ENVIRONMENTAL ASSESSMENT

MAMMAL DAMAGE MANAGEMENT
IN FLORIDA

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

January 2013

ACRONYMS

ABC	American Bird Conservancy
AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DEA	Drug Enforcement Administration
dRIT	Direct Rapid Immunohistochemistry Testing
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FPL	Feline Panleukopenia
FR	Federal Register
FSIS	Food Safety and Inspection Services
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal Year
IV	Intravenous
IC	Intracardiac
MOU	Memorandum of Understanding
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWP	Nationwide Permit
NWRC	National Wildlife Research Center
ORV	Oral Rabies Vaccination
PEP	Post - Exposure Prophylaxis
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
TNR	Trap, Neuter, Release Program
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Services
WMA	Wildlife Management Area
WS	Wildlife Services
ZP	Zinc Phosphide

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 PURPOSE

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS)[1] program in Florida continues to receive requests for assistance or anticipates receiving requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, and property, including threats to human safety, associated with beaver (*Castor canadensis*), black rats (*Rattus rattus*), bobcats (*Felis rufus*), coyotes (*Canis latrans*), eastern cottontail rabbits (*Sylvilagus floridanus*), feral cats (*Felis catus*), feral dogs (*Canis familiaris*), feral swine (*Sus scrofa*), Gambian rats (*Cricetomys gambianus*), gray fox (*Urocyon cinereoargenteus*), nine-banded armadillos (*Dasypus novemcinctus*), Norway rats (*Rattus norvegicus*), raccoons (*Procyon lotor*), red fox (*Vulpes vulpes*), river otters (*Lutra canadensis*), spotted skunks (*Spilogale putorius*), striped skunks (*Mephitis mephitis*),Virginia opossum (*Didelphis virginiana*), and white-tailed deer (*Odocoileus virginianus*). Normally, individual wildlife damage management projects conducted by the WS program could be categorically excluded from further analysis under the National Environmental Policy Act (NEPA), in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c), 60 FR 6000-6003).

The purpose of this Environmental Assessment (EA) is to evaluate cumulatively the individual projects conducted by WS to manage damage and threats to agricultural resources, property, natural resources, and threats to humans caused by those mammal species identified previously. This EA will assist in determining if the proposed cumulative management of mammal damage could have a significant impact on the environment based on previous activities conducted by WS and based on the anticipation of conducting additional efforts to manage damage caused by those species. Because the goal of WS would be to conduct a coordinated program to alleviate mammal damage in accordance with plans, goals, and objectives developed to reduce damage, and because the program's goals and directives[2] would be to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates those additional efforts and the analyses would be intended to apply to actions that may occur in any locale and at any time within Florida as part of a coordinated program. This EA analyzes the potential effects of mammal damage management when requested, as coordinated between WS and the Florida Fish and Wildlife Conservation Commission (FWC).

WS is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of proposed activities; and 5) evaluate and determine if there would be any potentially significant or cumulative effects from the proposed program or the alternatives. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents (see Appendix A), interagency consultations, public involvement, and previous EAs developed by WS in Florida (USDA 2002, USDA 2005*a*).

The EA evaluates the need for action to manage damage associated with mammals in the State, the potential issues associated with mammal damage management, and the environmental consequences of conducting different alternatives to meet the need for action while addressing the identified issues. The issues and alternatives associated with mammal damage management were initially developed by WS after consultation with the FWC. The FWC has regulatory authority to manage populations of mammal

[1] The WS program is authorized to protect agriculture and other resources from damage caused by wildlife through the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c).

[2] At the time of preparation, WS' Directives could be found at the following web address: http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml.

species in the State. To assist with the identification of additional issues and alternatives to managing damage associated with mammals in Florida this EA will be made available to the public for review and comment prior to the issuance of a Decision[3].

WS previously developed an EA that addressed WS' activities to manage damage associated with several species of mammals in Palm Beach County, Florida (USDA 2005*a*). Based on the analyses in that EA, a Decision and Finding of No Significant Impact was signed selecting the proposed action alternative. The proposed action alternative implemented a damage management program using a variety of methods in an integrated approach (USDA 2005*a*). In addition, WS prepared an EA that evaluated mammal damage management activities associated with alleviate predation of threatened and endangered (T&E) species along the coastal regions of the State (USDA 2002). Changes in the need for action and the affected environment have prompted WS to initiate this new analysis to address mammal damage in the State. This EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action, primarily a need to address damage and threats of damage associated with several additional species of mammals. In addition, this EA will: (1) assist in determining if the proposed management of damage associated with mammals could have a significant impact on the environment for both humans and other organisms, (2) analyze several alternatives to address the need for action and the identified issues, (3) coordinate efforts between WS and other entities, (4) inform the public, and (5) document the analyses of the environmental consequences of the alternatives to comply with the NEPA. Since activities conducted under the previous EAs will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EAs that addressed mammal damage management in Palm Beach County, Florida and T&E species protection will be superseded by this analysis and the outcome of the Decision issued for this EA.

1.2 NEED FOR ACTION

Some species of wildlife have adapted to and have thrived in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between people and wildlife. Those conflicts often lead people to request assistance with reducing damage to resources and to reduce threats to human safety. Wildlife can have either positive or negative values depending on the perspectives and circumstances of individual people. In general, people regard wildlife as providing economic, recreational, and aesthetic benefits. For some people, knowing that wildlife exists in the natural environment provides a positive benefit to many people. However, activities associated with wildlife may result in economic losses to agricultural resources, natural resources, property, and threaten human safety. Therefore, an awareness of the varying perspectives and values are required to balance the needs of people and the needs of wildlife. When addressing damage or threats of damage caused by wildlife, wildlife damage management professional must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural, and economic considerations as well.

Both sociological and biological carrying capacities must be considered when resolving wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). Those phenomena are especially important because they define the sensitivity of a person or community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any

[3]After the development of the EA by WS and consulting agencies and after public involvement in identifying new issues and alternatives, WS will issue a Decision. Based on the analyses in the EA after public involvement, a decision will be made to either publish a Notice of Intent to prepare an Environmental Impact Statement or a Finding of No Significant Impact will be noticed to the public in accordance to NEPA and the Council of Environmental Quality regulations.

associated damage. This damage threshold determines the wildlife acceptance capacity. While the biological carrying capacity of the habitat may support higher populations of wildlife, in many cases the wildlife acceptance capacity is lower or has been met. Once the wildlife acceptance capacity is met or exceeded, people begin to implement population or damage management to alleviate damage or address threats to human health and safety.

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (Berryman 1991, The Wildlife Society 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for damage management is derived from the specific threats to resources. Those species have no intent to do harm. They utilize habitats (*e.g.*, reproduce, walk, forage) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or pose a threat to human safety, people seek assistance with resolving damage or reducing threats to human safety. The threshold triggering a request for assistance is often unique to the individual person requesting assistance and can be based on many factors (*e.g.*, economic, social, aesthetics). Therefore, what constitutes damage is often unique to the individual person and damage occurring to one individual may not be considered damage by another individual. However, the use of the term "*damage*" is consistently used to describe situations where the individual person has determined the losses associated with wildlife is actual damage requiring assistance (*i.e*., has reached an individual threshold). The term "*damage*" is most often defined as economic losses to resources or threats to human safety; however, "*damage*" could also be defined as a loss in the aesthetic value of property and other situations where the behavior of wildlife was no longer tolerable to an individual person.

The need for action to manage damage and threats associated with mammals in Florida arises from requests for assistance[4] received by WS (USDA 2002, USDA 2005*a*). WS receives requests to reduce and prevent damage from occurring to four major categories: agricultural resources, natural resources, property, and threats to human safety (USDA 2002, USDA 2005*a*). WS has identified those mammal species most likely to be responsible for causing damage to those four categories in the State based on previous requests for assistance (USDA 2002, USDA 2005*a*). Table 1.1 lists WS' technical assistance projects involving mammal damage or threats of damage to those four major resource types in Florida from the federal fiscal year[5] (FY) 2006 through FY 2011.

Technical assistance has been provided by WS to those persons requesting assistance with resolving damage or the threat of damage. Technical assistance provides information and recommendations on activities to alleviate mammal damage that could be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities will be discussed further in Chapter 3 of this EA.

The technical assistance projects conducted by WS are representative of the mammal species that cause damage and threats in Florida. As shown in Table 1.1, WS has conducted 110 technical assistance projects to address damage and threats associated with those mammal species identified in this EA from FY 2006 through FY 2011. WS has conducted technical assistance projects associated with 10 mammalian species in Florida. Most of the requests for assistance have been associated with threats occurring to human safety, primarily associated with disease transmission threats. Most requests for technical assistance associated with threats to human safety are associated with raccoons, which are

[4] WS would only conduct mammal damage management after receiving a request for assistance. Before initiating mammal damage activities, a Memorandum of Understanding, cooperative service agreement, or other comparable document must be signed between WS and the cooperating entity, which would list all the methods the property owner or manager would allow to be used on property they own and/or manage.

[5] The federal fiscal year begins on October 1 and ends on September 30 the following year.

known vectors of several diseases that are transmissible to people. Of all the technical assistance projects conducted by WS from FY 2006 through FY 2011, the highest number of requests for assistance was associated with damage and threats caused by raccoons. Requests for technical assistance with agricultural damage were primarily associated with raccoons, river otters, and coyotes. WS also received requests for technical assistance associated with damage occurring to property and to natural resources. Beaver, armadillos, and coyotes were the primary species addressed during technical assistance projects involving damage or threats occurring to property while feral swine, raccoons, and coyotes were the primary species associated with damage or threats occurring to natural resources. Table 1.1 does not include projects involving operational assistance provided by WS in which WS was requested to provide direct assistance with managing damage or threats of damage. Direct operational assistance provided by WS is discussed further in Chapter 3.

Table 1.1 – Technical assistance projects conducted by WS from FY 2006 through FY 2011

Species	Projects	Species	Projects
Armadillo	7	**Opossum**	1
Beaver	11	**Feral Cat**	3
Coyote	23	**Feral Swine**	12
Gray Fox	1	**River Otter**	5
Raccoon	44	**White-tailed deer**	3

Table 1.2 lists those mammal species addressed in this EA and the resource types that those mammal species can cause damage to in Florida. Many of the mammal species can cause damage to or pose threats to a variety of resources. Most requests for assistance received by the WS program in Florida are related to threats associated with those mammal species causing damage or threats to human safety.

Table 1.2 – Mammal species that WS routinely receives requests for assistance and the resource type damage by those species

Species	Resource				Species	Resource			
	A	**N**	**P**	**H**		**A**	**N**	**P**	**H**
Beaver	X	X	X	X	**Nine-banded Armadillo**	X	X	X	X
Black Rat	X	X	X	X	**Norway Rat**	X	X	X	X
Bobcat	X	X			**Raccoon**	X	X	X	X
Coyote	X	X	X	X	**Red Fox**	X	X	X	X
Eastern Cottontail	X	X	X	X	**River Otter**	X	X		
Feral Cat	X	X	X	X	**Spotted Skunk**	X	X	X	X
Feral Dog	X	X	X	X	**Striped Skunk**	X	X	X	X
Feral Swine	X	X	X	X	**Virginia Opossum**	X	X	X	X
Gambian Rat	X	X	X	X	**White-tailed Deer**	X	X	X	X
Gray Fox	X	X	X	X					

[a]A=Agriculture, N =Natural Resources, P=Property, H=Human Safety

More specific information regarding mammal damage to those main categories are discussed in the following subsections of the EA:

Need for Mammal Damage Management to Protect Human Health and Safety

Zoonoses (*i.e.*, wildlife diseases transmissible to people) are a major concern of cooperators when requesting assistance with managing threats from mammals. Disease transmission could occur from direct interactions between humans and mammals or from interactions with pets and livestock that have direct contact with wild mammals. Pets and livestock often encounter and interact with wild mammals, which can increase the opportunity of transmission of disease to humans. Table 1.3 shows common diseases affecting humans that can be transmitted by wild mammals in addition to diseases that affect other animals, including domestic species. These include viral, bacterial, mycotic (fungal), protozoal, and rickettsial diseases.

Table 1.3 - Wildlife diseases in the Eastern United States that pose potential health risks through transmission to humans (Beran 1994, Davidson 2006)†

Disease	Causative Agent	Hosts‡	Human Exposure
Anthrax	*Bacillus antracis*	cats, dogs	inhalation, ingestion
Tetanus	*Clostridium tetani*	mammals	direct contact
Dermatophilosis	*Dermatophilus congolensis*	mammals	direct contact
Leprosy	*Mycobacterium leprae*	armadillo	inhalation, direct contact
Pasteurellaceae	*Haemophilus influenzae*	mammals	bite or scratch
Salmonellosis	*Salmonella* spp.	mammals	ingestion
Yersinosis	*Yersinia* spp.	cats	ingestion
Chlamydioses	*Chlamydophilia felis*	cats	inhalation, direct contact
Typhus	*Rickettsia prowazekii*	opossums	inhalation, ticks, fleas
Sarcoptic mange	*Sarcoptes scabiei*	red fox, coyotes, dogs	direct contact
Trichinosis	*Trichinella spiralis*	raccoons, fox	ingestion, direct contact
Rabies	*Lyssavirus* spp.	mammals	direct contact
Visceral larval	*Baylisascaris procyonis*	raccoons, skunks	ingestion, direct contact
Leptospirosis	*Leptospira interrogans*	mammals	ingestion, direct contact
Echinococcus	*Echinococcus multilocularis*	fox, coyotes	ingestion, direct contact
Toxoplasmosis	*Toxoplasma ondii*	cats, mammals	ingestion, direct contact
Spirometra	*Spirometra mansonoides*	bobcats, raccoons, fox	ingestion, direct contact
Giardiasis	*Giardia lamblia, G. duodenalis*	mammals	ingestion, direct contact

†Table 1.3 is not considered an exhaustive list of wildlife diseases that are considered infectious to humans that are carried by wildlife species. The zoonoses provided are the more common infectious diseases for the species addressed in this EA and are only a representation of the approximately 100 to 3,000 zoonoses known to exist.

‡ The host species provided for each zoonosis includes only those mammalian species addressed in this EA unless the zoonoses listed potentially infects a broad range of mammalian wildlife. Zoonoses infecting a broad range of mammals are denoted by the general term "mammals" as the host species. The diseases listed do not necessarily infect only those mammalian species covered under this EA but likely infect several species of mammals or groups of mammals. For a complete discussion of the more prevalent diseases in free-ranging mammals, please refer to Beran (1994) and Davidson (2006).

Individuals or property owners that request assistance with mammals frequently are concerned about potential disease risks but are unaware of the types of diseases that can be transmitted by those animals. In those types of situations, assistance is requested because of a perceived risk to human health or safety associated with wild animals living in close association with humans, from animals acting out of character by roving in human-inhabited areas during daylight, or from animals showing no fear when humans are present. Under the proposed action, WS could assist in resolving those types of requests for assistance.

In many circumstances when human health concerns are the primary reason for requesting WS' assistance there may have been no actual cases of transmission of disease to humans by mammals. Thus, the risk of disease transmission would be the primary reason for requesting assistance from WS. Situations in Florida where the threat of disease associated with wild or feral mammal populations may include:

- Exposure of residents to the threat of rabies due to high densities of raccoons or from companion animals encountering infected raccoons.

- Exposure of humans to threats of rabies posed by skunks that den under buildings or from companion animals interacting with infected skunks.
- Threats of parasitic infections to humans from *Giardia* spp. resulting from high feral cat populations in a park or recreation area.

The most common disease concern expressed by individuals requesting assistance is the threat of rabies transmission to humans, pets, and companion animals. Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal that poses an indirect and direct threat to humans. Indirect threats to humans occur from exposure from pets or livestock that have been infected from bites of a rabid animal. Direct threats can occur from handling infected wildlife or from aggressive animal behavior caused by rabies. The disease can be effectively prevented in humans when exposure is identified early and treated. In addition, domestic animals and pets can be vaccinated for rabies. However, the abundant and widely distributed reservoir among wild mammals complicates rabies control. The vast majority of rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in raccoons, skunks (primarily *Mephitis mephitis*), and bats (Order Chiroptera) (CDC 2011).

Over the last 100 years, the vector of rabies in the United States has changed dramatically. About 90% or greater of all animal cases reported annually to CDC now occur in wildlife (Krebs et al. 2000, CDC 2011). Before 1960, the majority of cases were reported in domestic animals. The principal rabies hosts today are wild carnivores and bats. The number of rabies-related human deaths in the United States has declined from more than 100 annually in the early 1900s to an average of one or two people per year in the 1990s. Modern day prophylaxis, which is the series of vaccine injections given to people who have been potentially or actually exposed, has proven nearly 100% successful in preventing mortality when administered promptly (CDC 2011). In the United States, human fatalities associated with rabies occur in people who fail to seek timely medical assistance, usually because they were unaware of their exposure to rabies. Although human rabies deaths are rare, the estimated public health costs associated with disease detection, prevention, and control have risen, exceeding $300 million annually. Those costs include the vaccination of companion animals, maintenance of rabies laboratories, medical costs such as those incurred for exposure case investigations, rabies post-exposure prophylaxis (PEP), and animal control programs (CDC 2011).

Accurate estimates of the aforementioned expenditures are not available. Although the number of PEPs given in the United States each year is unknown, it has been estimated to be as high as 40,000. When rabies becomes epizootic (*i.e.*, affecting a large number of animals over a large area) or enzootic (*i.e.*, present in an area over time but with a low case frequency) in a region, the number of PEPs in that area increases. Although the cost varies, a course of rabies immunoglobulin and five doses of vaccine given over a 4-week period typically exceeds $1,000 (CDC 2011) and has been reported to be as high as $3,000 or more (Meltzer 1996). As epizootics spread in wildlife populations, the risk of "*mass*" human exposures requiring treatment of large numbers of people that contact individual rabid domestic animals infected by wild rabid animals increases. One case in Massachusetts involving contact with, or drinking milk from, a single rabid cow required PEPs for 71 persons (CDC 1999). The total cost of this single incident exceeded $160,000 based on a median cost of $2,376 per PEP in Massachusetts. Likely, the most expensive single mass exposure case on record in the United States occurred in 1994 when a kitten from a pet store in Concord, New Hampshire tested positive for rabies after a brief illness. Because of potential exposure to the kitten or to other potentially rabid animals in the store, at least 665 persons received post-exposure rabies vaccinations at a total cost of more than $1.1 million (Noah et al. 1995). The American Veterinary Medical Association (AVMA) estimated the total cost for this specific incident, including investigation, laboratory testing, and rabies immunoglobulin and vaccines was more than $1.5 million (AVMA 2004).

Raccoons have been associated with the spread of rabies throughout the eastern United States, including Florida (USDA 2005*b*). Rabies in raccoons was virtually unknown prior to the 1950s. It was first described in Florida and spread slowly during the next three decades into Georgia, Alabama, and South Carolina. It was unintentionally introduced into the Mid-Atlantic States, probably by translocation of infected animals (Krebs et al. 1998). The first cases appeared in West Virginia and Virginia in 1977 and 1978, respectively. Since then, the raccoon variant of rabies expanded to form the most intensive rabies outbreak in the United States. The variant is now enzootic in all of the eastern coastal states, as well as Alabama, Pennsylvania, Vermont, West Virginia, and most recently, parts of Ohio (Krebs et al. 2000). The raccoon rabies epizootic front reached Maine in 1994, reflecting a movement rate of about 30 to 35 miles per year. The westward movement of the raccoon rabies front has slowed, probably in response to both natural geographic and man-made barriers. The Appalachian Mountains and perhaps river systems flowing eastward have helped confine the raccoon variant to the eastern United States. In addition, the USDA has created an oral rabies vaccine (ORV) "*barrier*" of vaccinated wild animals on the western edge of the Appalachian Mountains (USDA 2005*b*). If this combined barrier were breached by raccoon variant rabies, research suggests that raccoon populations would be sufficient for rabies to spread westward at a rate similar to or greater than the rate at which this rabies strain has spread in the eastern United States (Sanderson and Huber, Jr. 1982, Glueck et al. 1988, Hasbrouck et al. 1992, Mosillo et al. 1999).

