3.1.3 Alternative 3 - Nonlethal Control Only

Exclusion devises, trap-neuter-vaccinate-release (TNVR), and relocation of feral and free-ranging cats are the only nonlethal control methods currently available for use to protect affected resources in Puerto Rico. Trap-neuter-vaccinate-release and relocation of feral and free-ranging cats would not be carried out by WS for the reasons described in Section 3.2.1.

Nonlethal frightening devises have been determined to be unacceptable for use in any of the Alternatives. Frightening devises involving the use of electronic guards, pyrotechnics, propane cannons, and lights could potentially be used for temporary relief of feral and free-ranging cats; however, feral and free-ranging cats often become acclimated to such methods fairly rapidly and the use of these devices have the potential of adversely affecting humans and wildlife species needing protection. A detailed description of why frightening devices are not being considered in detail in this EA is found in Section 3.2.2.

Ws involvement in management strategies involving nonlethal methods would be limited to exclusion of feral and free-ranging cats from buildings and other man-made structures.

Exclusion

Exclusion devices are applicable for use on buildings and other man-made structures only. They are not feasible nor effective for protecting humans or wildlife species from fera l and free-ranging cats in urban or rural environments in this EA. This alternative would be used to deter cats from using man-made structures for shelter and kitten rearing. Exclusion could be achieved by use of wire-meshed materials to cover holes or other openings in buildings or other structures, or any other building material commonly used to seal holes etc.

If any of the above exclusion devices are to be employed, it would be the responsibility of the city and/or natural resource manager or landowner to do so.

Live Trapping/Relocation of Feral and Free-ranging Cats to an Animal Shelter Facility

Live trapping and relocation of feral and free-ranging cats could be accomplished by the use of walk-in cage traps, leghold traps, or snares. These control devices are described in detail in Section 3.1.4. Cats would be taken to the nearest animal shelter facility a nd would not, under any circumstance, be released by WS personnel back into the wild.

3.1.4 Alternative 4 - Lethal Control Only

This alternative would allow the lethal removal of feral and free-ranging cats that pose a health and safety threat to humans, creating a nuisance, and those posing a predation threats to native

wildlife. Lethal control methods would be applied in all areas of control operations. Feral and free-ranging cats would be euthanized on site in a humane manner utilizing AMVA approved methods (Beaver et al. 2001) and WS SOP's. Deceased animals would be buried or taken to a landfill, in accordance with WS policy and State Regulations. Unharmed and uninjured nontarget animals that could be safely handled, would be released on site.

Lethal methods of wildlife control are often very effective when used properly. Specific problem animals can be targeted and removed without negatively affecting the local population of a species (Bailey 1984). All control measures would be implemented in accordance with applicable Federal and Commonwealth laws, and WS policy. Weather and environmental conditions permitting, all field equipment would be checked at least once each day. If daily checking is not possible, all control equipment would be removed from the site. Population reduction of feral and free-ranging cats would be implemented by WS personnel with assistance from the participating city and/or natural resource managers or landowners. Target animals would be lethally removed using the methods and techniques listed below.

a. Ground Shooting - This method would be used to selectively remove feral and free-ranging cats. Most shooting would be done in conjunction with night spotlighting or predator calling utilizing shotguns or rifles. Opportunistic shooting of target animals would occur in areas away from public use areas or during times when the public would not be present. This alternative would only be used in areas and at times which are deemed safe.

b. Leghold Traps - This method would be used to capture and restrain target animals. Leghold traps, of the appropriate size and type, would be utilized to capture specific target animals. Leghold traps are a versatile and widely used control method. Placement of these traps is contingent upon the habits of the respective target species, habitat conditions, and presence of nontarget animals. Traps would be set in areas of high predator activity, including but not limited to pathways and watering holes. Traps could be placed as "baited" or "scented" sets, using an attractant consisting of fetid food, urine, or musk to attract the target animal to the trap location.

Opposition to the use of leghold traps has increased in recent years due to public concern that the leghold trap inflicts unacceptable injuries to trapped animals. Research on the No. 3 Victor Soft Catch leghold trap has demonstrated that coyotes can be successfully captured while producing only minor leg injuries (Phillips et al. 1996). Recent research comparing leg injuries associated with standard and modified Soft Catch leghold traps indicates that the addition of a "taos lightning" spring kit can further reduce injuries to captured animals and increase capture efficiency (Gruver et al. 1996). Soft Catch leghold traps modified with "taos lightening" springs kits may be used in some situations. Additionally, padded-jawed leghold traps may also be used to capture and restrain target species, however, WS will not limit trapping efforts to these devices.

c. Walk-in Cage Traps - This method would be used as the primary capture device for feral and free-ranging cats. These traps would be set in areas where leghold traps could not be used, or when it was deemed more efficient to use them. Placement of walk-in cage traps is contingent upon the habits of the respective target species, habitat conditions, and presence of nontarget animals. Traps placed in travel lanes of the target animal, using location rather than attractants, are known as "blind sets". More

frequently, traps are placed as "baited" or "scented" sets, using an attractant consisting of fetid food, urine, or musk to attract the animal into the trap. Most feral/free-ranging cats would be trapped using these devices.

d. Snares - Snares are capture devices comprised of a cable loop and a locking device. Most snares are equipped with a swivel to minimize cable twisting and breakage. Snares can be set as either lethal or live-capture devices. Neck snares are designed to tighten around an animal's neck as it passes through the device. Leg snares are live-capture devices meant to restrain the animal by tightening around the leg. Snares would be used as live-capture devices in narrow passageways and along well used predator pathways. Lethal snares would not be set to catch cats; however, live-capture snares may be used. Neck snares used in association with this project would incorporate break away locks.

e. Denning - Denning is the practice of seeking out the dens of depredating animals and eliminating the young, adults, or both to stop ongoing damage or alleviate health and safety problems. Denning would be used when appropriate and in specific cases where it has been determined necessary for alleviating a specific threat.

The usefulness of denning, as a wildlife damage management method, is well known (Till and Knowlton 1983). However, it's use is limited because cat dens are difficult to locate and access. When the adults are taken and the den site is known, the kittens are excavated and euthanized to prevent their starvation.

3.1.5 Alternative 5 - Integrated Wildlife Damage Management (Proposed Action)

This alternative, the proposed action, would incorporate an integrated damage management program utilizing techniques and methods described in Alternatives 2, 3, and 4 to reduce the threat to human health and safety and nuisance issues from feral and free-ranging cats. The integrated damage management program would also be effective in reducing predation of feral and free-ranging cats on native wildlife. This strategy would incorporate the nonlethal and lethal control measures described in 3.1.3 and 3.1.4.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

3.2.1 Trap, Neuter, and Release (TNR) or Trap, Neuter, Vaccinate, and Release (TNVR) Alternative

This topic has undergone considerable debate in animal welfare and scientific communities for a number of years. Two main questions or viewpoints dominate this debate: 1) Does trap-neuter-release work in controlling cat populations over the long run or even the short run? and 2) Does TNR programs address or alleviate problems (i.e., diseases) created by cat colonies?

Trap, neuter, and release programs have been going on for decades in Britain and Europe. Today, feral and free-ranging cats are causing the same problems they were causing ten years ago. Cat colonies have not died out or reduced in size, many continue to increase. Common consensus is that some cat colonies stabilize, but never come close to extinction. Many of these colonies would not survive if it were not for the supplemental feeding by humans in some areas (Smith and Shane 1986). So the problem with wildlife and human health issues have not been resolved by the TNR philosophy.

The National Association of State Public Health Veterinarians and the American Veterinarians Medical Association oppose TNR programs based on health concerns and threats (JAVMA 1996). First, diseases and parasites transmitted by cats to humans including ringworm, bartonellosis, larval migrans, cat scratch fever, toxoplasmosis, and vector-borne zoonotic diseases are not controlled in colony situations. Second, rabies is a major concern because cats are the number one domesticated species testing positive for rabies in the United States and other species commonly infected by the disease are also attracted to feeding stations in cat colonies .

As a result of the prevalent and perpetual threat to human health and safety created by TNR programs (cat colonies) and the continued threat to threatened and endangered wildlife and native wildlife in general, WS will not consider this issue further or be a participant of TNR programs in Puerto Rico.

3.2.2 Frightening Devices Alternative

Frightening devices such as electronic guards, pyrotechnics, propane cannons, and lights can be used to temporarily alleviate some animals' activity. The effectiveness of these devices depends upon the individual animal's fear of, and subsequent aversion to the offensive stimuli. Once an animal habituates to these stimuli, it often resumes its normal activities and movements.

The continuous and prolonged utilization of artificial lighting along some locations could have significant impacts on certain wildlife species. One well documented problem has been with beach habitats and nesting sea turtles and shorebirds. The use of artificial lighting may deter female sea turtles (Witherington and Martin 1996) and shorebirds, discouraging them from nesting at historic nesting sites. In addition, newly hatched sea turtles are strongly attracted to light sources (Raymond 1984, Witherington 1995, Witherington 1991). This disorientation could lead to increased mortality due to predation, dehydration, and exhaustion. Lights could also inhibit the foraging behavior of other nocturnal species. Additionally, artificial lights will not alter long-term cat behavior by disrupting movement or causing avoidance of lite site in urban areas.

The impact of noise resulting from the use of electronic guards, pyrotechnics, and propane exploders would not be allowed in an urban setting for extended periods of time. There is little evidence to suggest that such frightening techniques would cause cats to avoid an area. Noise associated with the above devices, potentially could impact both the humans and native wildlife proposed for protection in this EA.

3.2.3 Trap and Relocate Back into the Wild Alternative

This alternative would allow the live capture of feral and free-ranging cats using cage traps, snares, and/or leghold traps. Captured animals would be tranquilized and translocated to other areas where they would be released back into the wild or free living state.

Relocation of wildlife is often viewed as inhumane and biologically unsound management, especially when the wildlife species being relocated is already abundant or common in an area. Relocated animals are forced into a new environment where they often have to compete for space and resources with already well established animals of the same species or species better adept to live in a wild situation. This is especially true of feral and free-ranging cats. These cats

originated from domesticated stock, one or two generations removed, that were bred to be companion animals in a human dwelling or household and not as wild, self-reliant animals. Consequently, WS will not relocate any feral and free-ranging cats captured during control operations back into the wild. Relocation will consist only of the transfer of captured c ats to animal shelter facilities. If certain segments of the public demand relocation, then it will be up to that group(s) to acquire the appropriate permits and/or homes for the cats.