The raccoon variant of rabies presents a human health threat through potential direct exposure to rabid raccoons, or indirectly through the exposure of pets that have an encounter with rabid raccoons. Additionally, the number of pets and livestock examined and vaccinated for rabies, the number of diagnostic tests requested, and the number of post exposure treatments are all higher when raccoon rabies is present in an area. Human and financial resources allocated to rabies-related human and animal health needs also increase, often at the expense of other important activities and services.

In an effort to halt the westward spread of the raccoon variant of the rabies virus and to limit the spread of the canine variant from Texas, WS began participating in the distribution of ORV baits (fishmeal polymer containing Raboral V-RG® vaccine [Merial, Athens, Georgia, USA]). Currently, WS participates in the distribution of ORV baits and the surveillance of wildlife rabies vectors in 26 states, including Florida. ORV baits were first distributed by WS in Florida during February 2003. A total of 500,507 baits were distributed (270,234 by air and 230,273 by hand) across a 6,474 square kilometer area which included portions of Hernando, Hillsborough, Lake, Pinellas, Polk, and Sumter Counties, and all of Pasco County in the Tampa Bay area of Florida. Florida expanded its baiting program in 2005 by 1,188 square kilometer to include larger portions of Lake and Polk Counties. The total area where baits are distributed has decreased to its current size of 1,663 square kilometer, with 172,800 baits distributed in 2010. Since the inception of the program in February 2003, 3,672,548 ORV baits have been distributed in Florida. In 2007, as added surveillance, WS collected 124 samples for rabies testing. Of those 124 samples, two samples tested positive to the southeast raccoon rabies variant. In 2008, WS implemented Direct Rapid Immunohistochemistry Testing (dRIT) to aid CDC in the testing of surveillance animals. Since 2008, 1,133 animals have been tested by WS through dRIT; 16 of these have been confirmed positive for the southeast raccoon rabies variant by CDC. WS' participation in the ORV program is further addressed in a separate EA (USDA 2005*b*) but will be addressed in this EA to evaluate potential cumulative effects of activities proposed in this EA and the capturing and releasing of target animals during surveillance activities associated with the ORV program (USDA 2005*b*)[6].

[6]The supplemental EA addressing WS' participation in an ORV distribution and surveillance program contains the analyses for distribution of ORV baits and for surveillance activities conducted in Florida. The analyses contained in this EA do not reflect WS' actions for capturing and releasing target animals during surveillance activities associated with the ORV program since those actions are addressed in the referenced ORV EA.

The Florida Department of Health and the Florida Department of Agriculture and Consumer Services (FDACS) have provided the state leadership for the baiting effort. WS provided wildlife management leadership and contributed considerable funding to prevent the spread of rabies. Florida's baiting effort is a sister research project to the Massachusetts ORV Project.

Skunks are also an important wildlife host for the rabies virus in North America and are second only to raccoons in being the most commonly reported rabid wildlife species in the United States (Majumdar et al. 2005). The skunk variant of rabies may be found in the Midwest and California; however, skunks found throughout North America may be infected with different variants of rabies such as the raccoon variant. The distribution of rabies in skunks extends from Georgia to Maine east of the Appalachians, Texas to the Canadian border, and throughout the northern two thirds of California (Majumdar et al. 2005). The fox is one of the four major maintenance hosts for rabies in North America. In the 1950s, rabies in red fox spread throughout Canada, parts of New England, and Alaska. The range has since decreased, but fox rabies persists in Alaska and parts of Texas. Clinical signs of rabies in fox are often manifested as the "*furious*" form of rabies (Majumdar et al. 2005).

Increasing populations of raccoons have been implicated in the outbreak of distemper in certain areas (Majumdar et al. 2005). Distemper has not been identified as transmissible to humans. However, cooperators who feel threatened by the possibility of disease transmission often request assistance after observing sick raccoons on their property. Symptoms of distemper often lead to abnormal behavior in raccoons that are similar to symptoms associated with rabies. Raccoons with distemper often lose their fear of humans and can act aggressively which increases the risk that people, livestock, or companion animals may be bitten. Distemper is also known to occur in coyotes, red fox, and gray fox with symptoms that are similar to those exhibited by animals infected with the rabies virus.

Diseases and parasites affecting feral cats and dogs can have particularly serious implications to human health given the close association of those animals with humans and companion animals. The topic of feral animals and their impacts on native wildlife and human health elicits a strong response in numerous professional and societal groups with an interest in the topic. Feral cats and dogs are considered by most professional wildlife groups to be a non-native species that has detrimental impacts to the native ecosystems especially in the presence of a human altered landscape. However, a segment of society views feral animals to be an extension of companion animals that should be cared for and for which affection bonds are often developed especially when societal groups feed and care for individual feral animals. Of special concern are those cats and dogs considered companion animals that are not confined indoors at all times but are allowed to range outside the home for extended periods. If interactions occur between companion animals and feral animals of the same species, companion animals could become exposed to a wide-range of zoonoses that could be brought back into the home where direct contact between the companion animal and people increases the likelihood of disease transmission. Feral animals that are considered companion animals are also likely to affect multiple people if disease transmission occurs since those animals are likely to come in direct contact with several members of families and friends before diagnosis of a disease occurs.

Several known diseases that are infectious to people, including rabies, have been found in feral cats and dogs. A common zoonosis found in cats is ringworm. Ringworm (*Tinea* spp.) is a contagious fungal disease contracted through direct interactions with an infected person, animal, or soil. Other common zoonoses of cats are pasteurella, salmonella, cat scratch disease, and numerous parasitic diseases, including roundworms, tapeworms, and toxoplasmosis.

Most of the zoonoses known to infect cats and dogs that are infectious to humans are not life threatening if diagnosed and treated early. However, certain societal segments are at higher risks if exposed to zoonoses. Women who are pregnant, people receiving chemotherapy for immunologic diseases and organ transplants, and those with weakened immune systems are at increased risk of clinical disease if exposed to toxoplasmosis (AVMA 2004). In 1994, five Florida children were hospitalized with encephalitis that was associated with cat scratch fever (AVMA 2004). The daycare center at the University of Hawaii in Manoa was closed for two weeks in 2002 because of concerns about potential transmission of murine typhus (*Rickettsia typhi*) and flea (*Ctenocephalides felis*) infestations afflicting 84 children and faculty. The fleas at the facility originated from a feral cat colony that had grown from 100 cats to over 1,000, despite a trap, neuter, and release effort (AVMA 2004).

A study in France determined that stray cats serve as major reservoirs for the bacterium *Bartonella* spp. 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 fleabites. 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). 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 (Vaughn 1976, Eng and Fishbein 1990, Krebs et al. 1996).

Feral swine can pose a threat to human safety from disease transmission, from aggressive behavior, and from being struck by vehicles and aircraft. Feral swine are potential reservoirs for at least 30 viral and bacterial diseases (Samuel et al. 2001, Williams and Barker 2001, Davidson 2006) and 37 parasites (Forrester 1991) that are transmissible to humans. Brucellosis, salmonellosis, toxoplasmosis, trichinosis, tuberculosis, and tularemia are some of the common diseases that can be carried by feral swine that are also known to infect humans (Stevens 1996, Hubalek et al. 2002, Seward et al. 2004). In addition, feral swine can pose risks to domestic livestock through the potential transmission of diseases between feral swine populations and domestic livestock where interactions may occur.

This discussion on zoonoses is intended to briefly address the more common known zoonoses found in the United States for those species specifically addressed in this EA but is not intended to be an exhaustive discussion of all potential zoonoses. The transmission of diseases from wildlife to humans is neither well documented nor well understood for most infectious zoonoses. Determining a vector for a human infected with a disease known to occur in wildlife populations is often complicated by the presence of the known agent across a broad range of naturally occurring sources. For example, a person with salmonella poisoning may have contracted salmonella bacterium from direct contact with an infected pet but may have also contracted the bacterium from eating undercooked meat or from other sources.

Disease transmission directly from wildlife to humans is uncommon. However, the infrequency of such transmission does not diminish the concerns of those individuals requesting assistance that are fearful of exposure to a diseased animal since disease transmissions have been documented to occur. WS actively attempts to educate the public about the risks associated with disease transmission from wildlife to humans through technical assistance and by providing technical leaflets on the risks of exposure.

In addition to disease transmission threats, requests are also received for assistance from perceived threats of physical harm from wildlife, especially from predatory wildlife. Human encroachment into wildlife habitat increases the likelihood of human-wildlife interactions. Those species that humans are likely to encounter are those most likely to adapt to and thrive in human altered habitat. Several predatory and omnivorous wildlife species thrive in urban habitat due to the availability of food, water, and shelter. Many people enjoy wildlife to the point of purchasing food specifically for feeding wildlife despite laws prohibiting the act in many areas. The constant presence of human created refuse, readily available water supplies, and abundant rodent populations found in some areas often increases the survival rates and carrying capacity of wildlife species that are adaptable to those habitats. Often the only limiting factor of wildlife species in and around areas inhabited by people is the prevalence of diseases, which can be confounded by the overabundance of wildlife congregated into a small area that can be created by the unlimited amount of food, water, and shelter found within those habitats.

Beaver activity in certain situations can become a threat to public health and safety (*e.g.*, burrowing into or flooding of roadways and railroad beds can result in serious accidents) (Miller 1983, Woodward 1983). Increased water levels in urban areas resulting from beaver activity can lead to unsanitary conditions and potential health problems by flooding septic systems and sewage treatment facilities (DeAlmeida 1987, Loeb 1994). Beaver damming activity also creates conditions favorable to mosquitoes and can hinder mosquito control efforts or result in population increases of these insects (Wade and Ramsey 1986). While the presence of these insects is largely a nuisance, mosquitoes can transmit diseases, such as encephalitis (Mallis 1982).

In addition, beaver, which are carriers of the intestinal parasite *Giardia lamblia* can contaminate human water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Beach and McCulloch 1985, Wade and Ramsey 1986, Miller and Yarrow 1994). Giardiasis is an illness caused by a microscopic parasite that have become recognized as one of the most common causes of waterborne disease in humans in the United States during the last 15 years (CDC 1999). Giardiasis is contracted by swallowing contaminated water or putting anything in your mouth that has touched the fecal mattr of an infected animal or person. Symptoms of giardiasis include diarrhea, cramps, and nausea (CDC 1999). Beaver are also known carriers of tularemia, a bacterial disease that is transmittable to humans through bites by insect vectors, bites of infected animals, or by handling animals or carcasses that are infected (Wade and Ramsey 1986). Skinner et al. (1984) found that in cattle-ranching sections of Wyoming the fecal bacteria count was much higher in beaver ponds than in other ponds, something that can be a concern to ranchers and recreationists. Furthermore, damming of streams sometimes increases the number of aquatic snakes, including the poisonous cottonmouth (Wade and Ramsey 1986).

As people are increasingly living with wildlife, the lack of harassing and threatening behavior by people toward many species of wildlife has led to a decline in the fear wildlife have toward people. When wildlife species begin to habituate to the presence of humans and human activity, a loss of apprehension occurs that can lead to threatening behavior toward humans. This threatening behavior continues to increase as human populations expand and the populations of those species that adapt to human activity increase. Threatening behavior can be in the form of aggressive posturing, a general lack of apprehension toward people, or abnormal behavior. Although wildlife attacking people occurs rarely, the number of attacks appears to be on the increase. Timm et al. (2004) reported that coyotes attacking people have increased in California and the recent, highly publicized coyote attacks, including a fatal attack on a 19-year old woman in Nova Scotia (Canadian Broadcast Company 2009), have only heightened people's awareness of the threat of such encounters. Although attacks on people associated with those species addressed in the EA occurs rarely, requests for assistance to lessen the threat of possible attack do occur from people in Florida. Often, wildlife exhibiting threatening behavior or a loss of apprehensiveness to the presence of humans is a direct result and indication of an animal inflicted with a disease. So, requests for assistance are caused by both a desire to reduce the threat of disease transmission and from fear of aggressive behavior either from an animal that is less apprehensive of people or induced as a symptom of disease.

The primary request for assistance to reduce threats to human safety received by WS is to lessen the threat of disease transmission from exposure to wildlife. Since FY 2006, the mammalian wildlife species of most concern to the public based on requests for assistance in Florida are raccoons and feral swine. Public concerns associated with raccoons are due to the high prevalence of rabies in their populations. To a lesser extent, this is a concern for threats caused by feral cats and dogs.

Disease Surveillance and Monitoring

Public awareness and health risks associated with zoonoses (*i.e*., diseases of animals that can be transmitted to humans) have increased in recent years. Several zoonotic diseases associated with mammals are addressed in this EA. Those zoonotic diseases remain a concern and continue to pose threats to human safety where people encounter mammals. WS has received requests to assist with reducing damage and threats associated with several mammal species in Florida and could conduct or assist with disease monitoring or surveillance activities for any of the mammal species addressed in this EA. Most disease sampling would occur ancillary to other wildlife damage management activities (*i.e*., disease sampling occurs after wildlife have been captured or lethally taken for other purposes). For example, WS may sample deer harvested during the annual hunting season or during other damage management programs for Chronic Wasting Disease or may collect ticks from raccoons that were lethally taken to alleviate damage occurring to property. WS could sample feral swine taken by private landowners or during damage management activities to test for classical swine fever, swine brucellosis, pseudorabies, or other diseases.

Need for Mammal Damage Management at Airports

Airports provide ideal conditions for many wildlife species due to the large open grassy areas adjacent to brushy, forested habitat used as noise barriers. Access to most airport properties is restricted so mammals living within airport boundaries are not harvestable during hunting and trapping seasons and would be insulated from many other human disturbances.

The civil and military aviation communities have acknowledged that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer 2000, MacKinnon et al. 2001, Dolbeer 2009). Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996, Robinson 1996, Thorpe 1997, Keirn et al. 2010). Aircraft collisions with wildlife can also erode public confidence in the air transport industry as a whole (Conover et al. 1995).

Between 1990 and 2010, there were 2,558 reported aircraft strikes involving terrestrial mammals in the United States (Dolbeer et al. 2012). The number of mammal strikes actually occurring is likely to be much greater, since Dolbeer (2009) estimated 39% of civil wildlife strikes are actually reported. Civil and military aircraft have collided with a reported 36 species of terrestrial mammals from 1990 through 2010, including raccoons, fox, cats, coyotes, opossums, and striped skunks. In addition, 13 species of bats have been identified as having been struck by aircraft in the United States (Dolbeer et al. 2012). Of the terrestrial mammals reported struck by aircraft, 33% were carnivores (primarily coyotes), causing nearly $3.2 million in damages (Dolbeer et al. 2012). Deer accounted for 39% of the reported strikes involving terrestrial mammals in the United States causing nearly $31 million in damages (Dolbeer et al. 2012). Data also indicates that a much higher percentage of mammal strikes resulted in aircraft damage compared to bird strikes (Dolbeer et al. 2012). Costs of those collisions vary, but the Federal Aviation Administration (FAA) data reveals that mammal strikes in the United States cost the civil aviation industry approximately 275,290 hours of down time and $41.1 million in direct monetary losses between 1990 and 2010 (Dolbeer et al. 2012).

About 59% of mammal strikes in the United States have resulted in damage compared to 13% for birds from 1990 through 2010 (Dolbeer et al. 2012). In addition to direct damage, an aircraft striking a mammal can pose serious threats to human safety if the damage from the strike causes a catastrophic failure of the aircraft leading to a crash. For example, damage to the landing gear during the landing roll and/or takeoff run can cause a loss of control of the aircraft, causing additional damage to the aircraft and increasing the threat to human safety. Nearly 63% of the reported mammal strikes from 1990 through

2010 occurred at night, with 63% occurring during the landing roll or the takeoff run (Dolbeer et al. 2012).

Since 1990, aircraft have struck 23 armadillo, eight coyotes, 12 fox, nine raccoons, 18 opossums, three skunks, one cat, three dogs, and 18 white-tailed deer in Florida according to reports filed with the FAA (FAA 2011). Airports in Florida have requested assistance with managing threats to human safety and damage to property associated with mammals present inside the area of operations of airports. From FY 2006 through FY 2010, WS has conducted work on 12 military and 29 civilian airports throughout the State of Florida. The infrequency of mammal strikes does not lessen the need to prevent threats to human safety and the prevention of damage to property. Preventing damage and reducing threats to human safety is the goal of those cooperators requesting assistance at airports in Florida given that a potential strike can lead to the loss of human life and considerable damage to property.

Wildlife populations near or found confined within perimeter fences at airports can be a threat to human safety and cause damage to property when struck by aircraft. Those wildlife confined inside an airport perimeter fence would not be considered distinct populations nor separate from those populations found outside the perimeter fence. Wildlife found within the boundaries of perimeter fences originate from populations outside the fence. Those individuals of a species inside the fence neither exhibit nor have unique characteristics from those individuals of the same species that occur outside the fence; therefore, those individuals of a species confined inside an airport perimeter fence do not warrant consideration as a unique population under this analysis.

Need for Mammal Damage Management to Protect Agricultural Resources

Red fox, gray fox, coyotes, bobcats, deer, and other mammals can cause losses or injury to crops, livestock (*e.g*., sheep, goats, cattle, pigs, horses) and poultry (*e.g*., chickens, turkeys, geese, ducks) through consumption or predation. During 2001, crop and livestock losses from wildlife in the United States totaled $944 million, with field crop losses totaling $619 million, livestock and poultry losses totaling $178 million, and losses of vegetables, fruits, and nuts totaling $146 million. Those losses include destruction of or damage to crops in the field and death or injury to livestock. In 2001, the National Agricultural Statistics Service (NASS) reported that raccoons were responsible for 6%, 3%, and 6% of the total damage to field crops; livestock and poultry; and vegetables, fruits, and nuts, respectively, in the United States (NASS 2002). In addition, white-tailed deer accounted for 58% of the total field crop damage and 33% of vegetable, fruit, and nut damage. Wild pigs accounted for 3% or $18.5 million in damages to field crops (NASS 2002).

In 2010, the NASS (2011) reported cattle and calf losses from animal predation totaled 219,900 head in the United States according to livestock producers. Animal predation represented 5.5% of the total cattle and calf losses reported by livestock producers in 2010 totaling $98.5 million in economic losses. Coyotes were indicated as the primary predator of livestock with 53.1% of cattle and calf losses attributed to coyotes. Livestock losses were also attributed to bobcats, bears, and dogs. Producers spent nearly $188.5 million dollars on non-lethal methods to reduce cattle and calf losses from predation by animals in 2010 (NASS 2011). The primary non-lethal method employed by livestock producers was the use of guard animals with a reported 36.9% of producers using guard animals. Producers also reported using exclusion fencing, frequent checking, and culling as additional employed methods for reducing predation (NASS 2011).

In Florida, the NASS (2011) reported 900 cattle and 5,400 calves were killed in 2010 by animal predators. The economic loss from animal predators in Florida was estimated at nearly $2.5 million in 2010 (NASS 2011). Coyotes were attributed to 40.8% of the reported cattle losses and 77.4% of the calf losses in Florida. Dogs accounted for 9.0% of the cattle reported lost while 0.5% of the calves lost were attributed to dogs in the State (NASS 2011). Florida cattle producers reported using a number of non-lethal methods to reduce losses due to predators. The use of exclusion fencing was being employed by 14.1% of Florida livestock producers along with 37.4% reporting the use of guard animals (NASS 2011).

The NASS (2011) reported that 1.9% of the calves lost to animal predators were attributed to mountain lions and bobcats[7] predation in Florida. Cattle producers in the United States indicated mountain lions and bobcats caused 7.8% of the calf losses and 12.1% of the cattle losses attributed to animal predators in 2010 (NASS 2011). Bobcats are also known to prey on other livestock.

River otters may prey on fish and other cultured species at hatcheries and aquaculture facilities (Bevan et al. 2002). River otters may even prey on fish in marine aquaculture facilities (Goldburg et al. 2001).

The domestic cat has been found to transmit *Toxoplasma gondii* to both domestic and wild animal species. 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 *T. gondii* (Dubey 1973, Teutsch et al. 1979). Both feral and domiciled cats may be infected by this protozoan, but this infection is more common in feral cats. Fitzgerald et al. (1984) documented that feral cats transmitted *T. gondii* to sheep in New Zealand, resulting in ewes aborting fetuses. 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 *T. 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.

Diseases that may be communicable from feral cats to companion cats include feline panleukopenia (FPL) infection, feline calicivirus infection, feline reovirus infection, and feline syncytium-forming virus infection (Gillespie and Scott 1973). Of the four feline diseases, feline panleukopenia is considered 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 the July to September period.

Agricultural damage and threats caused by feral swine in Florida occurs to crops, livestock, and other agricultural resources. Damage occurs from direct consumption of agricultural crops and from trampling, rooting, and/or wallowing that are common activities of feral swine (Beach 1993). Rooting is a common activity of feral swine during their search for food where they overturn sod and soil (Stevens 1996). Feral swine also wallow in water and mud to regulate body temperature and to ward off skin parasites.

Damage and threats to livestock associated with feral swine occurs from predation on livestock and the risks associated with disease transfer from feral swine to domestic livestock. Feral swine can also cause damage to other agricultural resources. For example, feral swine can cause damage to pastures and land used for hay by rooting and wallowing, can cause damage to ponds and water sources for livestock, and can cause damage from the consumption of livestock feed. Feral swine feeding activities in agricultural crops can also lead to increased erosion from the removal of vegetation that leaves the soil bare along with the overturning of soil caused by rooting.

In addition, feral swine also damage pastures, land used for hay, and sod farms from rooting and wallowing activities (Beach 1993). Rooting activities can also lead to increased erosion and soil loss. Wallowing and rooting activities in livestock watering areas can lead to a degradation in water quality through an increase in turbidity, by causing algal blooms, by depleting dissolved oxygen, and increasing

[7] The 2011 NASS cattle loss report groups mountain lion and bobcat predation into one category and does not separate losses attributed to the two species. Mountain lions, given their preference for larger prey, are likely the cause of most of the losses attributed to this category, especially to adult cattle. However, bobcats are known to prey upon calves though infrequently.

erosion (Beach 1993). Since feral hogs often travel in family groups, damages from rooting and wallowing can be extensive often encompassing several acres.

Additional risks associated with feral hogs are the potential for disease transmission from feral swine to domestic livestock, especially to domestic swine. Feral swine are potential reservoirs for several diseases that are known to be transmissible between feral swine and domestic livestock (Wood and Barrett 1979, Corn et al. 1986, Beach 1993, Davidson 2006). Corn et al. (1986) found feral swine tested in Texas were positive for pseudorabies, brucellosis, and leptospirosis. A study in Oklahoma found samples from feral swine tested positive for antibodies of porcine parvovirus, swine influenza, and porcine reproductive and respiratory syndrome virus (Saliki et al. 1998). Cholera, trichinosis, and African swine fever are additional diseases that can be transmitted between livestock and feral swine. Disease transmission is likely to occur where domestic livestock and feral swine have a common interface, such as at water sources and livestock feeding areas.

Although several diseases that are carried by swine are also transmissible to other livestock, the primary concern is the potential transmission of diseases from feral swine to domestic swine. Pseudorabies is a viral disease associated with an extremely contagious herpes virus that can have negative effects on reproduction in domestic swine. Brucellosis is a bacterial disease that can also have negative effects on reproduction in swine. Many of the other diseases associated with feral swine also negatively affect the health and marketability of domestic swine that can lead to economic losses to the livestock producer. The United States is one of the world's largest producers of pork and is the second largest exporter of pork. Pork production in the United States accounts for about 10% of the total world supply. The retail value of pork sold to consumers exceeds $30 billion annually. In addition, the pork industry supports more than 600,000 jobs. An economic analysis estimated that the annual cost of pseudorabies to pork producers in the United States at more than $30 million annually in lost production as well as testing and vaccination costs (USDA 2008).

Although the source of livestock disease outbreaks can be difficult to identify, a risk of transmission and the spreading of diseases to domestic swine and other livestock exists wherever feral swine and domestic livestock interact. A disease outbreak not only has negative economic implications to the individual livestock producer, but also can cause economic losses that can negatively affect the statewide swine industry.

In addition to the potential for disease transmission, feral swine are also known to predate on livestock. Feral swine are known to kill calves, kids, lambs, and poultry (Stevens 1996, West et al. 2009). Predation occurs primarily on young livestock but feral hogs can also kill weakened or injured livestock. If feral swine populations continue to increase, WS could be requested to address localized predation associated with feral swine.

Beaver are the largest member of the Order Rodentia, which is characterized by mammal species that have upper and lower incisors (teeth) that grow continually. To prevent the overgrowth of the incisors, beaver must wear down the teeth through gnawing. Beaver feed and gnaw on woody vegetation to keep teeth worn to appropriate levels. This feeding and gnawing behavior often girdles trees and other woody vegetation leading to the death of the vegetation. Beaver are also known to feed on agricultural crops such as soybeans and corn (Chapman 1949, Roberts and Arner 1984). Where beaver are located near agricultural fields, consumption of crops can be high. During stomach content analyses of beaver, Roberts and Arner (1984) found that the stomachs of 83% of the beaver sampled in the summer near soybean fields contained only soybeans.

Flooding damage associated with beaver occurs when crops or pastures are inundated causing the death of plants. Flooding can also prevent access of agricultural producers to crops or livestock to forage areas.

Beaver dams across irrigation canals can prevent irrigation activities and flood surrounding cropland. Beaver often burrow into earthen embankments of canals, which can weaken the structural integrity of the structure through erosion and by allowing water to seep into interior of the structure. Beaver damage can lead to the failure of the embankments leading to costly repairs of the embankment and the potential for flooding.

Examples of some of the requests for assistance to resolve or alleviate damage to agricultural resources that the WS' program in Florida has responded to include:

- Coyotes attacking and killing calves and sheep
- Beaver dams causing flooding of tree plantations
- Feral swine rooting up commercial tree plantations

Need to Resolve Damage Occurring to Natural Resources

Natural resources may be described as those assets belonging to the public and often managed and held in trust by government agencies as representatives of the people. Such resources may be plants or animals, including T&E; historic properties; or habitats in general. Examples of natural resources in Florida are historic structures and places; parks and recreation areas; natural areas, including unique habitats or topographic features; threatened and endangered plants or animals; and any plant or animal populations which have been identified by the public as a natural resource.

Mammals can also cause damage to natural resources. Mammals causing damage are often locally overabundant at the damage site and threaten the welfare of a species population identified as a natural resource. An example of this would be nest predation of a local ground-nesting bird population by mammalian carnivores, such as raccoons, armadillos, opossum, feral swine, feral cats, coyotes, or fox. Massey (1971) and Massey and Atwood (1981) found that predators can prevent endangered least terns (*Sterna antillarum*) from nesting or cause them to abandon previously occupied sites. In another study, mammalian predators were found to have adversely affected the nesting success of least terns on sandbars and sandpits (Kirsch 1996).

In 2006, at Cayo Costa State Park, in Lee County, Florida, the nest depredation rate for federally endangered sea turtle species nesting on the island was 74%. In 2007, after an intensive nest predator removal project focused on raccoons and feral hogs, sea turtle nest depredation dropped to 7%. Least Terns, a threatened species in Florida, also use Cayo Costa beaches for nesting. In 2006, prior to the nest predator removal project, the disturbance rate for tern nests was 100% and no hatchlings emerged from nests. In 2007, the disturbance rate for tern nests fell to 4% and 58 hatchlings were recorded by Florida Department of Environmental Protection (FDEP) personnel (T. Hingten, FDEP, pers. comm. 2007). Confirmed nest and hatchling predators on Florida beaches include raccoons, nine-banded armadillos, Virginia opossum, spotted skunks, coyotes, red fox, gray fox, feral swine, and feral cats.

Scientists estimate that nationwide cats kill hundreds of millions of birds and more than a billion small mammals, such as rabbits, squirrels, and chipmunks, each year. The American Bird Conservancy (ABC) states that "*cats often kill common* [bird] *species such as cardinals, blue jays, and house wrens, as well as rare and endangered species such as piping plovers, Florida scrub-jays, and California least terns*" (ABC 2011). Some feral and free-ranging cats kill more than 100 animals each year. For example, at a wildlife experiment station, a roaming, well-fed cat killed more than 1,600 animals over 18 months, primarily small mammals (ABC 2011). Researchers at the University of Wisconsin coupled their four-year cat predation study with the data from other studies, and estimated that rural feral and free-ranging cats kill at least 7.8 million and perhaps as many as 217 million birds a year in Wisconsin (Coleman et al. 1997). In some parts of Wisconsin, feral and free ranging cat densities reached 114 cats per square mile, outnumbering all similar-sized native predators (Coleman et al. 1997). Churcher and Lawton (1989) observed 77 well fed free-ranging cats in a British village for one year. Churcher and Lawton (1989) estimated that 30% to 50% of a cat's catch were birds and that the cats had adversely affected house sparrow populations within the village. Based on information acquired in the study, Churcher and Lawton (1989) estimated that more than 20 million birds are killed by cats in Britain each year with more than 70 million animals overall being taken by cats annually.

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. Fitzgerald (1990) found that cats on the mainland fed most heavily on mammals; whereas, 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) along with mammals as large as hares and rabbits. Many cat populations rely heavily on humans either for handouts and/or for garbage. 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, while 24% were birds. 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 1974). Microtine rodents are particularly susceptible to over harvest by cats and other predators (Pearson 1964). Coman and Brunner (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. Some people view the predation of rodents by cats as beneficial, but native small mammals are important to maintaining biologically diverse ecosystems. Field mice and shrews are also important prey for birds such as great horned owls and red-tailed hawks.

Reptiles are thought to provide an important food source to cats when birds and mammals are less abundant, and in some situations, cats have been observed to prey on threatened species of reptiles. Domesticated cats have been identified as significant nest and/or hatchling predators of sea turtles. A study on the Aldabra Atoll, Seychelles found feral cats had an adverse effect on green turtle hatchlings. Seabrook (1989) found a positive correlation in cat activity and green turtle nesting at Aldabra Atoll. 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).

Cats can adversely affect local wildlife populations, especially in habitat "*islands*", such as suburban and urban parks, wildlife refuges, and other areas surrounded by human development (Wilcove 1985). The loss of bird species from habitat islands is well documented and nest predation is an important cause of the decline of neotropical migrants (Wilcove 1985). A two-year study was conducted in two parks with grassland habitat. One park had no cats but more than 25 cats were being fed daily in the other park. There were almost twice as many birds seen in the park with no cats as in the park with cats. California thrasher and California quail, both ground-nesting birds, were seen during surveys in the no-cat area; whereas, they were never seen in the cat area. In addition, more than 85% of the native seer mice and harvest mice trapped were in the no-cat area; whereas, 79% of the house mice, an exotic pest species, were trapped in the cat area. The researchers concluded, "*Cats at artificially high densities, sustained by supplemental feeding, reduce abundance of native rodent and bird populations, change the rodent species composition, and may facilitate the expansion of the house mouse into new areas*" (Hawkins et al. 1999).

Childs (1986) and Childs (1991) found that urban 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. The duration of susceptibility of rats to predation is attributed to abundance of garbage and artificial food sources in the urban 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. 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.

Impacts from cat predation are not always direct, but indirect in the form of competition for food resources. 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 affect some birds-of-prey by competing for a limited resource (primarily microtine rodents).

Deer overabundance can affect native vegetation and natural ecosystems in addition to ornamental landscape plantings. White-tailed deer selectively forage on vegetation (Strole and Anderson 1992), and thus can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). These changes can lead to adverse impacts on other wildlife species, which depend on these plants for food and/or shelter. Numerous studies have shown that over browsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and diversity (Warren 1991). By one count, 98 species of threatened and endangered plants, many of them orchids and lilies, are disturbed by deer browsing (Ness 2003).

The alteration and degradation of habitat from over-browsing by deer can have a detrimental effect on deer herd health and may displace other wildlife communities (*e.g.*, neotropical migrant songbirds and small mammals) that depend upon the understory vegetative habitat destroyed by deer browsing (Virginia Department of Game and Inland Fisheries 1999). Similarly, deCalesta (1997) reported that deer browsing affected vegetation that songbirds need for foraging surfaces, escape cover, and nesting. Species richness and abundance of intermediate canopy nesting songbirds was reduced in areas with higher deer densities (deCalesta 1997). Intermediate canopy-nesting birds declined 37% in abundance and 27% in species diversity at higher deer densities. Five species of birds were found to disappear at densities of 38.1 deer per square mile and another two disappeared at 63.7 deer per square mile. Casey and Hein (1983) found that three species of birds could no longer be found in a research preserve stocked with high densities of ungulates and that the densities of several other species of birds were lower than in an adjacent area with lower deer density. Waller and Alverson (1997) hypothesize that by competing with squirrels and other fruit-eating animals for oak mast, deer may further affect many other species of animals and insects.

Feral swine compete with over 100 species of native wildlife for important and limited natural food supplies. Some species including quail, turkey, endangered sea turtles, and shorebirds are at risk of predation by nest destruction and the consuming of eggs. Feral swine cause damage to natural areas such as parks and wildlife management areas in Florida. Those sites can suffer erosion and local loss of critical ground plants and roots, as well as destruction of seedlings because of feral swine feeding and rooting (Barrett and Birmingham 1994). Many state and federal natural resource managers are now in the process of controlling hog numbers because of their known impact to endangered plants and animals (Thompson 1977, West et al. 2009).

Feral swine are not native to North America, and many native species have not evolved to deal with swine competition or predation. Feral hogs are known to feed on many smaller animals (some threatened or endangered), disrupt ecosystems via rooting, and feed on rare and endangered plants. Many experts in the fields of botany and herpetology have observed marked declines in some rare species of plants, reptiles, amphibians, and soil invertebrates in areas inhabited by feral swine (Singer et al. 1984). It has been well documented that feral swine disturb large areas of vegetation and soil through rooting, and it is documented that hogs inhabiting coastal, upland, and wetland ecosystems are uprooting, damaging, and feeding on rare native species of plants and animals (Means 1999). Feral swine can disrupt natural vegetative communities, eliminate rare plants and animals, alter species composition within a forest, including both canopy and low growing species (Lipscomb 1989, Frost 1993), increase water turbidity in streams and wetlands (reducing water quality and impacting native fish), and increase soil erosion and alter nutrient cycling (Singer et al. 1984, DeBenedetti 1986). Kaller and Kelso (2003) found that feral and free-ranging swine were linked to increased levels of fecal coliform and other potentially pathogenic bacteria in several watersheds in Louisiana. Additionally, some species of freshwater mussels and aquatic insects were negatively affected by feral swine (Kaller and Kelso 2006).

Beaver activities also destroy habitat (*e.g.*, free-flowing water, riparian areas, and bird roosting and nesting areas) which can be important to many species. Patterson (1951) and Avery (1992) reported that the presence of beaver dams could negatively affect fisheries. Beaver dams may adversely affect stream ecosystems by increasing sedimentation in streams, and thereby affecting wildlife that depend on clear water such as certain species of fish and mussels. Stagnant water impounded by beaver dams can increase the water temperature of water impounded upstream of the dam which can negatively affect aquatic organism. Beaver dams can also act as barriers that inhibit movement of aquatic organism and prevent the migration of fish to spawning areas. The WS program in Florida has provided beaver damage management to maintain habitat for the endangered Okaloosa darter (*Etheostoma okaloosae*) by reducing sedimentation, preventing bank destabilization from beaver removing vegetation, and by removing barriers to darter movement. Beaver activities have been identified by the United States Fish and Wildlife Service (USFWS) as a possible threat to darters and darter habitat although some aspects of beaver induced habitat modifications may be beneficial to darters (USFWS 2007).

Need for Mammal Damage Management to Protect Property

Mammals cause damage to a variety of property types in Florida each year. Raccoons, skunks, and armadillos can cause damage to property by digging under porches, buildings, homes, and many other places. Armadillos often cause damage to lawns and turf while digging for grubs and insects. Beaver flood land, roads, and railways. They also girdle large trees and consume landscaping. Feral hogs root up turf in neighborhoods and golf courses.

As examples, since FY 2006, WS responded to 35 instances of coyote, and raccoon attacks or safety threats to companion animals in Florida. Also since FY 2006, WS has responded to 151 incidences of armadillos, beavers, black rats, cats, raccoons, Gambian rats, or opossums causing damage, or the threat of damage from these species to buildings in Florida. Aircraft striking mammals can also cause substantial damage requiring costly repairs and aircraft downtime.

Feral swine can damage landscaping, golf courses, roads, drainage ditches and cause erosion by feeding in these areas. Feral swine dig or root in the ground with their nose in search of desired roots, grubs, earthworms, and other food sources. Feral swine can damage landscaping, golf courses, roads, drainage ditches and cause erosion by feeding in these areas. The rooting and digging activity of feral swine turns sod and grass over which often leaves the area bare of vegetation and susceptible to erosion. Feral swine also pose a threat to property from being struck by motor vehicles and aircraft.

Deer-vehicle collisions are a serious concern nationwide because of losses to property and the potential for human injury and death (Conover et al. 1995, Romin and Bissonette 1996, Conover 1997). The economic costs associated with deer-vehicle collisions include vehicle repairs, human injuries and fatalities, and picking up and disposing of deer (Drake et al. 2005). The Insurance Institute for Highway Safety (2005) estimated that 1.5 million deer-vehicle collisions occur annually in the United States causing approximately 150 fatalities and $1.1 billion in damage to property. In 1995, the damage to vehicles associated with vehicles striking deer was estimated at $1,500 per strike in damages (Conover et al. 1995). Damage costs associated with deer collisions in 2011 were estimated at $3,171 per incident, which was an increase of 2.2% over the 2010 estimate (State Farm Mutual Automobile Insurance 2011*a*). An estimated 13,135 deer-vehicle collisions occurred in Florida from July 1, 2010 through June 30, 2011 (State Farm Mutual Automobile Insurance 2011*b*). Based on the average repair costs associated with vehicle strikes estimated at $3,171 in 2010 and the number of strikes that have occurred in the State estimated at 13,135 from July 2010 through June 2011, deer-vehicle collisions resulted in over $41.6 million in damage to property in the State.

Often, deer-vehicle collisions in which a deer carcass was not recovered or little vehicle damage occurred go unreported. A Cornell University study estimated that the actual number of deer-vehicle collisions could be as high as six times the reported number (Decker et al. 1990).

Beaver are generally considered beneficial where their activities do not compete with human land use or human health and safety (Wade and Ramsey 1986). The opinions and attitudes of individuals, organizations, and communities vary greatly and are primarily influenced and formed by the benefits and/or damage directly experienced by each individual (Hill 1982). Woodward et al. (1976) found that 24% of landowners who reported beaver activity on their property indicated benefits to having beaver ponds on their land and desired assistance with beaver pond management (Hill 1976, Lewis 1979, Woodward et al. 1985).

In some situations, the damage and threats caused by beaver outweigh the benefits (Grasse and Putnam 1955, Woodward et al. 1985, Novak 1987). Damage to resources associated with beaver are most often a result of their feeding, burrowing, and dam building behaviors. It is estimated that beaver cause $75 to $100 million dollars in economic losses annually in the United States, with total losses in the southeastern United States over the past 40 years estimated to be $4 billion (Novak 1987).

Beaver often will gnaw through trees and other woody vegetation for use in dam building, food caches, and the buildings of lodges. The girdling and felling of trees and other woody vegetation can cause economic losses, can threaten human safety and property when trees fall, and the loss of trees can be aesthetically displeasing to property owners. Timber resources have the highest recorded damage caused by beaver (Hill 1976, Lewis 1979, Hill 1982, Woodward et al. 1985). In some southeastern states, losses from beaver damage have been estimated at $3 million to $5 million dollars annually (Miller and Yarrow 1994), with timber losses as the most common type of damage (Hill 1982). Tracts of bottomland hardwood timber up to several thousand acres in size may be lost to beaver activity (Miller and Yarrow 1994). Timber damage caused by beaver activity in the southeastern United States has been estimated at $2.2 million annually in Mississippi (Arner and Dubose 1982), $2.2 million in Alabama (Hill 1976), $45 million in Georgia (Godbee and Price 1975), and $14.5 million in Louisiana in 1993 (Fowler et al. 1994).