3.2.4 Biological Control Alternative

Biological control is most commonly used to control select evasive plant and insect species. Very little effort has been devoted to the biological control of feral and free-ranging cats for two reasons: 1) there has not been any biological control agent developed that will work on feral and free-ranging cat populations only and not effect cats kept indoors and 2) it is not known how any potential biological control agents for cats would effect other closely related species (Dobson 1988).

3.2.5 Poisoning Alternative

Historically, poisoning has been a common practice in controlling many nuisance wildlife populations. It was common for both target and non-target species to be negatively impacted by broad scale poisoning campaigns. The use of select toxicants have proven effective at removing feral cats on some island situations in New Zealand (Eason 1992) and poisoning is still commonly used to control some nuisance species in the United States (i.e., rodents, starlings, etc.). However, due to concerns associated with poisoning, Wildlife Services will not incorporate poisoning into its integrated wildlife damage management program in Puerto Rico for controlling feral and free-ranging cats.

3.3 MITIGATION AND SOP's FOR WILDLIFE DAMAGE MANAGEMENT TECHNIQUES

3.3.1 Mitigation Measures

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS Program, nationwide and in Puerto Rico, uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1997).

Some key mitigating measures pertinent to the proposed action and alternatives that are incorporated into WS's SOPs include the following.

The WS Decision Model, which is designed to identify effective wildlife damage management strategies and their impacts, is consistently used.

- Nontarget animals captured in traps or snares are released unless it is determined by a WS Specialist that the animal will not survive and/or that the animal can not be released safely.

- Conspicuous, bilingual warning signs alerting people to the presence of traps and snares may be placed at major access points to areas where WS is conducting active cat management operations, if it has been determined that the presence of the signs would not impact the efficacy of the management program in an area.

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

- EPA-approved label directions are followed for all pesticide use. Currently, none are planned for use in the scope of this EA.

3.3.2 Additional Mitigation Measures and SOPs for Wildlife Damage Management Techniques

Some additional mitigating factors specific to the current program include the following:

- All WS Specialists who use restricted-use chemicals are trained and certified by WS personnel or others who are experts in the safe and effective use of these substances or are supervised by such qualified persons.

- Management actions are directed toward localized populations of feral and free-ranging cats posing a threat to human health and safety and predation on native wildlife species. Generalized or blanket suppression of feral and free-ranging cat populations across Puerto Rico will not be conducted.

- Although hazards to the public from control devices and activities are low according to a formal risk assessment (USDA 1997, Appendix P), hazards to the public and their pets are even further reduced by the fact that control activities are primarily conducted during nighttime hours and by trained wildlife damage management specialists.

3.4 ADDITIONAL MITIGATION MEASURES SPECIFIC TO THE ISSUES

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

Effects on Target Species Populations

- WS activities conducted to resolve feral and free-ranging cat issues in respect to human health and safety and predation on native wildlife are directed towards the eradication of feral and free-ranging cats within specified areas.

- WS lethal take (kill) data are regularly monitored by WS biologists to evaluate method efficacy, humaneness, and evaluate new alternatives as they become available.

Effects on Nontarget Species

- WS activities conducted to resolve wildlife damage are directed towards individual problem animals, or local populations or groups. Any nontarget animals captured in snares, cage traps, or leghold traps will be released whenever it is possible.

- When conducting removal operations via shooting, WS will shoot only target species or animals and will not shoot an animal that can not be accurately identified.

- WS specialists use lures, trap placements (sets), and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of nontarget animal captures.

Effects on Human Health and Safety

- WS control operations will be conducted professionally and in the safest manner possible. Most trapping will be conducted away from areas of high human activity and when determined necessary, signs will be placed to warn the public of any potential hazards.

- WS feral and free-ranging cat management via shooting will be conducted professionally and in the safest manner possible. Shooting will be conducted during time periods when public activity and access to the control areas are restricted. WS personnel involved in shooting operations will be fully trained in the proper and safe application of this method.

Humaneness of Methods Used by WS

- WS specialists will be well trained in the latest and most humane devices/methods for removing problem wildlife.

- WS personnel attempt to dispatch captured target animals, slated for lethal removal, as quickly and humanely as possible. In most field situations, a precise shot to the brain using a small caliber firearm is performed. This method causes rapid unconsciousness followed by the cessation of heart and respirator functions, resulting in a humane and rapid death. This method is in concert with the American Veterinary Medical Association's (AVMA) definition of euthanasia (Beaver et al. 2001).

The WS's National Wildlife Research Centers (NWRC) are continually conducting research, with the goal, to improve the selectivity and humaneness of wildlife damage management devices used by WS personnel in the field.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Chapter 4 provides information needed for making informed decisions on the feral and free-ranging cat damage management objectives outlined in Chapter 1 and the issues and affected environment discussed in Chapter 2. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis. This chapter analyzes the environmental consequences of each alternative in comparison with the No Action Alternative to determine if the real or potential impacts would be greater, lesser, or the same. Therefore, the No Action Alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration WS mandates, directives, and the procedures used in the WS decision process (USDA 1997).

The following resource values within the Commonwealth of Puerto Rico are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, critical habitats (areas listed in T&E species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

4.1 Detailed Analysis of Environmental Impacts of the Alternatives

4.1.1 Effects of Feral and Free-Ranging Cat Populations on Human Health and Safety, and Native Wildlife

Alternative 1. No Action

Under this alternative, WS would not be involved in Wildlife Damage Management (WDM) to reduce threats to human health and safety and native wildlife from feral and free-ranging cats in Puerto Rico. Threats to human health and safety and native wildlife from feral and free-ranging cats would continue, and potentially increase to higher levels, provided that city and/or natural resource managers or landowners did not implement their own WDM program. Efforts to reduce or prevent feral and free-ranging cat problems by city and/or natural resource mangers or others could increase. This increase, potentially could result in impacts on human health and safety to an unknown degree. Impacts on human health and safety, and native wildlife under this alternative could be the same, less than, or more than those of the proposed action depending on the level of effort and the WDM skills and knowledge of the person implementing control methods.

Alternative 2. Nonlethal Control before Lethal Control

Under this alternative, WS would implement and recommend nonlethal control prior to the use of lethal methods. It is likely that threats to human health and safety, and native wildlife would continue and many of the problem animals would not be removed from certain areas. It is probable, in many situations, that by the time all nonlethal methods were attempted and determined to be ineffective, the protected resource could be heavily impacted by feral and free-ranging cats. Currently, the only nonlethal methods recommended or used by WS is exclusion from buildings and other man-made structures, and live capture and relocation of cats to an animal shelter.

This alternative would likely be more effective at preventing or reducing threats and damage than Alternatives 1 and 3, but not as effective as Alternatives 4 and 5.

Alternative 3. Nonlethal Control Only

Under this alternative, WS would only implement and recommend nonlethal control methods. Nonlethal methods could reduce threats to human health and safety, and native wildlife from feral and free-ranging cats in some locations, if feeding was discontinued. This alternative might remove the majority of the problem animals from some sites, however, not all animals could be removed using non-lethal methods (i.e., trap-shy animals). Consequently, the threat to human and health safety, and native wildlife would still be present to an indeterminate degree . Threats and damage would likely continue, but at a lower level.

This alternative potentially would be more effective at reducing threats to human health and safety, and native wildlife than Alternative 1, providing that some effective level of nonlethal management could be implemented. Otherwise, the effects on human health and safety, and native wildlife from this alternative would be similar to Alternative 1. This alternative would not be as effective in reducing human health and safety risks as Alternatives 2, 4, and 5.

Alternative 4. Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering nonlethal methods. In most situations, lethal methods would be applied as a result of unsuccessful attempts by city and/or natural resource managers or landowners to alleviate feral and free-ranging cat problems through nonlethal methods. Threats to human health and safety, and native wildlife would likely be reduced or eliminated under this alternative, providing that lethal control methods could be safely and effectively implemented. In situations where lethal control could not be conducted, because of safety concerns or local ordinances, threats to human health and safety, and native wildlife could be expected to remain the same or increase. This alternative would likely be more effective at preventing or reducing threats to human health and safety than Alternatives 1, 2, and 3, if some effective level of lethal management could be implemented. Otherwise, effects on human health and safety, and native wildlife from this alternative would be similar to Alternative 1. This alternative would likely not be as effective in reducing threats to human health and safety, and predation on native wildlife as Alternative 5.

Alternative 5. Integrated Wildlife Damage Management (Proposed Action)

Under this alternative, WS would incorporate select components from Alternatives 2, 3, and 4 into its WDM program. This alternative has the greatest potential of reducing threats to human health and safety, and native wildlife because all potential nonlethal and lethal control alternatives and methods would be available for use and recommendation by WS.

4.1.2 Effects on Target Species Populations

Alternative 1. No Action

Under this alternative, WS would not be involved in Wildlife Damage Management (WDM) to reduce threats to human health and safety, nuisance issues, or predation on native wildlife from feral and free-ranging cats in Puerto Rico. No impact would be experienced by any target

species or population as a result of WS operations. Efforts by city and/or natural resource mangers and other entities to reduce or prevent feral and free-ranging cat problems could increase, potentially resulting in impacts on target species populations to an unknown degree. Impacts on target species under this alternative could be the same, less than, or more than those of the proposed action depending on the level of effort and the WDM skills and knowledge of the person implementing control methods.

Alternative 2. Nonlethal Control before Lethal Control

Under this alternative, WS would implement nonlethal control prior to the use of lethal methods. As stated in Section 2.2.2, it is not likely that WS would negatively impact target species populations on a local, regional, or island-wide scale under this alternative. Feral, free-ranging, and unmarked cat populations would be reduced in certain areas; however, cats kept indoors are not expected to be negatively impacted in any way. Impacts under this alternative would be similar to Alternatives 5, providing that lethal control is implemented. Otherwise, impacts would be similar to Alternatives 3.

Alternative 3. Nonlethal Control Only

Under this alternative, WS would only implement nonlethal control methods. WS would live trap and transport all feral and free-ranging cats to local animal shelters. As stated in Section 2.2.2, it is not likely that WS would negatively impact target species populations on a local, regional, or island-wide scale under this alternative. Feral, free-ranging, and unmarked cat populations would be reduced in certain areas, providing that some level of control could be achieved using nonlethal techniques. However, cats kept indoors are not expected to be negatively impacted in any way. Impacts under this alternative would be less than Alternatives 2, 4, and 5, but more than Alternative 1.

Alternative 4. Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering nonlethal methods. In most situations, lethal methods would be applied as a result of unsuccessful attempts by city and/or natural resource managers or landowners to alleviate feral and free-ranging cat problems through nonlethal methods. As stated in Section 2.2.2, it is unlikely that WS would negatively impact target species populations on a local, regional, or island-wide scale under this alternative. Some local reduction in feral and free-ranging cat populations may occur in localized areas were lethal control activities are implemented, but cats kept indoors would not be effected. Target animals that evade live-capture would be removed using other approved methods (i.e., shooting, etc.). Dispatched animals would be taken to an incendiary or buried. Impacts under this alternative would be similar to Alternatives 2 and 5, but potentially higher than Alternative 3.

Alternative 5. Integrated Wildlife Damage Management (Proposed Action)

Under this alternative, WS would incorporate select components from Alternatives 2, 3, and 4 into its WDM program. As stated in Section 2.2.2, it is unlikely that WS would negatively impact target species populations on a local, regional, or island-wide scale under this alternative. Some local reduction in feral and free-ranging cat populations may occur in localized areas were lethal control activities are implemented, but cats kept indoors would not be effected. Target animals that evade live-capture would be removed using other approved methods (i.e., shooting,

etc.). Dispatched animals would be taken to an incendiary or buried. Impacts under this alternative would be similar to Alternatives 2 and 4, but potentially higher than Alternatives 1 and 3.

4.1.3 Effects of Control Methods on Nontarget Species Populations, Including T&E Species

Alternative 1. No Action

Under this alternative, WS would not be involved in feral and free-ranging cat Wildlife Damage Management (WDM). No direct impacts would be experienced by any wildlife species or population as a result of WS. Efforts by city and/or natural resource mangers and other entities could increase, which could result in impacts on nontarget species populations to an unknown degree. Impacts on nontarget species under this alternative could be the same, less than, or more than those of the proposed action depending on the level of effort and the WDM skills and knowledge of the person implementing control methods.

Alternative 2. Nonlethal Control before Lethal Control

Under this alternative, WS would implement nonlethal control prior to the use of lethal methods. Impacts resulting from the implementation or recommendation of nonlethal control techniques and devices would be similar to Alternative 3; consequently, impacts associated with lethal control would be similar to Alternative 4.

Alternative 3. Nonlethal Control Only

Under this alternative, WS would only implement nonlethal control methods. Exclusion and live-trap and relocate to animal shelters would have minimal to no negative impacts on nontarget and T&E species. Control methods used by WS would be specific for cats and would not physically harm any animal inadvertently captured. Nontarget species would be released on-site and unharmed.

WS SOP's and mitigation measures, as described in 3.3, would be followed to help minimize potential impacts to nontarget and T&E species.

Alternative 4. Lethal Control Only

Under this alternative, WS would implement lethal control methods without applying nonlethal methods. Lethal removal by shooting is nearly 100% selective for target species, thus no nontarget or T&E species are expected to be lethally removed as a result in WS utilizing selective shooting under this alternative. Ground shooting during nighttime hours could cause impacts to nesting or hatchling sea turtles or other T&E species from the use of lights to locate cats, or the presence of humans on the beach and/or primary or secondary dunes. Lights can inhibit female sea turtles from coming ashore to nest and can disorient turtle hatchlings as they emerge from the nests and crawl to the sea. Disorientation could prevent the hatchlings from reaching the sea, exposing them to dehydration and predation. Use of lights, during the night, outside of the nesting season would not cause problems for sea turtles or colonial nesting birds. Spotlights using red lens would lessen any potential impacts on T&E species during nesting season. Observations during sea turtle nesting surveys indicate that humans speaking quietly in the vicinity do not disrupt turtle nesting behavior; however, movement does. Little information

is available regarding impacts to colonial nesting birds and small mammals from human presence on the dunes during nighttime hours. Potential impacts associated with spotlights would be minimized by use of appropriate night vision equipment or red filtered spotlights. Human presence would be kept to the minimal time needed to accomplish the locating, shooting, and retrieval of cats. Impacts associated with firearm discharge and noise would be minimized through the use of air rifles and suppressed rifles, and the use of well trained personnel.

Nontarget animals that are inadvertently captured in live traps (legholds, cage traps, and snares) would be released if it is determined that it is safe to do so and if the animal is injury free. Nontarget risks are minimized by the selection of the appropriate trap size, use of pan tension devices, selection of the appropriate attractant (bait), and proper site selection. Frequent trap checks will further minimize risks to nontarget animals. If nighttime operations are necessary, human presence would be kept to the minimum time necessary to conduct the operation. An exception to the time limitation would be to retrieve a captured animal. Risks associated with snares are greatest for animals that frequent the areas where snares are placed and travel along the paths of the target species. Nontarget risks would be minimized by adjusting the size of the loop and the height of placement. Proper loop size and placement allows animals smaller than the target species to pass through or under the device unharmed. The use of break away locks and stops (device used to prevent a snare from choking an animal) will allow animals larger than the target species to break free of the device and nontarget animals to be released. Hazards to nontarget animals associated with the use of snares could range from minor injuries or potential death due to strangulation. Snare use by employees experienced in targeting and capturing specific animals will further minimize risks to nontarget animals.

WS SOP's and mitigation measures, as described in 3.3, would be followed to help minimize potential impacts to nontarget and T&E species.

Alternative 5. Integrated Wildlife Damage Management (Proposed Action)

Under this alternative, WS would incorporate select components from Alternatives 2, 3, and 4 into its WDM program. Impacts resulting from the implementation or recommendation of nonlethal control techniques and devices would be similar to Alternative 3. The potential effects of lethal techniques would be similar to Alternative 4.

4.1.4 Humaneness of Control Techniques

Alternative 1. No Action

Under this alternative, WS would not be involved in WDM to reduce threats to human health and safety, nuisance issues, and predation on native wildlife by feral and free-ranging cats. No direct impacts would be experienced by any wildlife species or population as a result of WS. Efforts by city and/or natural resource mangers and other entities to reduce or prevent feral and free-ranging cat impacts could increase, potentially resulting in impacts to an unknown degree. Impacts under this alternative could be the same, less than, or more than those of the proposed action, depending on the level of effort and the WDM skills and knowledge of the person implementing control methods.

Alternative 2. Nonlethal Control before Lethal Control

Under this alternative, WS would be required to implement nonlethal methods prior to the implementation of lethal methods. Nonlethal methods could include live trapping and transporting feral and free-ranging cats to local animal shelters. Lethal methods, if implemented, would include shooting and live trapping followed by euthanasia. When performed by experienced professionals, shooting usually results in a quick death for the selected animal. WS personnel are experienced and professional in their use of control methods and implement these methods in the most humane manner possible. Mitigation measures and SOPs used to maximize humaneness were listed in Chapter 3.

Some segments of the public would view the shooting or killing an animal as inhumane. Persons or publics who view killing of any kind as inhumane would strongly oppose this alternative. Groups that are opposed to trapping and/or restraining of animals in traps and snares would considered this alternative inhumane.

Alternative 3. Nonlethal Control Only

Under this alternative, WS would implement nonlethal control methods only. WS personnel are experienced and professional in their use of control methods and use these methods in the most humane manner possible. Mitigation measures and SOPs used to maximize humaneness were listed in Chapter 3. Persons opposed to the live capturing and restraining of animals (i.e., traps and snares) would consider this alternative inhumane. Others that view lethal control of any kind as inhumane would most likely prefer this alternative to Alternatives 2, 4, and 5.

Alternative 4. Lethal Control Only

Under this alternative, WS would implement lethal control methods without applying and considering nonlethal methods. Lethal methods would generally be applied as a result of unsuccessful attempts by resource managers and landowners to alleviate cat damage through nonlethal methods. Lethal methods would consist of selective shooting and live trapping followed by euthanasia. When performed by experienced professionals, shooting usually results in a quick death for the selected animal. WS personnel are experienced and professional in their use of control methods and use these methods in the most humane manner possible. Mitigation measures and SOPs used to maximize humaneness were listed in Chapter 3.

Some segments of the public would view the shooting or killing of an animal as inhumane. Persons or publics who view killing of any kind as inhumane would strongly oppose this alternative. Groups that are opposed to trapping and/or restraining of animals in traps and snares would also considered this alternative inhumane. Overall, humanness of WDM under this alternative would be similar to Alternatives 2 and 5.

Alternative 5. Integrated Wildlife Damage Management (Proposed Action)

Under this alternative, WS would incorporate select components from Alternatives 2, 3, and 4 into its WDM program. Humaneness would be of the same level as that in Alternative 2.

4.1.5 Effects of Control Methods on Human Health and Safety

Alternative 1. No Action

Under this alternative, WS would not be involved in Wildlife Damage Management (WDM) to reduce threats to human health and safety, nuisance issues, and predation on native wildlife by feral and free-ranging cats. Therefore, WS damage control activities and methods would have no impact on human health and safety.

Risks to human safety from WS's use of firearms and trapping devices would be alleviated because no such use would occur. However, increased use of firearms and traps by less experienced and trained private individuals would probably occur. WS would not provide assistance to private individuals in the safe and proper use of WDM control devices. Risks to human safety under this alternative could increase or remain the same as Alternative 5.