In addition to damage associated with beaver feeding and gnawing on trees, damages and threats can also occur from dam building activities. Beaver dams impound water, which can flood property resulting in economic damage. Flooding from beaver dams can cause damage to roads, impede traffic, inundate timber, weaken earthen embankments, and cause damage to residential and commercial utilities.

Beaver often inhabit sites in or adjacent to urban/suburban areas and cut or girdle trees and shrubs in yards, undermine yards and walkways by burrowing, flood homes and other structures, destroy pond and reservoir dams by burrowing into levees, gnaw on boat houses and docks, and cause other damage to private and public property (Wade and Ramsey 1986). Additionally, roads and railroads may be damaged by saturation of the roadbed from beaver flooding or by beaver burrowing into the banks that comprise roadbeds and railroad beds.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for mammal damage management to reduce threats to human safety and to resolve damage to property, natural resources, and agricultural resources on federal, state, tribal, municipal, and private land within the State of Florida wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting mammal damage management in the State to meet the need for action and evaluates different alternatives to meeting that need while addressing those issues.

The methods available for use or recommendation under each of the alternatives evaluated are provided in Appendix B[8]. The alternatives and Appendix B also discuss how methods would be employed to manage damage and threats associated with mammals in the State. Therefore, the actions evaluated in this EA are the use of those methods available under the alternatives and the employment of those methods by WS to manage or prevent damage and threats associated with mammals from occurring when requested by the appropriate resource owner or manager.

Federal, State, County, City, and Private Lands

WS could continue to provide assistance on federal, state, county, municipal, and private land in Florida when a request was received for such services by the appropriate resource owner or manager pursuant to the appropriate alternatives. In those cases where a federal agency requests WS' assistance with managing damage caused by mammals, the requesting agency would be responsible for analyzing those activities in accordance with the NEPA. However, this EA could cover such actions if the requesting federal agency determined the analyses and scope of this EA were appropriate for those actions and the requesting federal agency adopted this EA through their own Decision based on the analyses in this EA. Therefore, actions taken on federal lands have been analyzed in the scope of this EA.

Native American Lands and Tribes

The WS program in Florida would only conduct damage management activities on Native American lands when requested by a Native American Tribe. Activities would only be conducted after a Memorandum of Understanding (MOU) or cooperative service agreement had been signed between WS and the Tribe requesting assistance. Therefore, the Tribe would determine when WS' assistance was required and what activities would be allowed. Because Tribal officials would be responsible for requesting assistance from WS and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would be anticipated. Those methods available to alleviate damage associated with mammals on federal, state, county, municipal, and private properties under the alternatives analyzed in this EA would be available for use to alleviate damage on Tribal properties when the use of those methods had been approved for use by the Tribe requesting WS' assistance. Therefore, the activities and methods addressed under the alternatives would include those activities that could be employed on Native American lands, when requested and when agreed upon by the Tribe and WS.

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[8] A complete list of chemical and non-chemical methods available for use under the identified alternatives, except the alternative with no damage management (Alternative 3), can be found in Appendix B. However, listing methods neither implies that all methods would be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods would be used to resolve every request for assistance.

Period for which this EA is Valid

If the analyses in this EA indicate an Environmental Impact Statement (EIS) is not warranted, this EA would remain valid until WS determined that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, this analysis and document would be reviewed and supplemented pursuant to the NEPA. Review of the EA would be conducted to ensure that activities conducted under the selected alternative occur within the parameters evaluated in the EA. If the alternative analyzing no involvement in mammal damage activities by WS were selected, no additional analyses would occur based on the lack of involvement by WS. The monitoring of activities by WS would ensure the EA remained appropriate to the scope of damage management activities conducted by WS in Florida based on the alternative selected.

Site Specificity

As mentioned previously, WS would only conduct damage management activities when requested by the appropriate resource owner or manager. In addition, WS' activities that could involve the take of mammals under the alternatives would only occur when permitted by the FWC, when required, and only at levels permitted.

This EA analyzes the potential impacts of mammal damage management based on previous activities conducted on private and public lands in Florida where WS and the appropriate entities entered into a MOU, cooperative service agreement, or other comparable document. The EA also addresses the potential impacts of mammal damage management in areas where additional agreements may be signed in the future. Because the need for action is to reduce damage and because the program's goals and directives would be to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates those additional efforts and analyzes the impacts of those efforts as part of the alternatives.

Many of the mammal species addressed in this EA can be found statewide and throughout the year in the State; therefore, damage or threats of damage can occur wherever those mammals occur. Planning for the management of mammal damage must be viewed as being conceptually similar to the actions of other entities whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. Although some locations where mammal damage would occur can be predicted, not all specific locations or times where such damage would occur in any given year can be predicted. In addition, the threshold triggering an entity to request assistance from WS to manage damage associated with mammals is often unique to the individual; therefore, predicting where and when such a request for assistance would be received by WS is difficult. This EA emphasizes major issues as those issues relate to specific areas whenever possible; however, many issues apply wherever mammal damage and the resulting management actions occurs and are treated as such.

Chapter 2 of this EA identifies and discusses issues relating to mammal damage management in Florida. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in the State (see Chapter 3 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives[9] and Standard Operating Procedures (SOPs) described in this EA as well as relevant laws and regulations.

[9]At the time of preparation, WS' Directives could be found at the following web address: http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Florida. In this way, WS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with the NEPA and still be able to accomplish its mission.

Summary of Public Involvement

Issues related to mammal damage management as conducted by WS in Florida were initially developed by WS in consultation with the FWC. Issues were defined and preliminary alternatives were identified through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document will be noticed to the public for review and comment. The public will be noticed through legal notices published in local print media, through direct mailings to parties that have requested to be notified, or have been identified to have an interest in the reduction of threats and damage associated with mammals in the State, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

WS will provide for a minimum of a 30-day comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives raised after publication of public notices would be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final Decision or publication of a notice of intent to prepare an EIS.

1.4 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

WS' Environmental Assessments in Florida**:** WS has previously developed an EA that analyzed the need for action to manage damage associated with several wildlife species associated with damage in Palm Beach County, Florida (USDA 2005*a*). WS has also prepared a separate EA to evaluate the need to reduce predation losses to endangered, threatened, and species of special concern along the coastal areas of Florida (USDA 2002). Those EAs identified the issues associated with managing damage associated with several mammal species addressed in this EA in the State and analyzed alternative approaches to meet the specific need identified in those EAs while addressing the identified issues.

Changes in the need for action and the affected environment have prompted WS to initiate this new analysis to address damage management activities in the State. This EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action, primarily a need to address damage and threats of damage associated with several additional species of mammals and to evaluate potential cumulative impacts associated with those activities. Since activities conducted under the previous EAs will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EAs that addressed mammals will be superseded by this analysis and the outcome of the Decision issued based on the analyses in this EA. However, information in the need for action in those EAs continues to be appropriate to the need for action associated with this EA (USDA 2002, USDA 2005*a*).

WS' Supplemental Environmental Assessment – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Fox, and Coyotes in the United States: WS issued an EA that analyzed the environmental effects of WS' involvement in the funding of and participation in Oral Rabies Vaccination programs to eliminate or stop the spread of raccoon rabies in a number of eastern states (including Florida) and gray fox and coyote rabies in Texas (USDA 2005*b*). The EA has been supplemented to analyze changes in the scope and analysis area of the ORV program. The most recent Decision/FONSI was signed in 2010. WS determined the action would not have any significant impact on the quality of the human environment. Pertinent information has been incorporated by reference into this EA.

USFWS Environmental Assessment – Eradication of Non-native Rats From Egmont Key National Wildlife Refuge: USFWS issued an EA that evaluated the impacts of non-native rats on Egmont Key NWR, and proposed control and eradication options. The EA proposes contracting WS to implement the eradication program.

Ecology and Management of White-tailed Deer in Florida: FWC prepared this document "*to serve as a management aid and a reference on deer ecology in Florida*" (FWC 2006). It covers basic deer biology and population management. Pertinent information available in this document has been incorporated by reference into this EA.

1.5 AUTHORITY AND COMPLIANCE

The authorities of WS and other agencies as those authorities relate to conducting wildlife damage management activities are discussed by agency in Appendix D. Several laws and regulations pertaining to wildlife damage management activities, including activities conducted in the State are also discussed in Appendix D.

1.6 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. As the authority for the management of mammal populations in the State, the FWC was involved in the development of the EA and provided input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The FWC is responsible for managing wildlife in the State of Florida, including those mammal species addressed in this EA. The FWC establishes and enforces regulated hunting and trapping seasons in the State. WS' activities to reduce and/or prevent mammal damage in the State would be coordinated with the FWC, which would ensure WS' actions would be incorporated into population objectives established for mammal populations in the State.

Based on the scope of this EA, the decisions to be made are: 1) should WS conduct mammal damage management to alleviate damage to agriculture, property, natural resources, and threats to human safety, 2) should WS conduct disease surveillance and monitoring in mammal populations when requested by the FWC and other agencies, 3) should WS implement an integrated wildlife damage management strategy, including technical assistance and direct operational assistance, to meet the need for mammal damage management in Florida, 4) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 5) would the proposed action or the other alternatives result in effects to the environment requiring the preparation of an EIS.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of SOPs, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues. Additional descriptions of the affected environment will be incorporated into the discussion of the environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Damage or threats of damage caused by those mammal species addressed in this EA can occur statewide in Florida wherever those mammals occur (USDA 2002, USDA 2005*a*). However, mammal damage management would only be conducted by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document were signed between WS and a cooperating entity. Most species of mammals addressed in this EA can be found throughout the year across the State where suitable habitat exists for foraging and shelter. Those mammal species addressed in this EA are capable of utilizing a variety of habitats in the State. Since those mammal species addressed in this EA can be found throughout most of the State, requests for assistance to manage damage or threats of damage could occur in areas occupied by those mammal species. Additional information on the affected environment is provided in Chapter 4.

Upon receiving a request for assistance, activities to reduce mammal damage or threats could be conducted on federal, state, tribal, municipal, and private properties in Florida. Areas where damage or threats of damage could occur include, but would not be limited to agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, railroad yards, waste handling facilities, industrial sites, natural resource areas, park lands, and historic sites; state and interstate highways and roads; railroads and their right-of-ways; property in or adjacent to subdivisions, businesses, and industrial parks; timberlands, croplands, and pastures; private and public property where burrowing mammals cause damage to structures, dikes, ditches, ponds, and levees; public and private properties in rural/urban/suburban areas where mammals cause damage to landscaping and natural resources, property, and are a threat to human safety through the spread of disease. The area would also include airports and military airbases where mammals are a threat to human safety and to property; areas where mammals negatively affect wildlife, including T&E species; and public property where mammals are negatively affecting historic structures, cultural landscapes, and natural resources.

Environmental Status Quo

As defined by the NEPA implementing regulations, the "*human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment*" (40 CFR 1508.14). Therefore, when a federal action agency analyzes their potential impacts on the "*human environment*", it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or could occur in the absence of the federal action by a non-federal entity. This concept is applicable to situations involving federal assistance to reduce damage associated with wildlife species.

Unprotected wildlife species, such as most non-native invasive species, are not protected under state or federal law. Most state-resident wildlife species are managed under state authority or law without any federal oversight or protection. In some situations, with the possible exception of restrictions on methods (*e.g*., firearms restrictions, pesticide regulations), unprotected wildlife species and certain resident wildlife species are managed with little or no restrictions, which allows them to be killed or taken by anyone at any time when they are committing damage. For mammal damage management in Florida, the FWC has the authority to manage and authorize the taking of mammals for damage management purposes.

A non-federal entity could lethally take mammals to alleviate damage without the need for a permit when those species are non-native or are unregulated by the FWC. In addition, mammals could be removed to alleviate damage during the hunting and/or trapping season, and/or through the issuance of permits by the FWC. In addition, most methods available for resolving damage associated with mammals would also be available for public use. Therefore, WS' decision-making ability would be restricted to one of three alternatives. WS could take the action using the specific methods as decided upon by the non-federal entity, provide technical assistance only, or take no action. If no action were taken by WS, the non-federal entity could take the action anyway using the same methods without the need for a permit, during the hunting or trapping season, or through the issuance of a permit by the FWC. Under those circumstances, WS would have virtually no ability to affect the environmental status quo since the action would likely occur in the absence of WS' direct involvement.

Therefore, based on the discussion above, it is clear that in those situations where a non-federal entity has obtained the appropriate permit or authority, and has already made the decision to remove or otherwise manage mammals to stop damage with or without WS' assistance, WS' participation in carrying out the action would not affect the environmental status quo.

2.2 ISSUES ASSOCIATED WITH MAMMAL DAMAGE MANAGEMENT ACTIVITIES

Issues are concerns of the public and/or professional community raised regarding potential adverse effects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues related to managing damage associated with mammals in Florida were developed by WS in consultation with the FWC along with those issues addressed during the scoping process during the development of previous EAs (USDA 2002, USDA 2005*a*). This EA will also be made available to the public for review and comment to identify additional issues.

The issues, as those issues relate to the possible implementation of the alternatives, including the proposed action, are discussed in detail in Chapter 4. The issues analyzed in detail in the EA are the following:

Issue 1 - Effects of Damage Management Activities on Target Mammal Populations

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations of target species. Methods available to resolve damage or threats to human safety under the alternatives are categorized into lethal and non-lethal methods.

Non-lethal methods could disperse or otherwise make an area unattractive to target species causing damage, which would reduce the presence of those species at the site and potentially the immediate area around the site where non-lethal methods were employed. Lethal methods would be employed to remove a mammal or those mammals responsible for causing damage or posing threats to human safety. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods under the alternatives would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

The analysis for magnitude of impact on the populations of those species addressed in the EA would be based on a measure of the number of individuals killed from each species in relation to that species' abundance. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations would be based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations would be based on population trends and harvest trend data, when available. Take would be monitored by comparing the number of individuals killed from a species of mammal with overall population or trends in the population of that species.

Methods available under each of the alternatives to resolve damage and reduce threats to human safety would be employed to target a single animal or a group of animals after applying the WS' Decision Model (Slate et al. 1992) to identify possible techniques. The effects of damage management activities on the population of target species from implementation of the alternatives addressed in detail, including the proposed action, are analyzed in Chapter 4.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

The issue of non-target species effects, including effects on T&E species, arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife. Methods available for use under the alternatives are described in Appendix B.

Concerns have also been raised about the potential for adverse effects to occur to non-target wildlife from the use of chemical methods. Chemical methods being considered for use to manage damage or threats associated with those mammal species addressed in this EA include immobilizing drugs, euthanasia chemicals, reproductive inhibitors, rodenticides, and taste repellents. Chemical methods being considered for use to manage damage and threats associated with mammals in Florida are further discussed in Chapter 4 and Appendix B.

The ESA states 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 USFWS to ensure compliance with the ESA and 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)].

As part of the scoping process for this EA, WS consulted with the USFWS pursuant to Section 7 of the ESA to facilitate interagency cooperation between WS and the USFWS. The potential effects of the alternatives on this issue are further discussed in Chapter 4.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

An additional issue often raised is the potential risks to human safety associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse effects on human safety. WS' employees would use and recommend only those methods that were legally available under each of the alternatives. Still, some concerns exist regarding the safety of methods available despite their legality and selectivity. As a result, this EA will analyze the potential for proposed methods to pose a risk to members of the public. In addition to the potential risks to the public associated with the methods available under each of the alternatives, risks to WS' employees would also be an issue. WS' employees would potentially be exposed to damage management methods, as well as, subject to workplace accidents. Selection of methods, under the alternatives, would include consideration for public and employee safety.

Safety of Chemical Methods Employed

The issue of using chemical methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use or recommendation of chemical methods would include immobilizing drugs, euthanasia chemicals, reproductive inhibitors, rodenticides, and repellents.

Immobilizing drugs would include ketamine and telazol, which are anesthetics (*i.e.*, general loss of pain and sensation) used during the capture of wildlife to eliminate pain, calm fear, and reduce anxiety in wildlife when handling and transporting wildlife. Xylazine is a sedative that is often used in combination with ketamine to calm nervousness, irritability, and excitement in wildlife during the handling and transporting of wildlife. Euthanasia chemicals would include sodium pentobarbital, Beuthanasia-D®, Fatal-Plus™, and potassium chloride, which would general be administered after an animal had been anesthetized.

Gonacon™ is the only product currently registered as a reproductive inhibitor and is only available to manage local deer populations. However, Gonacon™ is not currently registered for use in the State. If Gonacon™ became registered to manage local deer populations, the product would only be available for use by WS, the FWC, or agents under their direct supervision. The application of Gonacon™ to manage local deer herds could only occur after a permit had been issued by the FWC.

Rodenticides would include products containing the active ingredient zinc phosphide, brodifacoum, or diphacinone, which could be available to address damage and threats associated with those rat species addressed in this EA. Rodenticides are pesticides that require a restricted-use pesticide applicators license from the FDACS. According to the Environmental Protection Agency (EPA), zinc phosphide, when ingested, reacts with the acids in the gut releasing phosphine gas, which interferes with cell respiration leading to the death of the animal (EPA 1998). Brodifacoum and diphacinone are anticoagulant rodenticides that prevent the clotting of blood. Products containing the active ingredient brodifacoum and zinc phosphide are currently registered for use in Florida. Rodenticides containing brodifacoum are generally restricted-use pesticides, which, if available, could be purchased and applied by appropriately licensed people, and would not be products that were restricted to use by WS only. Products containing the active ingredient diphacinone are also currently registered for use in the State. Those active ingredients are discussed in this EA as possible methods that could be available under the alternatives, since products are or could be available containing those active ingredients and are or could be registered for use in the State.

Repellents for many mammal species contain different active ingredients with most ingredients occurring naturally in the environment. The most common ingredients of repellents are coyote urine, putrescent whole egg solids, and capsaicin. Repellents are generally restricted-use products that can only be purchased and applied by licensed applicators. Repellents are generally applied directly to affected resources and elicit an adverse taste response when ingested or cause temporarily sickness (*e.g.*, nausea). Products containing coyote urine or other odors associated with predatory wildlife are intended to elicit a fright response in target wildlife by imitating the presence of a predatory animal (*i.e.*, wildlife tend to avoid areas where predators are known to occur). WS would only employ or recommend for use those rodenticides and repellents that were registered for use pursuant to the FIFRA with the EPA and were registered for use in the State by the FDACS.

The issue of the potential for drugs used in animal capture, handling, and euthanasia to cause adverse health effects in humans that hunt and consume the species involved has been raised. Among the species to be captured and handled under the proposed action, this issue is expected to be of concern for wildlife that are hunted and sometimes consumed by people as food. Chemicals methods available for use under the relevant alternatives would be regulated by the EPA through FIFRA, by Florida laws, by the Drug Enforcement Administration (DEA), by the Food and Drug Administration (FDA), and by WS' Directives.

Safety of Non-Chemical Methods Employed

Most methods available to alleviate damage and threats associated with mammals are considered non-chemical methods. Non-chemical methods may include cultural methods, limited habitat modification, animal behavior modification, and other mechanical methods. Changes in cultural methods could include improved animal husbandry practices, altering feeding schedules, changes in crop rotations, or conducting structural repairs. Limited habitat modification would be practices that alter specific characteristics of a very localized area, such as removing bushes to eliminate shelter locations or planting vegetation that are less palatable to mammals. Animal behavior modification methods would include those methods designed to disperse mammals from an area through harassment or exclusion. Behavior modification methods could include pyrotechnics, propane cannons, barriers, electronic distress calls, effigies, Mylar tape, and lasers. Other mechanical methods could include cage traps, foothold traps, body-gripping traps, cable restraints, cannon nets, shooting, or the recommendation that a local population of mammals be reduced using hunting and/or trapping.

The primary safety risk of most non-chemical methods occurs directly to the applicator or those persons assisting the applicator. However, risks to others do exist when employing non-chemical methods, such as when using firearms, cannon nets, pyrotechnics, or body-gripping traps. Most of the non-chemical methods available to address mammal damage in Florida would be available for use under any of the alternatives and could be employed by any entity, when permitted. Risks to human safety from the use of non-chemical methods will be further evaluated as this issue relates to the alternatives in Chapter 4. A complete list of non-chemical methods available to alleviate damage associated with mammals is provided in Appendix B of this EA.

Effects of Not Employing Methods to Reduce Threats to Human Safety

An issue identified is the concern for human safety from not employing methods or not employing the most effective methods to reduce the threats that mammals can pose. The risks to human safety from diseases associated with certain mammal populations were addressed previously in Chapter 1 under the need for action. The low risk of disease transmission from mammals does not lessen the concerns of cooperators requesting assistance to reduce threats from zoonotic diseases. Increased public awareness of zoonotic events has only heightened the concern of direct or indirect exposure to zoonoses. Not adequately addressing the threats associated with potential zoonoses could lead to an increase in incidences of injury, illness, or loss of human life.

Additional concern is raised with inadequately addressing threats to human safety associated with aircraft striking mammals at airports in the State. Mammals have the potential to cause severe damage to aircraft, which can threaten the safety of passengers. Limiting or preventing the use of certain methods to address the potential for aircraft striking mammals could lead to higher risks to passenger safety. This issue will be fully evaluated in Chapter 4 in relationship to the alternatives.

Issue 4 - Effects on the Socio-cultural Elements of the Human Environment

One issue is the concern that the proposed action or the other alternatives would result in the loss of aesthetic benefits of target mammals 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.

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The public share 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 mammals as "*pets*" or exhibit affection toward those animals, especially people who enjoy viewing wildlife. Therefore, the public reaction can be 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.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). Those include direct benefits related to consumptive and non-consumptive uses, indirect benefits derived from vicarious wildlife related experiences, and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (Bishop 1987). Direct benefits are derived from a personal relationship with animals and may take the form of direct consumptive use (*i.e.*, using parts of or the entire animal) or non-consumptive use (*e.g.*, viewing the animal in nature or in a zoo, photographing) (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).

Public attitudes toward wildlife vary considerably. Some people believe that all wildlife should be captured and translocated 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. Those human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

Some individuals are offended by the presence of overabundant mammal species, such as raccoons, armadillos, coyotes, or feral species, such as cats or dogs. To such people those species represent pests that are nuisances, which upset the natural order in ecosystems, and are carriers of diseases transmissible to humans or other wildlife. Their overall enjoyment of other animals is diminished by what they view as a destructive presence of such species. They are offended because they feel that those mammal species proliferate in such numbers and appear to remain unbalanced.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

The issue of humaneness and animal welfare, 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. Schmidt (1989) indicated that vertebrate damage management for societal benefits could be compatible with animal welfare concerns, if "*…the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*"

According to the AVMA (1987), suffering is described as a *"…highly unpleasant emotional response usually associated with pain and distress."* However, suffering *"…can occur without pain…"* and *"…pain can occur without suffering…"*. Because suffering carries with it the implication of a time frame, a case could be made for *"…little or no suffering where death comes immediately…"* (California Department of Fish and Game 1991). Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

Defining pain as a component in humaneness appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would *"…probably be causes for pain in other animals…"* (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (California Department of Fish and Game 1991).

Pain and suffering, as it relates to methods available for use to manage mammals has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *"…neither medical nor veterinary curricula explicitly address suffering or its relief"* (California Department of Fish and Game 1991). Research suggests that some methods, such as restraint in foothold traps or changes in the blood chemistry of trapped animals, indicate "*stress*" (Kreeger et al. 1988). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

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

The decision-making process involves tradeoffs between the above aspects of pain and humaneness. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering. The issue of humanness and animal welfare concerns will be further discussed in Chapter 4. SOPs to alleviate pain and suffering are discussed in Chapter 3.

Issue 6 - Effects of Mammal Damage Management Activities on the Regulated Harvest of Mammals

Another issue commonly identified is a concern that damage management activities conducted by WS would affect the ability of persons to harvest those species during the regulated hunting and trapping seasons either by reducing local populations through the lethal removal of mammals or by reducing the number of mammals present in an area through dispersal techniques. Those species that are addressed in this EA that also can be hunted and/or trapped during regulated seasons in the State include beaver, bobcats, coyotes, eastern cottontails, feral swine, river otters, spotted skunks, striped skunks, Virginia opossum, and white-tailed deer (FWC 2012). No regulated harvest seasons exist for armadillos and rats in the State; however, those species can be lethally removed at any time and without limit.

Potential impacts could arise from the use of non-lethal or lethal damage management methods. Non-lethal methods used to reduce or alleviate damage caused by those mammal species are used to reduce mammal densities through dispersal in areas where damage or the threat of damage is occurring. Similarly, lethal methods used to reduce damage associated with those mammals could lower densities in areas where damage is occurring resulting in a reduction in the availability of those species during the regulated harvest season. WS' mammal damage management activities would primarily be conducted on populations in areas where hunting access is restricted (*e.g.*, airports) or has been ineffective. The use of non-lethal or lethal methods often disperses mammals from areas where damage is occurring to areas outside the damage area, which could serve to move those mammal species from those less accessible areas to places accessible to hunters.

Issue 7 – Effects of Beaver Dam Manipulation on the Status of Wetlands in the State

Wetlands are a valuable component of land-based ecosystems that provide numerous direct and indirect benefits to people and wildlife (*e.g.*, see Costanza et al. 1997, Millennium Ecosystem Assessment 2005). Between the 1780s and the 1980s, Dahl (1990) estimated 53% of the original wetland acres in the lower 48 states were lost, primarily from human development. Over that 200-year time span, Dahl (1990) estimated the wetland acres in Florida decreased from 20,325,013 acres to 11,038,300 acres, which represented a 46% decline. Beaver, through their building of dams and impounding water can have a unique role in establishing wetlands that not only provide benefit to the beaver, but to people and other wildlife. Beaver are often considered a "*keystone*" species for their ability to manipulate and create their own habitats, which can also provide benefits to other wildlife and people. Beaver may also be an inexpensive way of restoring wetlands or creating new wetlands (*e.g*., see Hey 1995, Muller-Schwarze and Sun 2003, Buckley et al. 2011).

The issue of WS' potential impacts to wetlands could occur from activities conducted to alleviate damage or threats of damage associated with beaver, primarily from the breaching or removal of beaver dams. Beaver dam breaching or removal during activities to manage damage caused by beaver sometimes occurs in areas inundated by water from water impounded by beaver dams. Dam material usually consists of mud, sticks, and other vegetative material. Beaver dams obstruct the normal flow of water, which can change the preexisting hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment over time. The depth of the bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water.

Beaver dams, over time, can establish new wetlands. The regulatory definition of a wetland stated by the United States Army Corps of Engineers and the EPA (40 CFR 232.2) is:

"Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Therefore, the breaching or removal of a beaver dam could result in the degrading or removal of a wetland, if wetland characteristics exist at a location where a beaver dam occurs. The preexisting habitat (prior to the building of the dam) and the altered habitat (areas flooded by impounded water) have different ecological values to the fish and wildlife native to the area. Some species may benefit by the addition of a beaver dam that creates a wetland, while the presence of some species of wildlife may decline. For example, darters listed as federally endangered require fast moving waters over gravel or cobble beds, which beaver dams can eliminate; thus, reducing the availability of habitat. In areas where bottomland forests were flooded by beaver dams, a change in species composition could occur over time as trees die. Hardwood trees are often killed when flooding persists for extended periods, as soils become saturated. Conversely, beaver dams could be beneficial to some wildlife such as river otter, neotropical migratory birds, and waterfowl that require aquatic habitats.

If a beaver dam was not removed and water was allowed to stand, hydric soils and hydrophytic vegetation could eventually form. This process could take anywhere from several months to years depending on preexisting conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content. If those conditions were met, then a wetland has developed that would have different wildlife habitat values than an area that has been more recently impounded by beaver dam activity.

In addition, concerns are often raised regarding the use of lethal methods to remove beaver to alleviate damage or threats. If beaver were lethally removed from an area and any associated beaver dam was removed or breached, the manipulation of water levels by removing/breaching the dam could prevent the establishment of wetlands in areas where water has been impounded for an extended period by beaver dams. If beaver were removed but the beaver dam was left undisturbed, the lack of maintenance to the dam by beaver would likely result in the eventual recession of the impounded water as weathering eroded the dam.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were also identified by WS and the FWC during the scoping process of this EA. Those additional issues were considered but detailed analyses will not occur for the reasons provided. The following issues were considered but were not analyzed in detail:

Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area

A concern was raised that an EA for an area as large as the State of Florida would not meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other regulatory agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to describe accurately such locations or times in an EA or EIS. Although WS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage could occur, the program cannot predict the specific locations or times at which affected resource owners would determine a damage problem has become intolerable to the point that they request assistance from WS. In addition, the WS program would not be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and other agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

Lead agencies have the discretion to determine the geographic scope of their analyses under the NEPA (Kleppe v Sierra Club, 427 U.S. 390, 414 (1976), CEQ 1508.25). Ordinarily, according to APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions could be categorically excluded (7 CFR 372.5(c)). The intent in developing this EA was to determine if the proposed action or the other alternatives would potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. This EA addresses impacts for managing damage and threats to human safety associated with mammals in the State to analyze individual and cumulative impacts and to provide a thorough analysis.

In terms of considering cumulative effects, one EA analyzing impacts for the entire State would provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination were made through this EA that the proposed action or the other alternatives might have a significant impact on the quality of the human environment, then an EIS would be prepared. Based on previous requests for assistance, the WS program in Florida would continue to conduct mammal damage management in a very small area of the State where damage was occurring or likely to occur.

WS' Impact on Biodiversity

The WS program does not attempt to eradicate any species of native wildlife in the State. WS operates in accordance with federal, and state laws and regulations enacted to ensure species viability. Methods available are employed to target individual mammals or groups of mammals identified as causing damage or posing a threat of damage. Any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. WS operates on a small percentage of the land area of Florida and only targets those mammals identified as causing damage or posing a threat. Therefore, activities conducted pursuant to any of the alternatives would not adversely affect biodiversity in the State.

A Loss Threshold Should Be Established Before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss would likely be tolerated by cooperators until the damage reaches a threshold where the damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. In addition, establishing a threshold would be difficult or inappropriate to apply to human health and safety situations. For example, aircraft striking mammals can lead to property damage and can threaten passenger safety if a catastrophic failure of the aircraft occurs because of the strike. Therefore, addressing the threats of wildlife strikes prior to an actual strike occurring would be appropriate.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah denied the plaintiffs' motion for a preliminary injunction. In part, the court determined a need for wildlife damage management could be established if a forest supervisor could show that damage from wildlife was threatened (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as a percentage of loss of a particular resource to justify the need for damage management actions.

Mammal Damage Management Should Not Occur at Taxpayer Expense

An issue identified is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based. Funding for activities would be derived from federal appropriations and through cooperative funding. Activities conducted in the State for the management of damage and threats to human safety from mammals would be funded through cooperative service agreements with individual property owners or managers. A minimal federal appropriation is allotted for the maintenance of a WS program in Florida. The remainder of the WS program would mostly be fee-based. Technical assistance would be provided to requesters as part of the federally funded activities, but the majority of direct assistance in which WS' employees perform damage management activities would be funded through cooperative service agreements between the requester and WS.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by mammals and that prove to be the most cost effective would likely receive the greatest application. As part of an integrated approach and as part of the WS Decision Model, evaluation of methods would continually occur to allow for those methods that were most effective at resolving damage or threats to be employed under similar circumstance where mammals were causing damage or posing a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. The cost effectiveness of methods and the effectiveness of methods would be linked. The issue of cost effectiveness as it relates to the effectiveness of methods is discussed in the following issue.

Effectiveness of Mammal Damage Management Methods

The effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented. The effectiveness can also be dependent upon how accurately practitioners diagnose the problem, the species responsible for the damage, and how actions were implemented to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible. The most effective approach to resolving any wildlife damage problem would be to use an adaptive integrated approach, which may call for the use of several management methods simultaneously or sequentially (Courchamp et al. 2003).

The purpose behind integrated management is to implement methods in the most effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment[10]. Efficacy is based on the types of methods employed, the application of the method, restrictions on the use of the method(s), the skill of the personnel using the method and, for WS' personnel, the guidance provided by WS' directives and policies.

The goal would be to reduce damage, risks, and conflicts with wildlife as requested and not to reduce/eliminate populations. Localized population reduction could be short-term with new individuals immigrating into the area or born to animals remaining at the site (Courchamp et al. 2003). The ability of an animal population to sustain a certain level of removal and to eventually return to pre-management levels does not mean individual management actions were unsuccessful, but that periodic management may be necessary. The return of wildlife to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

Comments are often received that lethal methods would be ineffective because additional mammals would likely to return to the area. In addition, comments also claim that because mammals return to an area after initial removal efforts were complete, the use of lethal methods gives the impression of creating a financial incentive to continue the use of only lethal methods. Those statements assume mammals only return to an area where damage was occurring if lethal methods were used. However, the use of non-lethal methods would also often be temporary, which could result in mammals returning to an area where damage was occurring once those methods were no longer used. The common factor when employing any method would be that mammals would return if suitable conditions continue to exist at the location where damage was occurring and mammal densities were sufficient to occupy all available habitats to the extent that damage occurs. Therefore, any reduction or prevention of damage from the use of methods addressed in Appendix B would be temporary if habitat conditions continue to exist that attract mammals to an area where damage was occurring.

Therefore, any method that disperses or removes mammals from areas would only be temporary if habitat containing preferred habitat characteristics continues to exist. Dispersing mammals using non-lethal methods addressed in Appendix B often requires repeated application to discourage mammals from returning to locations, which increases costs, moves mammals to other areas where they could cause damage, and would be temporary if habitat conditions that attracted those mammals to damage areas remained unchanged. Dispersing and translocating mammals could be viewed as moving a problem from

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

one area to another, which would require addressing damage caused by those mammals at another location, which increases costs and could be perceived as creating a financial incentive to continue the use of those methods since mammals would have to be addressed annually and at multiple locations. WS' recommendation of or use of techniques to modify existing habitat or making areas unattractive to mammals is discussed in Appendix B. WS' objective would be to respond to requests for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model.

Managing damage caused by mammals can be divided into short-term redistribution approaches and long-term population and habitat management approaches. Short-term approaches focus on redistribution and dispersal of mammals to limit use of an area where damage or threats were occurring. Short-term redistribution approaches may include prohibiting feeding, the use of pyrotechnics, propane cannons, effigies, and other adverse noise, erecting access barriers such as fencing, and taste aversion chemicals. Population reduction by limiting survival or reproduction, removing mammals, and habitat modification would be considered long-term solutions to managing damage caused by wildlife.

Redistribution methods would often be employed to provide immediate resolution to damage occurring until long-term approaches can be implemented or have had time to reach the desired result. Dispersing mammals can often be a short-term solution that moves those mammals to other areas where damages or threats could occur. Some short-term methods may become less effective in resolving damage as a mammal population increases, as mammals become more acclimated to human activity, and as mammals become habituated to harassment techniques. Non-lethal methods often require a constant presence at locations when mammals are present and must be repeated every day or night until the desired results are achieved, which can increase the costs associated with those activities. Non-lethal methods may also require constant monitoring and maintenance to insure proper results. For example, fencing could be used to prevent access to a resource; however, constant monitoring of the fencing would be required and necessary repairs completed to ensure the use of fencing would be successful in preventing access to resources. Long-term solutions to resolving mammal damage often require management of the population and identifying the habitat characteristics that attract mammals to a particular location.

Based on the evaluation of the damage situation, the most effective methods would be employed individually or in combination based on prior evaluations of methods or combinations of methods in other damage management situations. Once employed, methods would be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods would be considered as part of the decision making-process under WS' use of the Decision Model described in Chapter 3 for each damage management request based on the continual evaluation of methods and results.

Mammal Damage Should Be Managed By Private Nuisance Wildlife Control Agents

Wildlife control agents and private entities could be contacted to reduce mammal damage when deemed appropriate by the resource owner. The FWC maintains a website of nuisance wildlife trappers in the State[11]. In addition, WS could refer persons requesting assistance to agents and/or private trappers under all of the alternatives fully evaluated in the EA.

WS Directive 3.101 provides guidance on establishing cooperative projects and interfacing with private businesses. WS only responds to requests for assistance received. When responding to requests for assistance, WS would inform requesters that other service providers, including private entities, might be available to provide assistance.

[11]The website can be accessed at http://fwc.myflorida.com/fwcwww/fwc_www.nwt_nuisance_wildlife_pkg.nwt_active_trappers_rpt_pr; accessed January 24, 2013.

Effects from the Use of Lead Ammunition in Firearms

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally take mammals. As described in Appendix B, the lethal removal of mammals with firearms by WS to alleviate damage or threats could occur using a handgun, rifle, or shotgun. In an ecological risk assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996).

The take of mammals by WS using firearms in the State would occur primarily from the use of rifles. However, the use of shotguns or handguns could be employed to lethally take some species. To reduce risks to human safety and property damage from bullets passing through mammals, the use of rifles would be applied in such a way (*e.g*., caliber, bullet weight, distance) to ensure the bullet does not pass through mammals. Mammals that are removed using rifles would occur within areas where retrieval of all mammal carcasses for proper disposal is highly likely (*e.g*., at an airport). With risks of lead exposure occurring primarily from ingestion of bullet fragments, the retrieval and proper disposal of mammal carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead that may be contained within the carcass.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through a mammal, if misses occur, or if the mammal carcass was not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could contaminate ground water or surface water from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "*transport*" readily in surface water when soils were neutral or slightly alkaline in pH (*i.e*., not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "*fall zones*" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot was highly accumulated in areas with permanent water bodies present, the lead did not necessarily cause elevated lead levels in water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the "*action level*" of 15 parts per billion as defined by the EPA (*i.e.*, requiring action to treat the water to remove lead). The study found that the dissolution (*i.e*., capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape was reduced once the bullets and shot formed crusty lead oxide deposits on their surfaces, which served to reduce naturally the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS' activities to reduce mammal damage using firearms, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent.

A secondary concern surrounding lead ammunition surrounds the issue of lead deposition in meat, particularly meat that is donated to various charities. Stewart and Veverka (2011) documented that white-tailed deer that were shot with lead ammunition in the head or extreme upper neck in sharpshooting situations showed no deposition of lead fragments in the meat of the animals that would have been processed for human consumption. Lower neck shots do frequently experience lead fragmentation in the loin muscle and the authors recommend removing the loins prior to processing to ensure that these fragments are not ingested. WS' personnel would be trained to shoot and target the head and upper neck of white-tailed deer. Any deer that were shot in the lower neck would not be donated but would be disposed of properly to avoid potential human ingestion of lead fragments.

Since those mammals removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement, WS' assistance with removing those mammals would not be additive to the environmental status quo. The amount of lead deposited into the environment could be lowered by WS' involvement in damage management activities due to efforts by WS to ensure projectiles do no pass through but are contained within the mammal carcass, which limits the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy would increase the likelihood that mammals were lethally removed humanely in situations that ensure accuracy and that misses occur infrequently which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement ensures mammal carcasses lethally removed using firearms would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures mammal carcasses were removed from the environment to prevent the ingestion of lead in carcasses by scavengers. Based on current information, the risks associated with lead bullets that could be deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from mammal carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water.

Effects on Human Health from Consumption of Deer Meat Donated by WS

Of concern under this issue would be the consumption of deer meat donated to a charitable organization after being lethally taken by WS. Of recent concern is the potential for lead and other contaminants to be present in meat that has been processed for human consumption. The potential for the spreading of zoonotic diseases in deer processed and donated for human consumption is also a concern. Under the proposed action alternative, meat from deer lethally taken during damage management activities could be donated to charitable organizations for human consumption. Only meat from deer would be donated under the proposed action alternative. WS could recommend the donation or consumption of meat under the technical assistance only alternative but would not be directly involved with damage management activities under that alternative.