Alternative 2. Nonlethal Control before Lethal Control

Under this alternative, WS would be required to implement nonlethal methods prior to the implementation of lethal methods. WDM methods that might raise safety concerns include shooting with firearms and the use of traps and snares. Firearms are only used by WS personnel who are experienced in the safe handling and operation of such devices. WS personnel receive firearms safety training on an annual basis to keep them aware of safety concerns. The Puerto Rico WS program has not had any accidents involving the use of firearms or traps and snares in which a member of the public was harmed. Mitigation measures and SOPs used to maximize safe use of control methods were listed in Chapter 3. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse impacts on human safety from WS's use of these methods are expected.

Alternative 3. Nonlethal Control Only

Under this alternative, WS would implement and recommend nonlethal control methods only. WDM methods that might raise safety concerns include the use of traps and snares. WS personnel receive safety training on an annual basis to keep them aware of safety concerns. Mitigation measures and SOPs used to maximize safe use of control methods were listed in Chapter 3. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse impacts on human safety from WS's use of these methods are expected.

Alternative 4. Lethal Control Only

Under this alternative, WS would implement lethal control methods without applying or considering any nonlethal methods. Lethal methods would generally be applied as a result of unsuccessful attempts by resource managers and landowners to alleviate cat damage through nonlethal methods. WDM methods that might raise safety concerns include shooting with firearms and the use of traps and snares. Firearms are only used by WS personnel who are experienced in the safe handling and operation of such devices. WS personnel receive firearms safety training on an annual basis to keep them aware of safety concerns. The Puerto Rico WS program has not had any accidents involving the use of firearms or traps and snares in which a member of the public was harmed. Mitigation measures and SOPs used to maximize safe use of control methods were listed in Chapter 3. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1994, Appendix P). Therefore, no adverse impacts on human safety from WS's use of these methods is expected.

Alternative 5. Integrated Wildlife Damage Management (Proposed Action)

Under this alternative, WS would incorporate select components from Alternatives 2, 3, and 4 into its WDM program. Potential impacts associated with this alternative would be similar to those described under Alternatives 3 and 4.

4.1.6 Effects on the Aesthetic Values of Targeted Species and Protected Wildlife Species

Alternative 1. No Action

Under this alternative, WS would not conduct any lethal or nonlethal feral and free-ranging cat Wildlife Damage Management (WDM) activities. Some people and/or groups who oppose any wildlife damage control by government agencies or other groups and individuals would support this alternative. People or groups who have affectionate bonds with individual cats or cats in general, would not be affected by WS activities as stated in this alternative. Conversely, large segments of the public who value human health and safety and native wildlife would be impacted negatively because of the continued impact of feral and free-ranging cats on humans and native wildlife. However, it is likely that other natural resource managing agencies and landowners would conduct similar WDM on properties with this concern, resulting in impacts similar to Alternative 5.

Alternative 2. Nonlethal Control before Lethal Control

Under this alternative, WS would conduct nonlethal control methods prior to carrying out lethal control. It is important to note, that prior to WS involvement, most agencies and citizen groups involved in feral and free-ranging cat management have exhausted the use of nonlethal control methods. Some people have expressed opposition to the killing of any animals during WDM activities. Under this alternative some lethal control of feral and free-ranging cats could occur and these persons would continue to be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular animals that would be killed by WS's lethal control activities. Lethal control actions would generally be restricted to local sites and to small, insubstantial percentages of the overall population. Therefore, the species subjected to limited lethal control actions would remain common and abundant in the indoor environment; therefore, these animals (as a species) would still be available for viewing by persons with that interest. Some segments of the public are concerned about the welfare and potential impacts to feral and free-ranging cats. These publics would likely favor this alternative, since these cats could be taken to local animal shelters for further assistance in their well being.

The requirement for WS to implement all nonlethal methods before lethal control would prolong predation on native wildlife by feral and free-ranging cats. Publics concerned with native wildlife protection would be negativity impacted, because of the continued level of predation. Overall, impacts of this alternative on target species would be similar to Alternatives 5; conversely, the negative impacts to native wildlife would be greater than Alternatives 4 and 5 and similar to Alternatives 1 and 3.

Alternative 3. Nonlethal Control Only

Under this alternative, WS would implement and recommend nonlethal control methods only. Persons whom are concerned with the welfare and potential impacts to feral and free-ranging cats would likely favor this alternative.

Feral and free-ranging cats that are live-trapped and relocated to animal shelters would have a better chance of adoption, and the potential of increasing the cats' quality of life. Animals that could not be adopted would be humanely euthanized. Feral and free-ranging cats that could not be live-captured and relocated to an animal control shelter would continue to suffer from neglect, disease, parasites, injuries, and the environment. The quality of life for these cats would remain poor at best.

The requirement for WS to implement nonlethal methods would prolong predation impacts and would be detrimental to native wildlife species. Publics concerned with wildlife protection would be negativity impacted because of the continued level of predation sustained by feral and free-ranging cats. Overall, impacts of this alternative on target species would be slightly greater than Alternative 1 and less than Alternatives 2, 4, and 5. Negative impacts to wildlife species would be greater than Alternatives 4 and 5 and similar to Alternatives 1 and 2.

Alternative 4. Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering nonlethal methods. Some people have expressed opposition to the killing of any animals during WDM activities. Under this alternative some lethal control of feral and free-ranging cats could occur and these persons would continue to be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular animals that would be killed by WS's lethal control activities. Lethal control actions would generally be restricted to local sites and to small, insubstantial percentages of the overall population. Some local reduction in feral and free-ranging cat populations may occur in localized areas were lethal control activities are implemented, but cats kept indoors would not be effected. Some segments of the public are concerned about the welfare and potential impacts to feral and free-ranging cats. These publics would not likely favor this alternative, but would favor alternatives 1 and 3, since no cats would be removed and euthanized by WS.

Publics concerned with native wildlife protection would likely favor this alternative because predation rates would be reduced under this alternative. Overall, impacts of this alternative on target species would be similar to Alternatives 2 and 5. Negative impacts to native wildlife would be less than Alternatives 1, 2, and 3 and similar to Alternative 5.

Alternative 5. Integrated Wildlife Damage Management (Proposed Action)

Under this alternative, WS would incorporate select components from Alternatives 2, 3, and 4 into its WDM program. Potential impacts to cats would be similar to Alternative 2 and impacts to native wildlife would be similar to Alternative 4.

4.2 CUMULATIVE IMPACTS

No significant or cumulative adverse environmental consequences resulting from the proposed action are anticipated (Table 4-4). Control activities will not negatively impact native flora or fauna. Threats to human health and safety and predation to native wildlife by feral and free-ranging cats is expected to be less.

Federal and Puerto Rican wildlife agencies were contacted concerning the Proposed Action and reviewed this document concerning any potentially negative impacts to the environment.

No threatened or endangered species or critical habitat would be adversely impacted by the proposed action. Therefore, WS with concurrence from the USFWS, has determined that the proposed action would not likely adversely affect any species protected under the U.S. Endangered Species Act.

Overall impacts to feral and free-ranging cats in Puerto Rico is expected to be slight and very localized. Direct impacts to indoor cats with the appropriate tags or proof of ownership would be minimal to none. It is expected that a decrease in the exposure of indoor cats to feral and free-ranging cats would decrease the transmission of feline diseases and increase the health potential of indoor cats. Nuisance issues involving feral and free-ranging cats in localized areas would also be decreased.

Table 4-4. Summary of the potential effects of the Alternatives as it pertains to the identified Issues. Potential effects include both positive and negative, when applicable.

ISSUES	ALTERNATIVE 1. NO ACTION	ALTERNATIVE 2. NONLETHAL CONTROL BEFORE LETHAL CONTROL	ALTERNATIVE 3. NONLETHAL CONTROL ONLY	ALTERNATIVE 4. LETHAL CONTROL ONLY	ALTERNATIVE 5. INTEGRATED WILDLIFE DAMAGE MANAGEMENT (PROPOSED ACTION)
EFFECTS OF FERAL AND FREE-RANGING CAT POPULATIONS ON HUMAN HEALTH AND SAFETY, AND NATIVE WILDLIFE	Moderate to High impacts of feral & free-ranging cats on human health and safety, and native wildlife in many areas of Puerto Rico.	Moderate to High initial impacts of feral & free-ranging cats on human health and safety, and native wildlife in many areas of Puerto Rico. Impacts would be reduced once lethal control was initiated.	Moderate to High impacts of feral & free-ranging cats on human health and safety, and native wildlife in many areas of Puerto Rico. This alternative would maintain or increase the current impacts of cats on human health and safety, and native wildlife.	Low to No Negative Impact to human health and safety, and native wildlife. This alternative would alleviate human health and safety and native wildlife issues concerning cats.	Low to No Negative Impact to human health and safety, and native wildlife. This alternative would alleviate human health and safety and native wildlife issues concerning cats.
EFFECTS ON TARGET SPECIES POPULATIONS	No Impact would occur from WS.	Impacts under this alternative would be similar to Alternative 5, providing that lethal control is implemented. Otherwise, impacts would be similar to Alternative 3. Feral, free-ranging, and unmarked cat populations would be reduced in certain areas. Indoor cats are not expected to be negatively impacted in any way.	Impacts under this alternative would be less than Alternatives 2, 4, and 5, but more than 1. Feral, free-ranging, and unmarked cat populations would be reduced in certain areas. Indoor cats are not expected to be negatively impacted in any way.	Impacts under this alternative would be similar to Alternatives 2 and 5, but potentially higher than 3. Feral, free-ranging, and unmarked cat populations would be reduced in certain areas. Indoor cats are not expected to be negatively impacted in any way.	Impacts under this alternative would be similar to Alternatives 2 and 4, but potentially higher than 1 and 3. Feral, free-ranging, and unmarked cat populations would be reduced in certain areas. Indoor cats are not expected to be negatively impacted in any way.
EFFECTS OF CONTROL METHODS ON NONTARGET SPECIES POPULATIONS, INCLUDING T&E SPECIES	No Impact would be observed with any nontarget or T&E species as a result of WS.	Low Impact. All traps proposed for use are live capture devices; any nontarget animal captured will be	Low Impact. All traps proposed for use are live capture devices; any nontarget animal captured will be	Low Impact. All traps proposed for use are live capture devices; any nontarget	Low Impact. All traps proposed for use are live capture devices; any nontarget