If WS donated deer for human consumption, WS' policies pertaining to the testing or labeling of meat would be followed in order to address potential health concerns. Deer donated for human consumption may be tested for exposure to substances such as organophosphate and carbamate insecticides, lead, mercury, arsenic, organochlorines, and organic chemicals prior to distribution. Deer immobilized using immobilizing drugs or euthanized using euthanasia chemicals would not be donated for human consumption with disposal of carcasses occurring pursuant to WS Directive 2.515. Deer taken by any method for disease sampling or in an area where zoonotic diseases of concern are known to be prevalent and of concern to human health after consuming processed deer meat would not be donated for consumption and would be disposed of by deep burial or incineration. WS' adherence to policy would not result in adverse effects to human health from the donation of deer meat.

Donation of Feral Swine Taken Through Management Activities for Human Consumption

Under the Federal Meat Inspection Act, all swine must be inspected prior to entering into any establishment in which they are to be slaughtered. Inspections are carried out under the Food Safety and Inspection Services (FSIS) under the USDA. The FSIS has ruled that all swine are amenable to the Federal Meat Inspection Act and even if donated, are considered to be in commerce; therefore, all animals must be processed under inspection at an official establishment. This would entail examining the animal alive, at rest and in motion from both sides before passing the animal for slaughter.

In most instances, it would be difficult to trace the origins of feral swine or determine fitness for human consumption due to the potential for feral swine to carry disease (Wyckoff et al. 2009). Transporting live feral swine to slaughter facilities also increases the potential for spreading disease to domestic swine at facilities were swine are being held prior to slaughter. Therefore, feral swine will not be donated to food banks.

Potential for Feral Swine to Disperse to Other Areas Due to Management Activities

Methods involving the exclusion, pursuit, shooting, and/or harassment of feral swine could lead to the abandonment of areas traditionally used by swine in Florida. If feral swine were dispersed by WS under the alternatives, damages and threats could arise in other areas.

Under the alternatives where WS would be involved with managing damage, WS would evaluate the damage or threat situation to determine the appropriate methods. Activities conducted under the alternatives would be coordinated between WS, FWC, and local entities to monitor feral swine populations in areas where dispersal may occur. The potential for methods to disperse feral swine would be considered as part of the evaluation of the damage situation and would be incorporated into the decision-making process associated with the alternatives to determine which methods to employ and recommend. The use of methods that would likely result in the exclusion, harassment, or dispersal of feral swine (*e.g*., shooting, propane cannons, pyrotechnics) could be used in those situations where damage, threats of damage, and/or threats to human safety would require immediate resolution.

In those situations where feral swine could disperse to areas where damage could occur, individual feral swine could also be radio collared to locate and monitor movements of feral swine. Radio collaring could be used to track movements and locations of feral swine. The tracking of feral swine in relationship to damage management activities would also provide the ability to monitor movements and potential dispersal to other areas. Feral swine often form large groups that allow one individual of the group to be captured, collared, released, and allowed to return to the group. By collaring one individual, the movement and location of an entire group could be monitored. Radio telemetry would be available to monitor the movements of feral swine and to respond as necessary to swine potentially dispersing.

Coordination between agencies and local entities would ensure any dispersing feral swine were identified and addressed when they cause damage or threaten human safety. The limited use of methods that disperse feral swine should further ensure they would not be displaced to other areas within Florida. In addition, the passiveness of the primary methods proposed for use should limit dispersal of feral swine.

A Site Specific Analysis Should be Made for Every Location Where Mammal Damage Management Would Occur

The underlying intent for preparing an EA is to determine if a proposed action might have a significant impact on the human environment. WS' EA development process is issue driven, meaning issues that were raised during the interdisciplinary process and through public involvement that were substantive, were used to drive the analysis and determine the significance of the environmental impacts of the proposed action and the alternatives. Therefore, the level of site specificity must be appropriate to the issues listed.

The analysis in this EA was driven by the issues raised during the scoping process during the development of the EA. In addition to the analysis contained in this EA, WS' personnel use the WS Decision Model (Slate et al. 1992) described in Chapter 3 as a site-specific tool to develop the most appropriate strategy at each location. The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to requests for assistance.

As discussed previously, one EA analyzing impacts for the entire State would provide a more comprehensive and less redundant analysis that allows for a better cumulative impact analysis. If a determination were made through this EA that the alternatives developed to meet the need for action could result in a significant impact on the quality of the human environment, then an EIS would be prepared.

CHAPTER 3: ALTERNATIVES

Chapter 3 contains a discussion of the alternatives that were developed to meet the need for action discussed in Chapter 1 and to address the identified issues discussed in Chapter 2. Alternatives were developed for consideration based on the need for action and issues using the WS Decision model (Slate et al. 1992). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Chapter 3 also discusses alternatives considered but not analyzed in detail, with rationale. SOPs for mammal damage management in Florida are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

The following alternatives were developed to meet the need for action and address the identified issues associated with managing damage caused by mammals in the State:

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

The proposed action/no action alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, when requested, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by mammals in Florida. A major goal of the program would be to resolve and prevent damage caused by mammals and to reduce threats to human safety. To meet this goal, WS, in consultation the FWC, would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding was available, operational damage management. Funding could occur through federal appropriations or from cooperative funding. The adaptive approach to managing damage associated with mammals would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by a site-specific evaluation to reduce damage or threats to human safety for each request. City/town managers, agricultural producers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques.

Under this alternative, WS could respond to requests for assistance by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by mammals, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. The take of some of the mammal species addressed in this EA can only legally occur through the issuance of a permit by the FWC and only at levels specified in the permit, unless those mammal species are afforded no protection in which case no permit for take would be required.

Property owners or managers requesting assistance from WS could be provided with information regarding the use of effective and practical non-lethal and lethal techniques. Preference would be given to non-lethal methods when practical and effective under this alternative (see WS Directive 2.101). Property owners or managers may choose to implement WS' recommendations on their own (*i.e.*, technical assistance), use contractual services of private businesses, use volunteer services of private organizations, use the services of WS (*i.e.*, direct operational assistance), take the management action themselves, or take no further action.

WS would work with those persons experiencing mammal damage in addressing those mammals responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should occur as soon as mammals begin to cause damage. Mammal damage that has been ongoing can be difficult to resolve using available methods since mammals would be conditioned to an area and would be familiar with a particular location. Subsequently, making that area unattractive using available methods could be difficult to achieve once damage was ongoing. WS would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

WS' Decision Model would be the implementing mechanism for a damage management program under the proposed action alternative that could be adapted to an individual damage situation that allows for the broadest range of methods to be used to address damage or the threat of damage in the most effective, most efficient, and most environmentally conscious way available. When WS receives a request for direct operational assistance, WS would conduct site visits to assess damage or threats, would identify the cause of the damage, and would apply the Decision Model described by Slate et al. (1992) and WS Directive 2.201 to determine the appropriate methods to resolve or prevent damage. The use of the Decision model by WS' employees under the proposed action is further discussed below. In addition, preference would be given to non-lethal methods when practical and effective (see WS Directive 2.101).

Non-lethal methods that would be available for use by WS under this alternative include, but are not limited to minor habitat modifications, behavior modification, lure crops, visual deterrents, live traps, translocation, exclusionary devices, frightening devices, reproductive inhibitors, immobilizing drugs, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods that would be available to WS under this alternative include body-gripping traps, cable restraints, the recommendation of take during hunting and/or trapping seasons, rodenticides, euthanasia chemicals, and shooting. In addition, target mammal species live-captured using non-lethal methods (*e.g.*, live-traps, immobilizing drugs) could be euthanized. The lethal control of target mammals would comply with WS Directive 2.505.

Listing methods does not imply that all methods would be used or recommended by WS to resolve requests for assistance and does not imply that all methods would be used to resolve every request for assistance. The most appropriate response would often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. For example, if an entity requesting assistance had already attempted to alleviate damage using non-lethal methods, WS would not necessarily employ those same non-lethal methods, since those methods were proven ineffective at reducing damage or threats to an acceptable level to the requester.

Many lethal and non-lethal methods are intended to be short-term attempts at reducing damage occurring at the time those methods are employed. Long-term solutions to managing mammal damage would include limited habitat manipulations and changes in cultural practices, which are addressed further below and in Appendix B.

Non-lethal methods can disperse or otherwise make an area unattractive to mammals causing damage; thereby, reducing the presence of mammals at the site and potentially the immediate area around the site where non-lethal methods were employed. Non-lethal methods would be given priority when addressing requests for assistance (see WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model, especially when the requesting entity has used non-lethal methods previously and found those methods to be inadequate to resolving the damage or threats of damage. Non-lethal methods would be used to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse mammals from an area resulting in a reduction in the presence of those mammals at the site where those methods were employed. For any management methods employed, the proper timing would be essential in effectively dispersing those mammals causing damage. Employing methods soon after damage begins or soon after threats were identified increases the likelihood that those damage management activities would achieve success in addressing damage. Therefore, coordination and timing of methods would be necessary to be effective in achieving expedient resolution of mammal damage.

Under the proposed action alternative, WS could employ only non-lethal methods when determined to be appropriate for each request for assistance to alleviate damage or reduce threats of damage using the WS Decision Model. In some situations, a cooperating entity has tried to employ non-lethal methods to resolve damage prior to contacting WS for assistance. In those cases, the methods employed by the requester were either unsuccessful or the reduction in damage or threats had not reached a level that was tolerable by the requesting entity. In those situations, WS could employ other non-lethal methods, attempt to apply the same non-lethal methods, or employ lethal methods. In many situations, the implementation of non-lethal methods, such as exclusion-type barriers, would be the responsibility of the requestor, which means that, in those situations, the only function of WS would be to implement lethal methods, if determined to be appropriate using the WS Decision Model.

Lethal methods could be employed to resolve damage associated with those mammals identified by WS as responsible for causing damage or threats to human safety under this alternative; however, WS would only employ lethal methods after receiving a request for the use of those methods. The use of lethal methods would result in local population reductions in the area where damage or threats were occurring since mammals would be removed from the population. Lethal methods would often be employed to reinforce non-lethal methods and to remove mammals that were identified as causing damage or posing a threat to human safety. The use of lethal methods would result in local reductions of mammals in the area where damage or threats were occurring. The number of mammals removed from the population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of mammals involved with the associated damage or threat, and the efficacy of methods employed.

Often of concern with the use of lethal methods is that mammals that were lethally taken would only be replaced by other mammals either during the application of those methods (*e.g.*, mammals that relocate into the area) or by mammals the following year (*e.g.*, increase in reproduction and survivability that could result from less competition). As stated previously, the use of lethal methods would not be used as population management tools over broad areas. The use of lethal methods would be intended to reduce the number of mammals present at a specific location where damage was occurring by targeting those mammals causing damage or posing threats. Since the intent of lethal methods would be to manage only those mammals causing damage and not to manage entire mammal populations, those methods would not be ineffective because mammals return.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing mammal damage. The use of those methods would be intended to reduce damage occurring at the time those methods were employed but do not necessarily ensure mammals would not return once those methods were discontinued. Long-term solutions to resolving mammal damage would often be difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as fencing, or other practices that would not be costly or difficult to implement such as closing garbage cans. When addressing mammal damage, long-term solutions generally involve modifying existing habitat or making conditions to be less attractive to mammals. To ensure complete success, alternative sites in areas where damage was not likely to occur would often be required to achieve complete success in reducing damage and to avoid moving the problem from one area to another. Modifying a site to be less attractive to mammals would likely result in the dispersal of those mammals to other areas where damage could occur or could result in multiple occurrences of damage situations.

WS may recommend mammals be harvested during the regulated hunting and/or trapping season for those species in an attempt to reduce the number of mammals causing damage. Managing mammal populations over broad areas could lead to a decrease in the number of mammals causing damage. Establishing hunting or trapping seasons and the allowed take during those seasons is the responsibility of the FWC. WS does not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons.

A complete list of chemical and non-chemical methods available for use under this alternative can be found in Appendix B. However, listing methods neither implies that all methods would be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods would be used to resolve every request for assistance. As part of an integrated approach, WS may provide technical assistance and direct operational assistance to those people experiencing damage associated with mammals.

Technical Assistance Recommendations

Under the proposed action, WS would provide technical assistance to those persons requesting assistance with managing damage as part of an integrated approach. Technical assistance would occur as described in Alternative 2 of this EA. From FY 2006 through FY 2011, WS conducted 110 technical assistance projects that involved mammal damage to agricultural resources, property, natural resources, and threats to human safety (see Table 1.1).

Operational Damage Management Assistance

Operational damage management assistance would include damage management activities that were directly conducted by or supervised by personnel of WS. Operational damage management assistance could be initiated when the problem could not be effectively resolved through technical assistance alone and there was a written MOU, cooperative service agreement, or other comparable document signed between WS and the entity requesting assistance. The initial investigation by WS' personnel would define the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS' personnel could be required to effectively resolve problems, especially if chemical methods were necessary or if the problems were complex.

Educational Efforts

Education is an important element of activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations, WS provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS frequently cooperates with other entities in education and public information efforts. Additionally, technical papers have been and would continue to be presented at professional meetings and conferences so that other wildlife professionals and the public were periodically updated on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Research and Development

The National Wildlife Research Center (NWRC) functions as the research unit of WS by providing scientific information and the development of methods for wildlife damage management, which are effective and environmentally responsible. Research biologists with the NWRC work closely with wildlife managers, researchers, and others to develop and evaluate methods and techniques for managing wildlife damage. For example, research biologists from the NWRC were involved with developing and evaluating the reproductive inhibitor known under the trade name of Gonacon™. Research biologists with the NWRC have authored hundreds of scientific publications and reports based on research conducted involving wildlife and methods.

WS' Decision Making Procedures

WS' personnel would use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model (see WS Directive 2.201) and described by Slate et al. (1992). WS' personnel would assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, methods deemed to be practical for the situation would be incorporated into a damage management strategy. After this strategy was implemented, monitoring would be conducted and evaluation would continue to assess the effectiveness of the strategy. If the strategy were effective, the need for further management would be ended. In terms of the WS Decision Model, most efforts to resolve wildlife damage consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

Community-based Decision Making

WS could receive requests for assistance from community leaders and/or representatives. In those situations, the WS program in Florida under this alternative would follow the "*co-managerial approach*" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS could provide technical assistance regarding the biology and ecology of mammals and effective, practical, and reasonable methods available to the local decision-maker(s) to reduce damage or threats. This could include non-lethal and lethal methods. WS and other state and federal wildlife management agencies may facilitate discussions at local community meetings when resources were available. Under this approach, resource owners and others directly affected by mammal damage or conflicts would have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request direct operational assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Under a community based decision-making process, WS would provide information, demonstration, and discussion on available methods to the appropriate representatives of the community for which services were requested to ensure a community-based decision was made. By involving decision-makers in the process, damage management actions could be presented to allow decisions on damage management to involve those individuals that the decision-maker(s) represents. As addressed in this EA, WS would provide technical assistance to the appropriate decision-maker(s) to allow for information on damage management activities to be presented to those persons represented by the decision-maker(s), including demonstrations and presentation by WS at public meetings to allow for involvement of the community. Requests for assistance to manage damage caused by mammals often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives of the community, the decision-maker(s) would be able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentation by WS on damage management activities. This process would allow decisions on damage management activities to be made based on local input.

Community Decision-Makers

The decision-maker for the local community would be elected officials or representatives of the communities. The elected officials or representatives would be popularly elected residents of the local community or appointees who oversee the interests and business of the local community. This person or persons would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision-making. Identifying the decision-maker for local business communities can be more complex because building owners may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing Board. WS could provide technical assistance and make recommendations for damage reduction to the local community or local business community decision-maker(s). Direct assistance could be provided by WS only if requested by the local community decision-maker, funding is provided, and if the requested direct control was compatible with WS' recommendations.

Private Property Decision-Makers

In the case of private property owners, the decision-maker is the individual that owns or manages the affected property. The decision-maker has the discretion to involve others as to what occurs or does not occur on property they own or manage. Due to privacy issues, WS cannot disclose cooperator information to others. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others were involved in the decision-making process would be a decision made by that individual. Direct operational assistance could be provided by WS if requested, funding was provided, and the requested management was in accordance with WS' recommendations.

Public Property Decision-Makers

The decision-maker for local, state, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals, and legal mandates for the property. WS could provide technical assistance to this person and recommendations to reduce damage. Direct control could be provided by WS if requested, funding provided, and the requested actions were within the recommendations made by WS.

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with technical assistance only. Similar to Alternative 1, WS could receive requests for assistance from community representatives, private individuals/businesses, or from public entities. Technical assistance would provide those cooperators experiencing damage or threats associated with mammals with information, demonstrations, and recommendations on available and appropriate methods. The implementation of methods and techniques to resolve or prevent damage would be the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that were of limited availability for use by private entities (*e.g.*, loaning of propane cannons). Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies would be described to the requester for short and long-term solutions to managing damage; those strategies would be based on the level of risk, need, and the practicality of their application. WS would use the Decision Model to recommend those methods and techniques available to the requester to manage damage and threats of damage. Those persons receiving technical assistance from WS could implement those methods recommended by WS, could employ other methods not recommended by WS, could seek assistance from other entities, or take no further action.

Under a technical assistance only alternative, WS would recommend an integrated approach similar to the proposed action alternative (Alternative 1) when receiving a request for assistance; however, WS would not provide direct operational assistance under this alternative. Preference would be given to non-lethal methods when practical and effective under this alternative (see WS Directive 2.101). Recommendation of methods and techniques by WS to resolve damage would be based on information provided by the individual seeking assistance using the WS Decision Model. In some instances, wildlife-related information provided to the requestor by WS would result in tolerance/acceptance of the situation. In other instances, damage management options would be discussed and recommended. Only those methods legally available for use by the appropriate individual would be recommend or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those persons experiencing damage or threats associated with mammals in the State except for immobilizing drugs, euthanasia chemicals, and reproductive inhibitors. Immobilizing drugs and euthanasia chemicals would only be available to WS or appropriately licensed veterinarians. Under this alternative, the reproductive inhibitor available under the trade name of Gonacon™ would only be available for use by the FWC or those persons under the supervision of the FWC. At the time this EA was developed, Gonacon™ was not registered for use in the State.

The WS program in the State regularly provides technical assistance to individuals, organizations, and other federal, state, and local government agencies for managing mammal damage. Technical assistance would include collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator had attempted to resolve the problem. WS would then provide information on appropriate methods that the cooperator could consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues. Between FY 2006 and FY 2011, WS has conducted 110 technical assistance projects that involved mammal damage to agricultural resources, property, natural resources, and threats to human safety.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, and/or private businesses. Those persons experiencing damage or were concerned with threats posed by mammals could seek assistance from other governmental agencies, private entities, or conduct damage management on their own. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent mammal damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

Alternative 3 – No Mammal Damage Management Conducted by WS

This alternative would preclude all activities by WS to reduce threats to human health and safety, and to alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of mammal damage management in the State. All requests for assistance received by WS to resolve damage caused by mammals would be referred to the FWC, other governmental agencies, and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with mammals in the State, those persons experiencing damage caused by mammals could continue to resolve damage by employing those methods legally available since the take of mammals can occur despite the lack of involvement by WS. The take of mammals by other entities could occur through the issuance of permits by the FWC, when required, and during the hunting and/or trapping seasons. Cottontail rabbits, feral swine, raccoons, opossum, coyotes, beaver, and skunks can be harvested throughout the year during continuously open seasons for those species, including addressing those species to alleviate damage (FWC Statute 68A-9.010). In addition, armadillos and rats are considered unprotected species and can be addressed using legally available methods at any time. All methods described in Appendix B would be available for use by those persons experiencing damage or threats under this alternative, except for the use of Gonacon™, immobilizing drugs, and euthanasia chemicals. Gonacon™ could only be used by WS and the FWC. Immobilizing drugs and euthanasia chemicals could only be used by WS or appropriately licensed veterinarians. Some methods, such as foothold traps and body-gripping traps, require a permit from the FWC.

Under this alternative, those persons experiencing damage or threats of damage could contact WS; however, WS would immediately refer the requester to the FWC and/or other entities. The requester could contact other entities for information and assistance with managing damage, could take actions to alleviate damage without contacting any entity, or could take further no action.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

In addition to those alternatives analyzed in detail, several additional alternatives were identified by WS. However, those alternatives will not receive detailed analyses for the reasons provided. Those alternatives considered but not analyzed in detail include:

Non-lethal Methods Implemented Before Lethal Methods

This alternative would require that non-lethal methods or techniques described in Appendix B be applied to all requests for assistance to reduce damage and threats to safety from mammals in the State. If the use of non-lethal methods fails to resolve the damage situation or reduce threats to human safety at each damage situation, lethal methods would be employed to resolve the request. Non-lethal methods would be applied to every request for assistance regardless of severity or intensity of the damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by other entities or by those persons experiencing mammal damage but would only prevent the use of those methods by WS until non-lethal methods had been employed.

Those persons experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting WS. Verification of the methods used would be the responsibility of WS. No standard exists to determine requester diligence in applying those methods, nor are there any standards to determine how many non-lethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of non-lethal methods can be evaluated. The proposed action (Alternative 1) and the technical assistance only alternative (Alternative 2) are similar to a non-lethal before lethal alternative because WS would use or recommend non-lethal methods before lethal methods (WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not contribute additional information to the analyses in the EA.

Use of Non-lethal Methods Only by WS

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by mammals in the State. Only those methods discussed in Appendix B that were considered non-lethal would be employed by WS. No intentional lethal take of mammals would occur by WS. The use of lethal methods could continue to be used under this alternative by other entities or by those persons experiencing damage by mammals. The non-lethal methods used or recommended by WS under this alternative would be identical to those non-lethal methods identified in any of the alternatives.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS could refer requests for information regarding lethal methods to the FWC, local animal control agencies, or private businesses or organizations. Property owners or managers could conduct management using any method that was legal. Property owners or managers might choose to implement WS' non-lethal recommendations, implement lethal methods, or request assistance from a private or public entity other than WS. Property owners/managers frustrated by the lack of WS' assistance with the full range of mammal damage management techniques may try methods not recommended by WS or use illegal methods (*e.g.*, poisons). In some cases, property owners or managers may misuse some methods or use some methods in excess of what was necessary, which could then become hazardous and pose threats to the safety of people and non-target species.

The proposed action, using an integrated damage management approach, incorporates the use of non-lethal methods when addressing requests for assistance. In those instances where non-lethal methods would effectively resolve damage from mammals, those methods would be used or recommended under the proposed action. Since non-lethal methods would be available for use under the alternatives analyzed in detail, this alternative would not add to the analyses. Those mammals that could be lethally removed by WS under any of the alternatives could be removed by those persons experiencing damage or threats even if WS was not involved.

Use of Lethal Methods Only by WS

This alternative would require the use of lethal methods only to reduce threats and damage associated with mammals. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. Non-lethal methods have been effective in alleviating mammal damage. For example, the use of one-way exclusion devices can be effective at allowing bats to exit a structure but prevent re-entry. Once bats have exited the structure, structural repairs could be completed to permanently prevent re-entry of bats. In those situations where damage could be alleviated using non-lethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. Therefore, this alternative was not considered in detail.

Trap and Translocate Mammals Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Mammals would be live-captured using immobilizing drugs, live-traps, cannon nets, or rocket nets. All mammals live-captured through direct operational assistance by WS would be translocated. Translocation sites would be identified and have to be approved by the FWC and/or the property owner where the translocated mammals would be placed prior to live-capture and translocation. Live-capture and translocation could be conducted as part of the alternatives analyzed in detail. However, the translocation of mammals could only occur under the authority of the FWC. Therefore, the translocation of mammals by WS would only occur as directed by the FWC. When requested by the FWC, WS could translocate mammals or recommend translocation under any of the alternatives analyzed in detail, except under the no involvement by WS alternative (Alternative 3). Since WS does not have the authority to translocate mammals in the State unless permitted by the FWC, this alternative was not considered in detail. In addition, translocation of mammals by WS could occur under any of the alternatives analyzed in detail, except Alternative 3. However, translocation by other entities could occur under Alternative 3.

The translocation of mammals to other areas following live-capture that have caused damage generally would not be effective or cost-effective. Translocation is generally ineffective because problem mammal species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and translocation would most likely result in mammal damage problems at the new location. In addition, hundreds of mammals would need to be captured and translocated to solve some damage problems (*e.g.*, deer confined within a perimeter fence); therefore, translocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (see WS Directive 2.501) because of the stress to the translocated animal, poor survival rates, threat of spreading diseases, and the difficulties that translocated wildlife have with adapting to new locations or habitats (Nielsen 1988). Since WS does not have the authority to translocate mammals in the State unless permitted by the FWC, this alternative was not considered in detail.

Reducing Damage by Managing Mammal Populations through the Use of Reproductive Inhibitors

Under this alternative, the only method that would be available to resolve requests for assistance by WS would be the recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in mammals responsible for causing damage. Reproductive inhibitors are often considered for use where wildlife populations are overabundant and where traditional hunting or lethal control programs are not publicly acceptable (Muller et al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors.

Reproductive control for wildlife could be accomplished through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through: 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) through gene therapy. Contraception could be accomplished through: 1) hormone implantation (synthetic steroids such as progestins), 2) immunocontraception (contraceptive vaccines), and 3) oral contraception (progestin administered daily).

Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species. Currently, chemical reproductive inhibitors are not available for use to manage most mammal populations. Given the costs associated with live-capturing and performing sterilization procedures on mammals and the lack of availability of chemical reproductive inhibitors for the management of most mammal populations, this alternative was not evaluated in detail. If a reproductive inhibitor becomes available to manage a large number of mammal populations and has proven effective in reducing localized mammal populations, the use of the inhibitor could be evaluated under the proposed action as a method available that could be used in an integrated approach to managing damage. This EA would be reviewed and supplemented to the degree necessary to evaluate the use of the reproductive inhibitor as part of an integrated approach described under the proposed action. Currently, the only reproductive inhibitor that is registered with the EPA is Gonacon™, which is registered for use on white-tailed deer only. However, Gonacon™ was not registered for use in the State during the development of this EA. Reproductive inhibitors for the other mammal species addressed in this EA do not currently exist.

Compensation for Mammal Damage

The compensation alternative would require WS to establish a system to reimburse persons impacted by mammal damage and to seek funding for the program. Under such an alternative, WS would continue to provide technical assistance to those persons seeking assistance with managing damage. In addition, WS would conduct site visits to verify damage. Evaluation of this alternative indicates that a compensation only alternative has many drawbacks. Compensation would: 1) require large expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation, 2) compensation most likely would be below full market value, 3) give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies, and 4) not be practical for reducing threats to human health and safety.

Short Term Eradication and Long Term Population Suppression

An eradication alternative would direct all WS' program efforts toward total long-term elimination of mammal populations wherever a cooperative program was initiated in Florida. Eradication of native mammal species is not a desired population management goal of State agencies or WS. Eradication as a general strategy for managing mammal damage was not considered in detail because State and federal agencies with interest in, or jurisdiction over, wildlife oppose eradication of any native wildlife species and eradication is not acceptable to most people.

Suppression would direct WS' program efforts toward managed reduction of certain problem populations or groups. In areas where damage can be attributed to localized populations of mammals, WS could decide to implement local population suppression using the WS' Decision Model. However, large-scale population suppression would not be realistic or practical to consider as the basis of the WS' program. Problems with the concept of suppression would be similar to those described above for eradication. Typically, WS' activities in Florida would be conducted on a very small portion of the sites or areas inhabited or frequented by problem species.

Bounties

Payment of funds (bounties) for killing some mammals suspected of causing economic losses have not been supported by state agencies, such as the FWC, as well as most wildlife professionals for many years (Latham 1960, Hoagland 1993). WS concurs with those agencies and wildlife professionals because of several inherent drawbacks and inadequacies in the payment of bounties. Bounties are often ineffective at controlling damage over a wide area, such as across the entire State. The circumstances surrounding the take of animals are typically arbitrary and completely unregulated because it is difficult or impossible to assure animals claimed for bounty were not taken from outside the area where damage was occurring. In addition, WS does not have the authority to establish a bounty program.

Trap-Neuter-Release Program for Feral and Free Ranging Cats and/or Dogs

This topic has undergone considerable debate in animal welfare and scientific communities for a number of years. The debate focuses on whether controlling feral, free-ranging, or invasive animal populations through Trap-Neuter-Release (TNR) programs are effective and alleviate problems (*i.e*., diseases, predation, agricultural damage, and human safety).

Theoretically, TNR programs would work if all animals of one sex or both were sterilized. However, the probability of controlling invasive species in the wild with this technique would not currently be reasonable; especially, with many feral animals being self-sufficient and not reliant on people to survive. Additionally, some individuals within a population can be trap-shy. Capturing or removing trap-shy individuals often requires implementing other methods.

The National Association of State Public Health Veterinarians and the AVMA oppose TNR programs based on health concerns and threats (AVMA 2003). Of major concern would be the potential for disease and parasite transmission to humans from direct contact during either sterilization or the risk of exposure after the animal was released. Once live-captured, performing sterilization procedures during field operations on anesthetized animals could be difficult. Sanitary conditions could be difficult to maintain when performing surgical procedures in field conditions. To perform operations under appropriate conditions, live-captured animals would need to be transported from the capture site to an appropriate facility, which could increase the threat from handling and transporting the animal. A mobile facility could be used; however, a mobile facility would still require additional handling and transporting of the live-captured animal to the facility. Once the surgical procedure was completed, the animal would have to be held to ensure recovery and transported back to the area where capture occurred.

TNR programs are often not as successful as desired and needed to reduce immediate threats posed by wildlife, especially when human safety is a concern (AVMA 2003, Barrows 2004, Levy and Crawford 2004, Jessup 2004, Winter 2004, AVMA 2009). Feral animals subjected to a TNR program would continue to cause the same problems[12] they caused before the TNR program was initiated because of slow attrition. TNR programs can take a decade or longer to reduce target species populations (Barrows 2004, Winter 2004); especially, when acute issues need rapid solutions (Levy and Crawford 2004, Stoskopf and Nutter 2004). Several studies report that target species' populations often remain stable or increase following TNR programs due to immigration and reproduction from other members of the groups (Castillo and Clarke 2003, Levy and Crawford 2004, Winter 2004) with little to no resolution of threats to human safety or damages (Barrows 2004, Slater 2004, Winter 2004).

Other concerns arise when considering the legality of TNR programs given the documented damage caused by target species, especially to native wildlife (Barrows 2004, Levy and Crawford 2004, Jessup 2004). Some people have questioned whether TNR programs are violating the Migratory Bird Treaty Act and the ESA because released animals may continue to kill migratory birds and/or endangered species (Barrows 2004, Levy and Crawford 2004, Jessup 2004). Because of the continued threat to human safety created by TNR programs and the continued threat to T&E wildlife and native wildlife in general, this alternative will not be considered further.

[12] Brickner (2003), Levy et al. (2003), Barrows (2004), and Jessup (2004) reported that sterilized cats that do not spend any time on courting and mating are left with more time to hunt than non-sterilized cats and therefore, continue to remain as potential reservoirs of animal and human disease, a social nuisance, and continue to hunt and kill protected species.

3.3 STANDARD OPERATING PROCEDURES FOR MAMMAL DAMAGE MANAGEMENT

SOPs improve the safety, selectivity, and efficacy of activities intended to resolve wildlife damage. The WS program in Florida uses many such SOPs. Those SOPs would be incorporated into activities conducted by WS under the appropriate alternatives when addressing mammal damage and threats in the State.

Some key SOPs pertinent to the relevant alternatives include the following:

- The WS Decision Model, which is designed to identify effective strategies to managing wildlife damage and their potential impacts, would be consistently used and applied when addressing mammal damage.
- EPA-approved label directions would be followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse effects occur to the environment when chemicals are used in accordance with label directions.
- Immobilizing and euthanasia drugs would be used according to the DEA, FDA, and WS' directives and procedures.
- All controlled substances would be registered with the DEA or the FDA.
- WS' employees would follow approved procedures outlined in the WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001).
- WS' employees that use controlled substances would be trained to use each material and would be certified to use controlled substances.
- WS' employees who use pesticides and controlled substances would participate in State-approved continuing education to keep current of developments and maintain their certifications.
- Pesticide and controlled substance use, storage, and disposal would conform to label instructions and other applicable laws and regulations, and Executive Order 12898.
- Material Safety Data Sheets for pesticides and controlled substances would be provided to all WS' personnel involved with specific damage management activities.
- All personnel who use firearms would be trained according to WS' Directives.
- The use of non-lethal methods would be considered prior to the use of lethal methods when managing mammal damage.
- The take of mammals by WS under the proposed action alternative would only occur when authorized by the FWC, when applicable, and only at levels authorized.
- Management actions would be directed toward localized populations, individuals, or groups of target species. Generalized population suppression across Florida, or even across major portions of Florida, would not be conducted.
- Non-target animals live-captured in traps would be released unless it was determined that the animal would not survive and/or that the animal could not be released safely.

3.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

Several additional SOPs are applicable to the alternatives and the issues identified in Chapter 2 including the following:

Issue 1 - Effects of Damage Management Activities on Target Mammal Populations

- Lethal take of mammals by WS would be reported and monitored by WS and the FWC to evaluate population trends and the magnitude of WS' take of mammals in the State.
- WS would only target those individuals or groups of target species identified as causing damage or posing a threat to human safety.
- The WS' Decision Model, designed to identify the most appropriate damage management strategies and their impacts, would be used to determine strategies for resolving mammal damage.
- WS would monitor activities to ensure those activities do not adversely affect mammal populations in the State.
- Preference would be given to non-lethal methods, when practical and effective.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

- When conducting removal operations via shooting, identification of the target would occur prior to application.
- As appropriate, suppressed firearms would be used to minimize noise impacts.
- Personnel would use lures, trap placements, and capture devices that would be strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.
- Any non-target animals captured in cage traps, nets, or any other restraining device would be released whenever it is possible and safe to do so.
- Personnel would be present during the use of live-capture methods or live-capture methods would be checked at least once a day or in accordance with Florida laws and regulations. This would help ensure non-target species were released in a timely manner or were prevented from being captured.
- Carcasses of mammals retrieved after damage management activities have been conducted would be disposed of in accordance with WS Directive 2.515.
- WS has consulted with the USFWS and the FWC to evaluate activities to resolve mammal damage and threats to ensure the protection of T&E species.
- WS would monitor activities conducted under the selected alternative, if activities are determined to have no significant impact on the environment and an EIS is not required, to ensure those activities do not negatively impact non-target species.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

- Damage management activities would be conducted professionally and in the safest manner possible. Whenever possible, damage management activities would be conducted away from areas of high human activity. If this were not possible, then activities would be conducted during periods when human activity is low (*e.g.*, early morning).

- Shooting would be conducted during times when public activity and access to the control areas were restricted. Personnel involved in shooting operations would be fully trained in the proper and safe application of this method.

- All personnel employing chemical methods would be properly trained and certified in the use of those chemicals. All chemicals used by WS would be securely stored and properly monitored to ensure the safety of the public. WS' use of chemicals and training requirements to use those chemicals are outlined in WS Directive 2.401 and WS Directive 2.430.

- All chemical methods used by WS or recommended by WS would be registered with the EPA, DEA, FDA, and/or the FDACS, as appropriate.

- WS would adhere to all established withdrawal times for mammals when using immobilizing drugs for the capture of mammals that are agreed upon by WS, the FWC, and veterinarian authorities. Although unlikely, in the event that WS was requested to immobilize mammals either during a time when harvest of those mammal species was not occurring or during a time where the withdrawal period could overlap with the start of a harvest season, WS would euthanize the animal or mark the animal with a tag labeled with a "*do not eat*" warning and appropriate contact information

- Carcasses of mammals retrieved after damage management activities would be disposed of in accordance with WS Directive 2.515.

Issue 4 - Effects on the Socio-cultural Elements of the Human Environment

- Management actions to reduce or prevent damage caused by mammals would be directed toward specific individuals identified as responsible for the damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- All methods or techniques applied to resolve damage or threats to human safety would be agreed upon by entering into a cooperative service agreement, MOU, or comparable document prior to the implementation of those methods.

- Preference would be given to non-lethal methods, when practical and effective.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

- Personnel would be well trained in the latest and most humane devices/methods for removing target mammals causing damage.

- WS' personnel would check methods frequently to ensure mammals captured would be addressed in a timely manner to minimize the stress of being restrained.

- When deemed appropriate using the WS' Decision Model, WS' use of lethal methods would comply with WS' directives (WS Directive 2.505, WS Directive 2.430).

- The NWRC is continually conducting research to improve the selectivity and humaneness of wildlife damage management devices used by personnel in the field.

- The use of non-lethal methods would be considered prior to the use of lethal methods when managing mammal damage.

Issue 6 - Effects of Mammal Damage Management Activities on the Regulated Harvest of Mammals

- Management actions to reduce or prevent damage caused by mammals in the State would be directed toward specific individuals identified as responsible for the damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- WS' activities to manage damage and threats caused by mammals would be coordinated with the FWC.

- WS' lethal take (killing) of mammals would be reported to and monitored by the FWC to ensure WS' take has been considered as part of management objectives for those mammal species in the State.

- WS would monitor activities to ensure those activities do not adversely affect mammal populations in the State.

Issue 7 – Effects of Beaver Dam Manipulation on the Status of Wetlands in the State

- WS' personnel would remove beaver dams in accordance with federal and state laws and regulations for environmental protection. Beaver dam removal would be conducted to restore drainage or the stream channel for an area, or if an area has an established silvicultural or other agricultural, commercial/industrial activity, and where such an area has not become an established wetland.

- Upon receiving a request to remove beaver dams, WS would visually inspect the dam and the associated water impoundment to determine if characteristics exist at the site that would meet the definition of a wetland under section 404 of the Clean Water Act (40 CFR 232.2; see Issue 5 in Section 2.2 of this EA). If wetland conditions were present at the site, the entities requesting assistance from WS would be notified that a permit might be required to remove the dam and to seek guidance from the Florida Department of Environmental Protection and the United States Army Corps of Engineers pursuant to Florida State Law and the Clean Water Act.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative as that alternative relates to the issues identified. The following resource values in the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, critical habitats (areas listed in T&E species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. Those resources will not be analyzed further.

The activities proposed in the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur because of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. Therefore, the proposed action/no action alternative (Alternative 1) serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS and the FWC.

Issue 1 - Effects of Damage Management Activities on Target Mammal Populations

A common issue is whether damage management actions would adversely affect the populations of target mammal species, especially when lethal methods were employed. WS would maintain ongoing contact with the FWC to ensure activities occurred within management objectives for those species. WS would submit annual activity reports to the FWC. With management authority over wildlife in the State, the FWC would monitor the total take of mammals from all sources and would factor in survival rates from predation, disease, and other mortality data. Ongoing contact with the FWC would assure local, state, and regional knowledge of wildlife population trends would be considered. As discussed previously, the analysis for magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest trend data. Information on mammal populations and trends are often derived from several sources, including published literature and harvest data.

Methods available to address mammal damage or threats of damage in the State that would be available for use or recommendation under Alternative 1 (proposed action/no action alternative) and Alternative 2 (technical assistance only alternative) would either be lethal methods or non-lethal methods. Many of the methods would also be available to other entities under Alternative 3 (no involvement by WS alternative). The only methods that would not be available for use by other entities under Alternative 2 and Alternative 3 would be immobilizing drugs, euthanasia chemicals, and Gonacon™. Under Alternative 2, WS could recommend lethal and non-lethal methods as part of an integrated approach to resolving requests for assistance. Alternative 1 would address requests for assistance received by WS through technical and/or operational assistance where an integrated approach to methods would be employed and/or recommended. Non-lethal methods that would be available to WS under Alternative 1 would include, but would not be limited to habitat/behavior modification, pyrotechnics, visual deterrents, live traps, translocation, cable restraints, exclusionary devices, frightening devices, nets, reproductive inhibitors, immobilizing drugs, and chemical repellents (see Appendix B for a complete list and description of potential methods).