		released, whenever possible.	released, whenever possible.	animal captured will be released, whenever possible.	animal captured will be released, whenever possible.
HUMANENESS OF CONTROL TECHNIQUES	No Impact by WS.	Low to Moderate Impact - potentially greater than Alternatives 1 & 3, but as humane as possible with the available resources and technologies.	Low to Moderate Impact - potentially less than Alternatives 2,4, &5. Some components of the public would favor this alternative to lethal control on site. Humaneness of this alternative would not necessarily be more humane than Alternatives 2, 4, or 5.	Low to Moderate Impact - potentially greater than Alternatives 1 & 3, but as humane as possible with the available resources and technologies.	Low to Moderate Impact - potentially greater than Alternatives 1 & 3, but as humane as possible with the available resources and technologies.
EFFECTS OF CONTROL METHODS ON HUMAN HEALTH AND SAFETY	No Impact by WS.	Low Risk or Impact - but greater than Alternatives 1 & 3.	Low Risk or Impact - no potential Human Health and Safety issues would be created by the WS operational program.	Low Risk or Impact - as the result of WS operations, but greater than Alternatives 1 & 3.	Low Risk or Impact - as the result of WS operations, but greater than Alternatives 1 & 3.
EFFECTS ON THE AESTHETICS VALUES OF TARGETED SPECIES AND PROTECTED WILDLIFE SPECIES	No Impact by WS - feral and free-ranging cat populations would not be effected; however, High impact to domiciled population of cats due to continued effects of disease and parasites associated with free-ranging cats; High Impact for T&E and wildlife species. The aesthetics of wildlife species would be greatly affected by this Action.	Low Impact - domiciled cats will not be impacted negatively by this alternative. Potential, High initial Impact for T&E and wildlife species until the implementation of lethal control techniques.	Impacts of this alternative on target species would be slightly greater than Alternative 1 and less than Alternatives 2, 4, and 5. Negative impacts to wildlife species would be greater than Alternatives 4 and 5 and similar to Alternatives 1 and 2. High impact to domiciled population of cats due to continued effects of disease and parasites associated with free-ranging cats; High Impact for T&E and wildlife species.	Low Impact - domiciled cats will not be negatively impacted. High positive Impact for T&E and wildlife species , due to alleviation of predation.	Low Impact - domiciled cats will not be negatively impacted. High positive Impact for T&E and wildlife species , due to alleviation of predation.

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED

PREPARERS

Lawrence J. Brashears, Jr.	USDA, APHIS, WS - District Supervisor
Bernice U. Constantin	USDA, APHIS, WS - State Director
David S. Reinhold	USDA, APHIS, WS - Environmental Management Coordinator

CONSULTATIONS

Madeline Yondin	USDI, NPS - Old San Juan Park Manager
Lorna M. Huertas	City of San Juan
Ismael Pacheco Ocasio	City of San Juan, C.C.A.A
Agnes B. Suarez	City of San Juan, Vice Mayor
Carlos Maysonet-Negrón	Dept. of Natural and Environmental Resources - Administrator
David P. Flemming	USFWS - Ecological Services

APPENDIX A. BIBLIOGRAPHY AND LITERATURE CITED

Adamec, R. E. 1976. The interaction of hunger and preying in the domestic cat (*Felis catus*): an adaptive hierarchy? Behav. Biol. 18: 263-272.

Anderson, D. W., J. O. Kieth, G. R. Trapp, F. Gress, and L. A. Moreno. 1989. Introduced small ground predators in California brown pelican colonies. Colonial Waterbirds 12(1):98-103.

Andrews, R. D. and D. H. Ferris. 1966. Relationships between movement patterns of wild animals and the distribution of leptospirosis. J. Wildl. Manage. 30(1): 131-134.

Amarasekare, P. 1993. Potential Impact of mammalian nest predators on endemic forest birds of western Mauna Kea, Hawaii. Conserv. Biol. 7(2):316-324.

Anonymous. 1931. Catalina cats and quail. Calif. Fish and Game 17(4): 450-451.

Apps, P. J. 1966. Home ranges of feral cats on Dassen Island. J. Mammal. 67: 199-200.

Ashmole, N. 1963. The biology of the Wideawake or Sooty tern on Ascension Island. Ibis 103b(3): 297-365.

Baldwin, J. A. 1980. The domestic cat, *Felis catus* L., in the Pacific Islands. Carnivore Genet. Newsl, 4: 57-66.

Bailey, J.A. 1984. Principles of wildlife management. John Wiley and Sons, New York, New York. 373pp.

Baron, A., C. N. Stewart, and J. M. Warren. 1956. Patterns of social interaction in cats (*Felis domestica*). Behaviour XI: 56-66.

Beaver, B. V., W. Reed, S. Leary, B. McKiernan, F. Bain, R. Schultz, B. T. Bennett, P. Pascoe, E. Shull, L. C. Cork, R. Franis-Floyd, K. D. Amass, R. Johnson, R. H. Schmidt, W. Underwood, G. W. Thorton, and B. Kohn. 2001. 2000 Report of the AVMA Panel on Euthanasia. J. Am. Vet. Med. Assoc. 218: 669-696.

Bell, B. D. 1974. Mangere Island. New Zealand Wildl. Serv. Wildlife--A Review 5: 31-34.

Berryman, J.H. 1991. Animal damage management: responsibilities of various agencies and the need for coordination and support. Proc. East Wild. Damage Control Conf. 5:12-14.

Bishop, R. C. 1987. Economic values defined. Pages 24-33 in D. J. Decker and G. R. Goff, eds. Valuing wildlife: Economic and social perspectives. Westview Press. Boulder, CO. 424 pp.

Boddicker, M. L. 1983. House cats (feral). Pages 25-29 in Timm, R. M., ed., Prevention and control of wildlife damage. University of Nebraska Press.

Brockie, R. E., L. L. Loope, M. B. Usher, and O. Hamann. 1988. Biological invasions of island nature reserves. Biol. Conserv. 44:9-36.

Bryant, S. L. 1991. The ground parrot, *Pezoporus wallicus*, in Tasmania: distribution, density and conservation status. Department of Parks, Wildlife & Heritage, Tasmania. Scientific Report 91/1. 109 pp.

Caras, R. 1973. Meet wildlife enemy no. 2. National Wildl. 11:30-31.

Childs, J. E. 1986. Size-dependent predation on rats (*Rattus norvegicus*) by house cats (*Felis catus*) in an urban setting. J. Mammal. 67:196-198.

_____. 1990. Urban cats: their demography, population density, and owner characteristics in Baltimore, Maryland. Anthrozoos 4: 234-244.

_____. 1991. And the cat shall lie down with the rat. Natural History 6:16-19.

Christian, D. P. 1975. Vulnerability of meadow voles, *Microtus pennsylvanicus*, to predation by domestic cats. Amer. Midland Nat. 93(2):498-502.

Churcher, P. B. and J. H. Lawton. 1987. Predation by domestic cats in a English village. J. Zool., Lond. 212: 439-455.

_____ and _____. 1989. Beware of well-fed felines. Nat. Hist. 98(7):40-46. [Letters: 98(9):4; 98(11):4].

Clifton, M. 1992. Until there are none, spay/neuter one. The Animals' Agenda May 1992:12-19.

Coleman, J. S. and S. A. Temple. 1989. Effects of free-ranging cats on wildlife: a progress report. Proc. 4th East. Wildl. Damage Control Conf.: 9-12.

_____ and _____. 1993. A survey of owners of free-ranging domestic cats in rural Wisconsin. Wildl. Soc. Bull. 21: 381-390.

Coman, B. J. and H. Brunner. 1972. Food habits of the feral house cat in Victoria. J. Wildl. Manage. 36(3): 848-853.

Comfort, A. 1956. Maximum ages reached by domestic cats. J. Mammal. 37(1): 118-119.

Concannon, P. W. and V. N. Meyers-Wallen. 1991. Current and proposed methods for contraception and termination of pregnancy in dogs and cats. J. Amer. Vet. Med. Assoc. 198: 1214-1225.

Condy, P. R., G. D. Anderson, J. Heijnen, and F. Smit. 1975. Notes on an efficient cat trap fitted with a remote signalling device. Zool. Africana 10: 103-107.

Corbett, L. K. 1978. A comparison of the social organization and feeding ecology of domestic cats (*Felis catus*) in two contrasting environments in Scotland. Carnivore Genet. Newsl. 3:269.

Davis, D. E. 1957. The use of food as a buffer in a predator-prey system. J. Mammal. 38(4):466-472.

Day, D. 1981. The Doomsday Book of Animals. London Editions Limited, 70 Old Compton Street, London. 288 pp.

Decker, D. J. and G. R. Goff. 1987. Valuing Wildlife: Economic and social perspectives. Westview Press. Boulder, CO. 424 pp.

Dobson, A. P. 1988. Restoring island ecosystems: the potential of parasites to control introduced mammals. Conserv. Biol. 2(1): 31-39.

Domm, S. And J. Messersmith. 1990. Feral cat eradication on a barrier reef island, Australia. Atoll Research Bull. 338: 1-4.

Doucet, G. J. 1973. House cat as predator of snowshoe hare. J. Wildl. Manage. 37(4): 591.

Dubey, J. P. 1973. Feline toxoplasmosis and coccidiosis: a survey of domiciled and stray cats. J. Amer. Vet. Med. Assoc. 162(10): 873-877.

_____, R. M. Weigel, A. M. Siegel, P. Thulliez, U. D. Kitron, M. A. Mitchell, A. Mannelli, N. E. Mateus-Pinilla, S. K. Shen, O. C. H. Kwok, and K. S. Todd. 1995. Sources and reservoirs of *Toxoplasma gondii* infection on 47 swine farms in Illinois. J. Parasitol. 81(5): 723-729.

Eason, C. T., D. R. Morgan, and B. K. Clapperton. 1992. Toxic baits and baiting strategies for feral cats. Pages 371-376 in Borrecco, J. E. and R. E. Marsh, eds. Proc. 15th Vertebrate Pest Conf. Univ. of California, Davis. 415 pp.

Eberhard, T. 1954. Food habits of Pennsylvania house cats. J. Wildl. Manage. 18(2): 284-286.

Eidson, M., L. A. Tierney, O. J. Rollag, T. Becker, T. Brown, and H. F. Hull. 1988. Am. J. Public Health 78: 1333-1335.

Eng, T. R. and D. B. Fishbein. 1990. Epidemiologic factors, clinical findings, and vaccination status of rabies in cats and dogs in the United States in 1988. J. Amer. Vet. Med. Assoc. 197(2): 201-209.

Erlinge, S., G. Goransson, G. Hogstsdt, G. Jansson, O. Liberg, J. Loman, I. N. Nilsson, T. von Schantz, and M. Sylven. 1984. Can vertebrate predators regulate their prey? Am. Nat. 123(1): 125-133.

Errington, P. L. 1936. Notes on food habits of southern Wisconsin house cats. J. Mammal. 17:64-65.

Everard, C. O. R. and J. D. Everard. 1992. Mongoose rabies in the Caribbean. Annual NY Acad. Sci. 1992 Jun 16;653:356-66. Review.

Fellers, G. M. and C. A. Drost. 1995. Handbook for restoring native animals. Natural Resources Report NPS/NRPORE/NRR-95/19. 34 pp.

Figley, W. K. and L. W. VanDruff. 1982. The ecology of urban mallards. Wildl. Monogr., No. 81.

Fitzgerald, B. M. 1980. Feeding ecology of the feral house cat in New Zealand. Carnivore Genet. Newsl. 4:67-71.

_____. 1988. Diet of domestic cats and their impact on prey populations. Pages 123-150 in Turner, D. C. and P. Bateson., eds. The domestic cat: the biology of its behaviour. Cambridge Univ. Press, Cambridge. 222 pp.

_____. 1990. House cat. Pages 330-348 in King, C. M., ed. The handbook of New Zealand mammals. Oxford Univ. Press.

_____, W. B. Johnson, C. M. King, and P. J. Moors. 1984. Research on Mustelids and cats in New Zealand. WRLG Res. Review No. 3. Wildl. Res. Liaison Group, Wellington. 22 pp.

Florida Fish and Wildlife Conservation Commission. 1999. Ground colonial shorebird colonies occupied in 1999 and associated predators. (unpubl. Rep.)

Frenkel, J. K. 1973. Toxoplasma in and around us. Bioscience 23: 343-352.

George, W. G. 1974. Domestic cats as predators and factors in winter shortages of raptor prey. The Wilson Bull. 86(4): 384-396.

_____. 1978. Domestic cats as density independent hunters and "surplus killers". Carnivore Genet. Newsl. 3:282-287.

_____ and M. George. 1979. Population densities and ownership patterns of preying cats in rural America. Carnivore Genet. Newsl. 3: 317-324.

Gibb, J. A., C. P. Ward, and G. D. Ward. 1969. An experiment in the control of a sparse population of wild rabbits (*Oryctolagus cuniculus*) in New Zealand. New Zealand J. Sci. 12:509-534.

Gill, D. 1975. The feral house cat as predator of varying hare. Canadian Field-Naturalist 89: 78-79.

Gillespie, J. H. and F. W. Scott. 1973. Feline viral infections. Advances in Vet. Sci. and Comp. Med. 17: 163-200.

Gnam, R. S. 1990. Conservation of the Bahama Parrot. Am. Bird 44(1):32-36.

_____ and A. Burchsted. 1991. Population estimates for the Bahama Parrot on Abaco Island, Bahamas. J. Field Ornithol. 62(1):139-146.

Greenberg, C. H. 1989. Free-ranging dogs and cats on the Oak Ridge Reservation: situation and solution. U.S.D.E., Environmental Sciences Division, Publication No. 3142. 15 pp.

Grinnell, J. 1914. Bird life as a community asset. Calif. Fish and Game 1(1):20-23.

Gruver, K. S., R. L. Philips, and E. S. Williams. 1996. Leg injuries to coyotes captured in standard and modified Soft Catch traps. Proc. Vertebr. Pest. Conf. 17.

Harrison, G. H. 1992. Is there a killer in your house? National Wildlife, October/November Issue: 10-15.

Hart, B. L. and L. Cooper. 1984. Factors related to urine spraying and fighting in prepubertal gonadectomized male and female cats. J. Amer. Vet. Med. Assoc. 184: 1255-1258.

Haspel, C. and R. E. Calhoon. 1989. Home ranges of free-ranging cats (*Felis catus*) in Brooklyn, New York. Canadian J. Zool. 67(1): 178-181.

_____ and _____. 1990. The interdependence of humans and free-ranging cats in Brooklyn, New York. Anthrozoos 3: 155-161.

_____ and _____. 1993. Activity patterns of free-ranging cats in Brooklyn, New York. J. Mammal. 74(1): 1-8.

_____ and M. Whitman. 1981. Redesign suggestions for traps used to catch cats or other small mammals. Carnivore Genet. Newsl. 4:183-184.

Heller, R., M. Artois, V. Xemar, D. De Briel, H. Gehin, B. Jaulhac, H. Monteil, and Y. Piemont. 1997. Prevalence of *Bartonella henselae* and *Bartonella clarridgeiae* in stray cats. J. Clin. Microbiol. 35(6): 1327-1331.

Holler, N. R. 1992. Choctawhatchee beach mouse. Pages 76-86 in S. R. Humphrey, ed., Rare and endangered biota of Florida, Vol. 1. Mammals. University Press of Florida. Tallahassee, FL. 392 pp.

Holliman, D. C. 1983. Status and habitat of Alabama gulf beach mice, *Peromyscus polionotus amobates* and *P. p. trissyllepsis*. Northeast Gulf Sci. 6: 121-129.

Howard, W. E. 1957. Amount of food eaten by small carnivores. J. Mammal. 38(4):516-517.

_____ and R. E. Marsh. 1986. Implications and management of feral mammals in California. Proc. 12th Vert. Pest Conf.: 226-229.

Hubbs, E. L. 1951. Food habits of feral house cats in the Sacramento Valley. Calif. Fish and Game 37: 177-189.

Humphrey, S. R. and D. B. Barbour. 1981. Status and habitat of three subspecies of *Peromyscus polionotus* in Florida. J. Mammal. 62:840-844.

Hunter, S. 1990. The impact of introduced cats on the predator-prey interactions of a sub- Antarctic avian community. Pages 365-371 in Antarctic ecosystems: ecological changes and conservation. Berlin; New York: Springer-Verlag. c 1990.

Imber, M. J. 1973. The petrels of Little Barrier. New Zealand Wildl. Serv., Wildlife--A Review 4: 4-9.

Iverson, J. B. 1978. The impact of feral cats and dogs on populations of the West Indian rock iguana, *Cyclura carinata*. Biol. Conserv. 14:63-73.

Izawa, N. 1983. Daily activities of the feral cat. J. Mammal. Soc. Japan 9(5): 219-228.

_____, T. Doi, and Y. Ono. 1982. Grouping patterns of feral cats (*Felis catus*) living on a small island in Japan. Jap. J. Ecol. 32: 373-382.

Jackson, J. A. 1978. Alleviating problems of competition, predation, parasitism, and disease in endangered birds. Pages 75-84 in Temple, S. A., ed. Endangered birds: management techniques

for preserving threatened species. Proc. of the Symposium on Management Techniques for Preserving Endangered Birds. Univ. Wisconsin Press. 466 pp.

Jackson, W. B. 1951. Food habits of Baltimore, Maryland, cats in relation to rat populations. J. Mammal. 32:458-461.

JAVMA. 1996. AVMA Position Statement on Abandoned and Feral Cats. JAVMA Vol. 209, No. 6, September 1996: 1042.

Jehl, J. R. 1972. On the cold trail of an extinct petrel. Pacific Discovery 25:24-28.

_____ and K. C. Parkes. 1983. 'Replacements' of landbird species on Socorro Island, Mexico. The Auk 100:551-559.

Johnstone, G. W. 1985. Threats to birds on subantarctic islands. Pages 101-121 in ICBP Techn. Publ. No. 3.

Jones, E. 1977. Ecology of the feral cat, *Felis catus* (L.), on Macquarie Island. Austral. Wildl. Res. 4:249-262.

_____ and B. J. Horton. 1984. Gene frequencies and body weights of feral cats, *Felis catus* (L.), from five localities and from Macquarie Island. Austral. J. Zool. 32: 231-237.

Jones, R. D. and G. V. Byrd. 1979. Interrelation between seabirds and introduced animals. Pages 221-226 in Bartonek, J. C. and D. N. Nettleship, eds. Conservation of marine birds of northern North America. U.S. Dept. Interior, Fish and Wildl. Service, Wildl. Res. Rep. 11. Washington, D.C. 319 pp.

Jurek, R. M. 1994. A bibliography of feral, stray, and free-ranging domestic cats in relation to wildlife conservation. Calif. Dep. of Fish and Game, Nongame Bird and Mammal Program Rep. 94-5. 24 pp.

Krebs, J. W., T. W. Strine, J. S. Smith, D. L. Noah, C. E. Rupprecht, and J. E. Childs. 1996. Rabies surveillance in the United States during 1995. J. Amer. Vet. Med. Assoc. 209(12): 2031-2044.

____, J. S. Smith, C. E. Rupprecht, and J. E. Childs. 1997. Rabies surveillance in the United States during 1996. J. Amer. Vet. Med. Assoc. 211(12): 1525-1539.

____. 1998. Rabies surveillance in the United States during 1997. J. Amer. Vet. Med. Assoc. 213(12): 1713-1728.

____. 1999. Rabies surveillance in the United States during 1998. J. Amer. Vet. Med. Assoc. 215(12): 1786-1798.

____, C. E. Rupprecht, and J. E. Childs. 2000. Rabies surveillance in the United States during 1999. J. Amer. Vet. Med. Assoc. 217(12): 1799-1811.

____, A. M. Mondul, C. E. Rupprecht, and J. E. Childs. Rabies surveillance in the United States during 2000. J. Amer. Vet. Med. Assoc. 219(12): 1687-1699.

Kerr, D. 1982. Feral cats-a new threat. Austral. Ranger Bull. 1.

Kirby, G. and D. W. Macdonald. 1988. Cat society and the consequences of colony size. Pages 67-81 in Turner, D. C. and P. Bateson, eds. The domestic cat: the biology of its behaviour. Cambridge Univ. Press, New York, NY.

Kirkpatrick, R. D. and M. J. Rauzon. 1986. Foods of feral cats, *Felis catus*, on Jarvis and Howland Islands, Central Pacific Ocean. Biotropica 18(1):72-75.

Konecny, M. J. 1987. Food habits and energetics of feral house cats in the Galapagos Islands. Oikos 50(1):24-32.

_____. 1987. Home range and activity patterns of feral house cats in the Galapagos Islands. Oikos 50(1): 17-23.

Langham, N. P. E. 1990. The diet of feral cats on Hawkes Bay farmland, New Zealand. New Zealand J. Zool. 17:243-255.

Laundre, J. 1977. The daytime behaviour of domestic cats in a free-roaming population. Anim. Behav. 25: 990-998.

Leopold, A.S. 1933. Game management. Charles Scribner & Sons, New York, NY. 481 pp.

Liberg, O. 1980. Spacing patterns in a population of rural free roaming domestic cats. Oikos 35: 336-349.

_____. 1982. Domestic cat. Pages 222-224 in D. E. Davis, ed. CRC handbook of census methods for terrestrial vertebrates. CRC Press, Inc., Boca Raton, Florida. 397 pp.

_____. 1984. Food habits and prey impact by feral and house-based cats in a rural area of southern Sweden. J. Mammal. 65:424-432.

Loughborough, J. M. 1932. Will cat license laws save wildlife? Trans. 19th Amer. Game Conf., Amer. Game Assoc. Washington, D.C. Pages 175-181.

Macdonald, D. W. and P. J. Apps. 1978. The social behaviour of a group of semi-dependent farm cats, *Felis catus*: a progress report. Carnivore Genet. Newsl. 3: 256-268.

_____, _____, G. M. Carr, and G. Kerby. 1987. Social dynamics, nursing coalitions and infanticide among farm cats, *Felis catus*. Paul Parey Scientific Publishers, Berlin and Hamburg. 66 pp.

Maggitti, P. 1989. Feral cats: controlled colonies are sometimes the solution. The Animals' Agenda May 1989:26-31.

Magnarelli, L. A., J. F. Anderson, H. R. Levine, and S. A. Levy. 1990. Tick parasitism and antibodies to *Borrelia burgdorferi* in cats. J. Amer. Vet. Med. Assoc. 197(1): 63-66.

Matheson, C. 1944. The domestic cat as a factor in urban ecology. J. Animal Ecol. 13(2):130-133.

May, R. M. 1988. Control of feline delinquency. Nature 332(31 March): 392-393.

McMurry, F. B. 1945. Three shrews, *Cryptotis parva*, eaten by a feral house cat. J. Mammal. 26:94.

_____ and C. C. Sperry. 1941. Food of feral house cats in Oklahoma, a progress report. J. Mammal. 22(2): 185-190.

Mead, C. J. 1982. Ringed birds killed by cats. Mammal Rev. 12(4): 183-186.

Merton, D. V. 1970. The rehabilitation of Cuvier Island. New Zealand Wildl. Serv., Wildlife 1970-- A Review: 5-8.

_____. 1978. Controlling introduced predators and competitors on islands. Pages 121-128 in Temple, S. A., ed. Endangered birds: management techniques for preserving threatened species. Proc. of the Symposium on Management Techniques for Preserving Endangered Birds. Univ. Wisconsin Press. 466 pp.

Moors, P. J. and A. E. Atkinson. 1984. Predation on seabirds by introduced animals, and factors affecting its severity. Pages 667-690 in ICBP Techn. Publ. No. 2.

Moyers, J. E. 1996. Food habits of gulf coast subspecies of beach mice (*Peromyscus polionotus spp.*). M.S. Thesis. Auburn University, Auburn, Alabama. 83 pp.

Nader, I. A. and R. Martin. 1962. The shrew as prey of the domestic cat. J. Mammal. 43:417.

Nassar, R. and J. Fluke. 1991. Pet population dynamics and community planning for animal welfare and animal control. J. Amer. Vet. Med. Assoc. 198: 11-1161, 1171.

_____ and J. Mosier. 1991. Projections of pet populations from census demographic data. J. Amer. Vet. Med. Assoc. 198: 1157-1159.

National Academy of Sciences. 1990. Biotic sources of mortality. Pages 62-64 in Decline of the sea turtle: causes and prevention - Committee on Sea Turtle Conservation, Board on Environmental Studies and Toxicology, Board on Biology, Commission on Life Sciences, National Research Council. National Academy Press. Washington, D.C.

Natoli, E. 1985. Spacing patterns in a colony of urban stray cats (*Felis catus* L.) in the historic centre of Rome. Appl. Animal Behav. Sci. 14: 289-304.

Neville, P. F. 1983. Humane control of an urban cat colony. Intern. Pest Control 25(5): 144-145, 152.

_____. 1989. Feral cats: management of urban populations and pest problems by neutering. Pages 261-267 in Putman, R. J., ed. Mammals as pests. Chapman and Hall, New York.

_____ and J. Remfry. 1984. Effect of neutering on two groups of feral cats. Vet. Record 114: 447-450.

Newsome, A.E., I. Parer, and P. C. Catling. 1989. Prolonged prey suppression by carnivores --- predator-removal experiments. Oecologia 78:458-467.

Oppenheimer, E. 1980. *Felis catus* population densities in urban areas. Carnivore Genet. Newsl. 4: 72-80.

Parmalee, P. W. 1953. Food habits of the feral house cat in east-central Texas. J. Wildl. Manage. 17(3): 375-376.

Passanisi, W. C. and D. W. Macdonald. 1990. The fate of controlled feral cat colonies. UFAW Animal Welfare Research Report No. 4. 44 pp.

Patton, S., S. L. Johnson, D. G. Loeffler, B. G. Wright, J. M. Jensen. 1986. Epizootic of toxoplasmosis in kangaroos, Wallabies, and potaroos: possible transmission via domestic cats. J. Amer. Vet. Med. Assoc. 189(9): 1166-1169.

Pearson, O. P. 1964. Carnivore-mouse predation: an example of its intensity and bioenergetics. J. Mammal. 45(2):177-188.

_____. 1971. Additional measurements of the impact of carnivores on California voles (*Microtus californicus*). J. Mammal. 52:41-49.

Phillips, R. L., K. S. Gruver, and E. S. Williams. 1996. Leg injuries to coyotes captured in three types of foothold traps. Wildl. Soc. Bull. 24(2): 260-263.

Prescott, C. W. 1973. Reproductive patterns in the domestic cat. Austral. Vet. J. 49: 126-129.

Randall, R. E. 1972. The rabbit and the feral cat in the Monarch Isles or Heisker National Nature Reserve. Glasg. Nat. 19: 13-16.

Raymond, P. W. 1984. Sea Turtle hatchling disorientation and beach front lighting. A review of the problem and potential solutions. The Center for Environmental Education. Sea Turtle Rescue Fund. Washington, D. C. 72 pp.

Reif, J. S. 1976. Seasonality, natality, and herd immunity in feline panleukopenia. Am.. J. Epidemiology 103(1):81-87.

Remfry, J. 1978. Control of feral cat populations by long-term administration of megestrol acetate. Vet. Record 103: 403-404.

_____. 1985. Humane control of feral cats. Pages 41-49 in Humane control of land mammals and birds. Universities Federation for Animal Welfare, Pooters Bar.

_____. 1996. Feral cats in the United Kingdom. J. Amer. Vet. Med. Assoc. 208: 520-523.

Rosatte, R. C. 1985. Preliminary studies on the feasibility of urban rabies control. Proc. 7th Great Plains Wildl. Damage Control Conf. 7: 78-91.

Rosenblatt, B. 1992. Cats on campus. The Animals' Agenda April 1992:20-21.

Ross, C. 1992. Feral cats and silent spring. The American City and County, May 1992: 24.

Rowan, A. N. 1991. What we need to learn from epidemiologic surveys pertaining to pet overpopulation. J. Amer. Vet. Med. Assoc. 198(7): 1233-1236.

Schneider, R. and M. L. Vaida. 1975. Survey of canine and feline populations: Alameda and Contra Costa Counties, California, 1970. J. Amer. Vet. Med. Assoc. 166(5): 481-486.

Seabrook W. 1989. Feral cats (Felis catus) as predators of hatchling green turtles (Chelonia mydas). J. Zool., Lond. 219: 83-88.

Smith, R. E. and W. M. Shane. 1986. The potential for the control of feral cat popula tions by neutering. Feline Practice 16(1):21-23.

Snetsinger, T. J., S. G. Fancy, J. C. Simon, and J. D. Jacobi. 1994. Diets of owls and feral cats in Hawaii. Elepaio 54: 47-50.

Soule, M. E., D. T. Bolger, A. C. Alberts, J. Wright, M. Sorice, and S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands. Conserv. Biol. 2(1):75-92.

Stagno, S., A. C. Dykes, C. S. Amos, R. A. Head, D. D. Juranek, and K. Walls. 1980. An outbreak of toxoplasmosis linked to cats Pediatrics 65(4): 706-712.

Stallcup, R. 1992. Cats: a heavy toll? Bird Watcher's Digest. March/April Issue: 94-95.

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

Stockner, P. K. 1991. The economics of spaying and neutering: market forces and owners' values affecting pet population control. J. Amer. Vet. Med. Assoc. 198: 1180-1182.

Teutsch, S. M., D. D. Juranek, A. Sulzer, J. P. Dubey, R. K. Sikes. 1979. Epidemic toxoplasmosis associated with infected cats. N. Engl. J. Med. 300(13): 695-699.

Till, J. A., and F. F. Knowlton. 1983. Efficacy of denning in alleviating coyote depredations on domestic sheep. J. Wildl. Manage. 47:1018-1025.

Todd, N. B. 1977. Cats and commerce. Sci. Am. 237(5): 100-107.

Toner, G. C. 1956. House cat predation on small animals. J. Mammal. 37(1): 119.

Universities Federation for Animal Welfare. 1981. Feral cats: notes for veterinary surgeons. Vet. Record 108: 301-303.

USDA. 1989. Strategic Plan. U.S. Dept. Agric., Anim. Plant Health Inspection Serv., Anim. Damage Control, Operational Support Staff, Riverdale, MD.

_____. 1997 (revised). Animal Damage Control program final environmental impact statement. Vol. 1-3. Animal Damage Control. Hyattsville, MD.

U. S. Fish and Wildlife Service. 1985. Endangered and threatened wildlife and plants; determination of endangered status and critical habitat for three beach mice; final rule. Fed. Reg. 50(109): 23872-23889.

_____. 1993. Recovery plan for the Anastasia Island and Southeastern Beach Mouse. Atlanta, GA. 3 pp.

_____. 1999. South Florida multi-species recovery plan. Atlanta, Georgia. 2172 pp.

Van Aarde, R. J. 1978. Reproduction and population ecology of the feral house cat, *Felis catus*, on Marion Island. Carnivore Genet. Newsl. 3: 288-316.

Van Rensburg, P. J., J. D. Skinner, and R. J. Van Aarde. 1987. Effects of feline panleucopaenia on the population characteristics of feral cats on Marion Island. J. Appl. Ecol. 24(1): 63-73.

Van't Woudt, B. D. 1990. Roaming, stray, and feral domestic cats and dogs as wildlife problems. Proc. 14th Vert. Pest Conf.: 291-295.

Vaughn, J. B. 1976. Cat rabies. Pages 139-154 in G. M. Baer, ed. The natural history of rabies. Vol. II. Academic Press New York.

Veitch, C. R. 1980. Feral cats on Little Barrier Island. New Zealand Wildl. Serv., Wildlife -- A Review 11: 62-64.

_____. 1983. A cat problem removed. New Zealand Wildl. Serv.., Wildlife--A Review 12: 47-49.

_____. 1985. Methods of eradicating feral cats from offshore islands in New Zealand. Pages 125-141 in Moors, P. J., ed. Conservation of Island Birds: Case Studies for the Management of Threatened Island Birds. ICBP Tech. Publ., 3.

Wall, P. G., E. J. Threllfall, L. R. Ward, B. Rowe. 1996. Multiresistant *Salmonella typhimurium* DT104 in cats: a public health risk. Lancet 348: 471.

Warham, J. 1967. The white-headed petrel *Pterodroma lessoni* at Macquarie Island. Emu 67:1-22.

Warner, R. D. 1984. Occurrence and impact of zoonoses in pet dogs and cats at US Air Force bases. Am. J. Public Health 74(11): 1239-1243.

Warner, R. E. 1985. Demography and movements of free-ranging domestic cats in rural Illinois. J. Wildl. Manage. 49(2): 340-346.

Weimerskirch, H., R. Zottier, and P. Jouventin. 1988. The avifauna of the Kerguelen Islands. The Emu 89: 15-29.

Wildlife Society, The. 1990. Conservation policies of The Wildlife Society. The Wildlife Society. Washington, D.C. 20 pp.

Williams, A. J. 1984. Status and conservation of seabirds at some islands in the African Sector of the Southern Ocean. Pages 627-635 in Croxall, J. P., P. G. H. Evans, and R. W. Schreiber, eds. Status and Conservation of the World's Seabirds. ICBP, Cambridge.

Witherington, B. E. 1991. Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles. *(Caretta caretta)*. Biol. Conserv. 55:139-149.

_____. 1995. Hatchling orientation. A Summary. Pages 577-578 in K. A. Bjorndal, ed., Biology and Conservation of sea turtles. Revised Edition. Smithsonian Institution Press. Washington D.C.

_____ and R. E. Martin. 1996. Understanding, assessing, and resolving light-pollution problems on sea turtle nesting beaches. FMRI Tech. Rep. TR-2. Florida Marine Research Institute, St. Petersburg, Florida. 73p.

Zaunbrecher, K. I. and R. E. Smith. 1993. Neutering of feral cats as an alternative to eradication programs. J. Amer. Vet. Med. Assoc. 203(3): 449-452. [Comments and response, J. Amer. Vet. Med. Assoc. 203(9): 1256-1257].

APPENDIX B. GLOSSARY

Abundance - The number of individuals of a species in a given unit of area.

Animal Behavior Modification - The use of scare tactics/devises (i.e., electronic distress sounds, propane exploders, pyrotechnics, lights, scarecrows, etc.) to deter or repel animals that cause damage to resources or property or threaten human health and safety.

Animal Rights - A philosophical and political position that animals have inherent rights comparable to those of humans.

Animal Welfare - Concern for the well-being of individual animals, unrelated to the perceived rights of the animal or the ecological dynamics of the species.

Canid - A coyote, dog, fox, wolf or other member of the dog (Canidae) family.

Carnivore - A species that primarily eats meat (member of the Order Carnivora).

Confirmed Losses - Wildlife-caused losses or damages verified by USDA-WS. These figures usually represent a fraction of the total losses.

Corrective Damage Management - Management actions applied when damage is occurring or after it has occurred.

Denning/Den Hunting - The process of locating predator (primarily coyote) burrows and destroying the pups. The adult predator may also be killed.

Depredating Species - An animal species causing damage to, or loss of crops, livestock, other agricultural or natural resources, property, or wildlife.

Depredation - The act of killing, damaging, or consuming animals, crops, other agricultural or natural resources, property, or wildlife.

Direct Control - Administration or supervision of wildlife damage management by WS, often involving direct intervention to capture depredating animals.

Endangered Species - Federal designation for any species or population that is in danger of extinction throughout all or a significant portion of its range.

Environment - The conditions, influences, or forces that affect or modify an organism or and ecological community and ultimately determine its form and survival.

Environmental Assessment - An analysis of the impacts of a planned action to the human environment to determine the significance of that action and whether an EIS is needed.

Environmental Impact Statement - A document prepared by a federal agency to analyze the anticipated environmental effects of a planned action or development, compiled with formal examination of options and risks.

Eradication - Elimination of a specific wildlife species, generally considered pests, from designated areas.

Exotic (Nonnative) Species - Any plant or animal that is not native to an area; species transplanted by humans that are native to other areas of a county, state, or other parts of a country or species introduced from other countries.

Feral (Nonnative) Wildlife Species - Generally, any animal commonly domesticated by humans that is no longer dependent on humans to survive and living in the wild (i.e., escaped livestock, poultry, fowl, dogs, cats, etc.).

Habitat - An environment that provides the requirements (ie., food, water, shelter, and space) essential for the development and sustained existence of a species.

Habitat Modification/Management - Protection, destruction, or modification of a habitat to maintain, increase, or decrease its ability to produce, support, or attract designated wildlife species

Harvest or Kill Data - An estimate of the number of animals removed from a population by humans.

Humaneness - The perception of compassion, sympathy, or consideration for animals from the viewpoint of humans.

Integrated Pest Management - The procedure of integrating, applying, and assessing practical pest management methods while minimizing potential harmful effects to humans, nontarget species, and the environment. Often several different techniques are incorporated into a management program (i.e., cultural, exclusion, lethal and nonlethal methods, etc.).

Integrated Wildlife Damage Management - See *Integrated Pest Management.* The IPM approach applied to the objective of managing wildlife damage rather than pest animal populations. Often several different techniques are incorporated into a management program (i.e., cultural, exclusion, lethal andnonlethal methods, etc.).

Lethal Management Methods/Techniques - Wildlife damage management methods that result in the death of targeted animals (e.g., ground calling and shooting, trapping, denning, etc.).

Local Population - The population within an immediate specified geographical area.

Long-term - An action, trend, or impact that affects the potential of an event over an extended period of time.

Magnitude - Criteria used in this EA to evaluate the significance of impacts on species abundance. Magnitude refers to the number of animals removed in relation to their abundance.

Nonlethal Control Methods/Techniques - Wildlife damage management methods or techniques that do not result in the death of targeted animals (e.g., live traps, repellents, pyrotechnics, fences, etc.).

Nontarget Species/Animals - An animal species or local population that is inadvertently captured, killed, or injured during wildlife damage management and is not the targeted species/animal.

Offending Animal/Species - The individual animal(s) within a specified area causing damage to property, public health and safety, wildlife, natural resources, or to agricultural resources.

Omnivore/Omnivorous - An animal that eats both plant and animal matter; a generalist, opportunistic feeder that eats whatever is available.

Pesticide - A toxic chemical substance used to control pest animals.

Population - A group of organisms of the same species that occupies a particular area.

Predator - An animal that kills and consumes another animal.

Preventive Damage Management - Management applied before damage begins.

Prey - An animal that is killed and consumer by a predator.

Pyrotechnics - Specialize fireworks used to frighten wildlife.

Repellent - A substance with taste, odor, or tactile properties that discourages specific animals or species from using a food or place.

Requester - Individual(s) or agency(ies) that request wildlife damage management assistancefrom WS.

Selectivity - Damage management methods that affect the specific animals or species responsible for causing damage without adversely affecting other species.

Short-term - An action, trend, or impact that does not have long lasting affects to the reproductive or survival capabilities of a species.

Significant Impact - An impact that will cause important positive or negative consequences to man and his environment.

Take - The capture or killing of an animal.

Target Species/Animal/Population - An animal, species, or population at which wildlife damage management is directed.

Technical Assistance - Advise, recommendations, information, demonstrations, and materials provided to others for managing wildlife damage problems.

Threatened Species - Federal designation for a species or population that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Toxicant - A poison or poisonous substance.

Unconfirmed Losses - Losses or damage reported by resource owners or managers, but not verified by WS.

Wildlife - Any wild mammal, bird, reptile, or amphibian.

Wildlife Damage Management - Actions directed toward resolving livestock or wildlifepredation, protecting property, or safegaurding public health and safety in a coordinated, managed program.

Work Plan - A management plan developed jointly by WS and other federal, state, individuals, or other private entities specifying when, where, how, and under what constraints wildlife damage management will be conducted. Work plans generally include a map showing areas designated for planned control, restricted control, no control, and special protection.