Non-lethal methods that would be available under all of the alternatives can disperse or otherwise make an area unattractive to mammals causing damage; thereby, reducing the presence of mammals at the site and potentially the immediate area around the site where non-lethal methods were employed. Non-lethal methods would be given priority by WS when addressing requests for assistance under Alternative 1 and

Alternative 2 (see WS Directive 2.101). However, non-lethal methods would not necessarily be employed or recommended to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model. For example, if a cooperator requesting assistance had already used non-lethal methods, WS would not likely recommend or continue to employ those particular methods since their use had already been proven ineffective in adequately resolving the damage or threat.

Many non-lethal methods would be used to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse mammals from the area resulting in a reduction in the presence of those mammals at the site where those methods were employed. However, mammals responsible for causing damage or threats would be dispersed to other areas with minimal impact on those species' populations. Non-lethal methods would not be employed over large geographical areas or applied at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods would generally be regarded as having minimal impacts on overall populations of wildlife since individuals of those species were unharmed. The use of non-lethal methods would not have adverse impacts on mammal populations in the State under any of the alternatives.

The continued use of many non-lethal methods can often lead to the habituation of mammals to those methods, which can decrease the effectiveness of those methods. For any management methods employed, the proper timing would be essential in effectively dispersing those mammals causing damage. Employing methods soon after damage begins or soon after threats were identified would increase the likelihood that those damage management activities would achieve success in addressing damage. Therefore, the coordination and timing of methods would be necessary to be effective in achieving expedient resolution of mammal damage.

In addition to non-lethal methods that would be used to disperse, exclude, or harass wildlife, another non-lethal method available under the alternatives would be the reproductive inhibitor commonly known as Gonacon™. The reproductive inhibitor Gonacon™ is currently not registered for use in Florida. However, the product is discussed in this assessment to evaluate the potential use of the chemical if it becomes registered for use in the future. Gonacon™ has been classified as a restricted-use pesticide by the EPA. Restricted-use pesticides can only be purchased and/or applied by those persons who have successfully completed an applicators course to use restricted-use pesticides. The FDACS administers training and testing required for applicators to purchase and apply restricted-use pesticides in the State. Gonacon™ could be employed by WS and/or the FWC, if registered for use in the State, under Alternative 1. Only the FWC or their designated agents could use Gonacon™ if Alternative 2 or Alternative 3 were selected.

Lethal methods would also be available for use under all the alternatives by WS and/or by other entities. Lethal methods that would be available to address mammal damage include live-capture followed by euthanasia, shooting, body gripping traps, rodenticides, cable restraints, and the recommendation of hunting and/or trapping, where appropriate. All of those methods would be available for use by WS or for recommendation by WS under Alternative 1. Lethal methods could be employed by WS under Alternative 1 to resolve damage only after receiving a request for the use of those methods. Those same methods would also be available for WS to recommend and for other entities to use under Alternative 2. Under Alternative 3, those same lethal methods would continue to be available for use by other entities despite the lack of involvement by WS in damage management activities.

When live-captured target animals were to be lethally taken under Alternative 1, take would occur pursuant to WS Directive 2.505 and WS Directive 2.430. Under alternative 2, WS would recommend the use of methods to lethally take live-captured or restrained target animals in accordance with WS Directive

2.505. No assistance would be provided by WS under Alternative 3; however, many of those methods available to lethally take live-captured or restrained animals would continue to be available for use by other entities under Alternative 3.

The use of lethal methods by any entity could result in local population reductions in the area where damage or threats were occurring since mammals would be removed from the population. Lethal methods could be employed or recommended to remove mammals that have been identified as causing damage or posing a threat to human safety. Therefore, the use of lethal methods could result in local reductions of mammals in the area where damage or threats were occurring. The number of mammals removed from the population annually by WS using lethal methods under Alternative 1 would be dependent on the number of requests for assistance received, the number of mammals involved with the associated damage or threat, and the efficacy of methods employed. The number of mammals removed by other entities under Alternative 2 and Alternative 3 would be unknown but would likely be similar to the take that could occur under Alternative 1.

Chemical methods that could be available under the alternatives to manage damage associated with certain mammal species would include zinc phosphide, brodifacoum, and diphacinone. In most cases, those chemical methods would not be restricted to use by WS only; therefore, when registered for use in the State as a restricted-use pesticide, those products would be available for use by licensed pesticide applicators under any of the alternatives.

Most lethal methods would be employed to reduce the number of mammals present at a location since a reduction in the number of mammals at a location could lead to a reduction in damage, which would be applicable whether using lethal or non-lethal methods. The intent of non-lethal methods would be to harass, exclude, or otherwise make an area unattractive to mammals, which disperses those mammals to other areas leading to a reduction in damage at the location where those mammals were dispersed. Similarly, the use of a reproductive inhibitor would be to reduce a local population of target mammals, which could reduce the damage occurring since fewer individuals in a localized population can lead to more tolerable damage levels. The intent of using lethal methods would be similar to the objective trying to be achieved when using non-lethal methods, which would be to reduce the number of mammals in the area where damage was occurring; thereby, reducing the damage occurring at that location.

Although the use of firearms can reduce the number of mammals using a location (similar to dispersing mammals), the use of a firearm is most often used to supplement and reinforce the noise associated with non-lethal methods. The capture of mammals using live-traps and subsequently euthanizing those mammals would be employed to reduce the number of mammals using a particular area where damage was occurring. Similarly, the recommendation that mammals be harvested during the regulated hunting and/or trapping season for those species in the State would be intended to manage those populations in the area where damage was occurring.

Rodenticides would also be employed to target specific or localized populations of black rats, Norway rats, and Gambian rats where damage or threats of damage were occurring. Determination of the number of rats killed from the use of rodenticides can be difficult since most rats killed by those methods die underground. Removal of rats by WS would be done at specific isolated sites (*e.g.*, airports, orchards, islands).

Often of concern with the use of lethal methods is that mammals that were lethally taken would only be replaced by other mammals either during the application of those methods (*e.g.*, mammals that relocate into the area) or by mammals the following year (*e.g.*, increase in reproduction and survivability that could result from less competition). As stated previously, WS would not use lethal methods during direct operational assistance as population management tools over broad areas. Lethal methods would be employed under Alternative 1 to reduce the number of mammals present at a location where damage was occurring by targeting those mammals causing damage or posing threats. The return of mammals to areas where methods were previously employed does not indicate previous use of those methods were ineffective since the intent of those methods were to reduce the number of mammals present at a site where predation was occurring or could occur at the time those methods were employed.

The use of most lethal methods would be intended to reduce the number of mammals present at a location since a reduction in the number of mammals at a location could lead to a reduction in damage, which is applicable whether using lethal or non-lethal methods. The intent of non-lethal methods would be to harass, exclude, or otherwise make an area unattractive to mammals, which could disperse those mammals to other areas potentially leading to a reduction in damage at the location where those mammals were dispersed. The intent of using lethal methods would be similar to the objective trying to be achieved when using non-lethal methods, which would be to reduce the number of mammals in the area where damage was occurring leading to a reduction in the damage occurring at that location.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing mammal damage. Those methods would be employed to reduce damage occurring at the time those methods were employed but do not necessarily ensure mammals would not return once those methods were discontinued or after the reproductive season (when young disperse and occupy vacant areas). Long-term solutions to resolving mammal damage can often be difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as fencing, or other practices such as structural repairs. When addressing mammal damage, long-term solutions generally involve modifying existing habitat or making conditions to be less attractive to mammals. To ensure complete success, alternative sites in areas where damage was not likely to occur would often times be required to achieve complete success in reducing damage and to avoid moving the problem from one area to another. Modifying a site to be less attractive to mammals would likely result in the dispersal of those mammals to other areas where damage could occur or could result in multiple occurrences of damage situations.

WS may recommend under Alternative 1 and Alternative 2 that property owners or managers, that request assistance, allow mammals to be harvested during the regulated hunting and/or trapping season for those species in an attempt to reduce the number of mammals causing damage on their properties. Managing localized mammal populations by allowing hunting and/or trapping could lead to a decrease in the number of mammals causing damage. Establishing hunting and trapping seasons and the allowed take during those seasons is the responsibility of the FWC. WS does not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons. However, the harvest of those mammals during hunting and/or trapping seasons in the State would be occurring in addition to any take that could occur by WS under the alternatives or recommended by WS. In addition, mammals could also be lethally removed by other entities to alleviate damage or threats of damage under all the alternatives. The total number of individuals from each species that werelethally removed by other entities to alleviate damage or threats of damage is currently not available.

The issue of the potential impacts of conducting the alternatives on the populations of those mammal species addressed in this assessment is analyzed for each alternative below.

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance to those persons requesting assistance with managing damage and threats associated with mammals in the State. WS could employ those methods described in Appendix B in an adaptive approach that would integrate methods to effectively reduce damage and threats associated with mammals in the State.

As discussed previously, the analysis to determine the magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest trend data. WS' take that could occur to alleviate damage or threats of damage under the proposed action would be monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take was maintained below the level that would cause undesired adverse effects to the viability of native species' populations. The potential impacts on the populations of target mammal species from the implementation of the proposed action are analyzed for each species below.

Nine-banded Armadillo Population Information and Effects Analysis

The nine-banded armadillo is easily recognized due to its unique appearance. An opossum-sized animal, the armadillo has a "*shell*", which is composed of ossified dermal plates covered by a leathery epidermis (Whitaker, Jr. and Hamilton, Jr. 1998). The armadillo is the only North American mammal that has heavy bony plates (National Audubon Society 2000). Originally thought to occur in Central and South America, including Mexico, the nine-banded armadillo has undergone a northward and eastward expansion into the United States since the late-1800s, likely through natural dispersal from Mexico and release of captive armadillos (Layne 2003). Today, the armadillo can be found across the southern portion of the United States with additional dispersal northward and eastward in the United States likely in the future (Layne 2003). Range expansion is likely only limited by the reduced food availability and the colder temperatures experienced during the winter months.

Armadillos do not tolerate extended periods of cold weather, which may limit their expansion northward. Armadillos do not hibernate and must feed every couple of days during winter months since they do not store food nor accumulate efficient amounts of body fat to survive through the winter. The presence of snow or frozen soils limits the availability of food sources, primarily the availability of insects, during winter months. The lack of food available often causes armadillos to starve during winter months.

Armadillos occupy and exploit a variety of natural and human-modified terrestrial habitats in the United States and across their range, including those armadillos found Florida. Layne (2003) summarizes the natural habitat types occupied by armadillos throughout their range as "*...pine-oak woodlands, oak-elm woodlands, pine forests, mixed pine-hardwood forests, bottomland forests, riparian woodlands, mesic hardwood forests, scrub, chaparral-mixed grass, inland and coastal prairies, salt marsh, coastal dunes, and coastal strand*." Human-modified habitats where armadillos can be found has been summarized by Layne (2003), which included "*...pastures, parkland, cemeteries, golf courses, citrus groves, pine plantations, plant nurseries, cut-over pineland, and various croplands*." The ability of armadillos to exploit a wide variety of habitat types is likely one of the main components facilitating the range expansion of the armadillo into and across the United States (Layne 2003). Habitat suitability is likely more of a function of soil substrate rather than vegetative type due to the foraging and digging behavior of armadillos (Layne 2003).

Armadillos are opportunistic feeders and will often forage by digging and probing the soil, leaf litter, and decaying wood for invertebrates, primarily insects. One study found at least 488 different food items in the stomachs of 281 armadillo with insects and other invertebrates comprising 92% of the stomach contents (Kalmbach 1943). Armadillos are also known to forage on plant material and small vertebrates with food preferences often driven by the availability of food sources (Layne 2003).

Armadillos are prolific diggers and damages attributed to armadillos are often associated with their digging behavior. Armadillos will dig out shelters and dig while rooting out invertebrates in the soil and leaf litter. This digging and rooting behavior are the most common complaints from resource owners in Florida. Damage to landscaping is the most common resource being damaged by armadillos in Florida. Sandy soils are conducive to digging and armadillos can be found in those areas in Florida where sandy soils are present.

Female armadillos produce one litter of young per year, which are identical quadruplets (National Audubon Society 2000). Population estimates for armadillos in the United States range from 30 to 50 million armadillos (Gilbert 1995). Armadillos were first released into Florida in the 1920s (Bailey 1924, Sherman 1936). Today, armadillos can be found statewide across Florida throughout the year in suitable habitat (Layne 2003). However, a current population estimate for Florida is not available. In Florida, winter temperatures are relatively sufficient to maintain armadillo populations; however, periods of extreme cold or prolonged periods of cold temperatures may temporarily reduce local populations.

Since a statewide population estimate for armadillos is not currently available, a population estimate will be derived based on the best available information for armadillos to provide an indication of the magnitude of take proposed by WS to alleviate damage and threats of damage. Population densities for armadillos are reported to range from 0.004 to 1.4 armadillos per acre with an average of 0.25 armadillos per acre (Mengak 2005). The land area of Florida has been estimated at 53,625 square miles (United States Census Bureau 2010), which is approximately 34,320,000 acres. Using a population density estimated at 0.004 to 1.4 armadillos per acre, the statewide population could range from approximately 137,300 armadillos to approximately 48 million armadillos. With an average of 0.25 armadillos per acre, the statewide population could be estimated at nearly 8.6 million armadillos. As stated previously, the actual number of armadillos in the State is currently unknown. Under a worst-case scenario, if armadillos occupied only 50% of the land area of Florida, the lowest population could be estimated at nearly 69,000 armadillos. Armadillos can be found in a variety of habitats, including urban areas, throughout the State; therefore, armadillos likely occupy more than 50% of the land area in the State. However, opossum occupying only 50% of the land area was used to provide a minimum population estimate to evaluate the magnitude of the proposed take by WS to alleviate or prevent damage.

Armadillos are considered an unprotected species in Florida and can be addressed at any time to alleviate damage without the need for a permit from the FWC and with no limit on the number that can be removed. However, the total number of armadillos removed annually in Florida is unknown. Since FY 2006, the WS program in Florida has lethally removed 193 armadillos to alleviate damage and threats of damage, which is an average of 33 armadillos removed annually. The lethal removal of armadillos has occurred primarily from the use of firearms. The highest level of take occurred during FY 2010 when 65 armadillos were lethally removed using firearms. In addition, WS live-captured and released unharmed 77 armadillos and dispersed one armadillo during damage management activities conducted between FY 2006 and FY 2011. Armadillos could also be unintentionally removed during other activities to manage damage caused by wildlife but are discussed in this analysis to ensure a cumulative evaluation occurs. As stated previously, the number of armadillos lethally removed by other entities to alleviate damage is currently unknown.

Based on previous requests for assistance received by WS and in anticipation of additional efforts to address damage, WS could lethally remove up to 100 armadillos annually in the State as part of those efforts to alleviate and prevent damage, including the take of armadillos unintentionally during other damage management activities. Given the range of population estimates in the State, the take of 100 armadillos by WS annually would represent 0.1% of a statewide population estimated at 137,300 armadillos, if the overall population remains at least stable. Under the worst-case scenario, with a population estimated at 69,000 armadillos statewide, take of up to 100 armadillos would represent 0.2%

of the estimated population. Although the number of armadillos lethally taken by other entities in the State to alleviate damage is unknown, the cumulative take of armadillos, including the proposed take of up to 100 armadillos annually by WS, would likely be of low magnitude when compared to the actual statewide population of armadillos.

Bobcat Population Information and Effects Analysis

Bobcats are a medium-sized member of the North American cat family, and may be mistaken for a large bob-tailed domestic cat by some people. Bobcats are actually two to three times larger than most domestic cats and appear more muscular and fuller in body. Their fur is dense, soft, short and generally yellowish to reddish-brown in color with numerous black spots and black-tipped guard hairs on the back and white with black spots on the belly. Forelegs are tawny with black bars. The species gets its common name from its characteristic stubby or "*bobbed*" tail. The tail is generally only 9 to 20 cm (3.5 to 8 inches) in length with two or three black bars and a black tip above, while the underside is pale or white (Larivière and Walton 1997). Their upper legs have dark horizontal bands. The face has thin, black lines stretching onto broad cheek ruff and their ears are tufted. Males are generally larger than females. The length of bobcats ranges from 47.5 to 125 cm (19 to 49 inches), while their weight ranges between 4.1 and 18.3 kg (9 to 40 lbs) (Larivière and Walton 1997).

Bobcats are capable of hunting and killing prey that range from the size of a mouse to that of a deer. Rabbits, tree squirrels, ground squirrels, wood rats, porcupines, pocket gophers, and ground hogs comprise most of their diet. Opossums, raccoon, grouse, wild turkey, and other ground nesting birds are also eaten. Occasionally, insects and reptiles can be part of a bobcat's diet and bobcats are known to scavenge. Bobcats are opportunistic predators, and may feed on livestock and domestic animals, such as poultry, sheep, goats, house cats, small dogs, exotic birds and game animals, and rarely, calves (Virchow and Hogeland 1994). McCord and Cardoza (1982) reported the cottontail rabbit to be the principal prey of bobcats throughout their range.

Ruell et al. (2009) reported bobcat densities ranged from 0.65 to 1.09 bobcats per square mile (0.25 to 0.42 bobcats per square kilometer) in coastal southern California in both large open habitat and in habitat surrounded by human developments. Lawhead (1984) reported bobcat densities of 0.66 per square mile (0.26 bobcats per square kilometer) in Arizona with a preference for riparian habitat. Bobcats in southern Illinois were reported to have a population density of 0.70 bobcats per square mile (0.27 bobcats per square kilometer) (Nielsen and Woolf 2001), while Anderson (1987) provided population density estimates of 0.13 to 0.26 bobcats per square mile (0.05 to 0.10 bobcats per square kilometer). Bobcats reach densities of about one per 0.7 square kilometer (1 per ¼ square mile) on some islands in the Gulf Coast of the southeastern United States. Densities vary from about one per 1.3 square kilometer (1 per ½ square mile) in coastal plains to about one cat per 10.7 square kilometer (1 per 4 square miles) in portions of the Appalachian foothills. Mid-Atlantic and mid-western states usually have scarce populations of bobcats (Virchow and Hogeland 1994). Populations are stable in many northern states and reviving in other states where intensive trapping formerly decimated the species (National Audubon Society 2000). Rates of natural mortality reported for adult bobcats in protected populations appear to be quite low. Crowe (1975) estimated a 3% mortality rate in a protected population, based on Bailey's (1972) study of bobcats in southeastern Idaho. Causes of natural mortality for adult bobcats include starvation (Hamilton 1982), disease and predation (Lembeck 1978), and injuries inflicted by prey (Fuller et al. 1985).

Bobcats are common statewide in Florida in suitable habitat. The current statewide population of bobcats in Florida has been estimated at 303,338 bobcats (Roberts and Crimmins 2010). Bobcats are classified as furbearers in Florida, with a regulated annual hunting and trapping seasons. During the annual hunting and trapping season, there is no daily or possession limit for bobcats. The number of bobcats harvested in the State annually is currently unknown; however, on state wildlife management areas, 16 bobcats were harvested between May 1, 2010 and May 1, 2011 (FWC 2012). As mandated through the Convention on International Trade in Endangered Species, the FWC requires that all bobcat pelts to be sold must be tagged. However, bobcats can be found statewide in Florida where suitable habitat occurs and are not considered a threatened or endangered species.

Between FY 2006 and FY 2011, WS has lethally removed 26 bobcats in the State during all damage management activities, including two bobcats that were unintentionally taken during other damage management activities targeting other wildlife species. In addition, WS has live-captured and released 13 bobcats between FY 2006 and FY 2011, including six that were live-captured unintentionally and released unharmed. WS has also dispersed four bobcats using non-lethal methods. Based on previous requests for assistance received by WS and in anticipation of additional efforts to address damage, it is possible that WS could kill up to 20 bobcats annually during all damage management activities in Florida, including take that could occur unintentionally during other damage management activities targeting other species.

Habitat preferred by bobcats is quite diverse in Florida ranging from upland forests to coastal wetlands. Roberts and Crimmins (2010) estimated the statewide population at 303,338 bobcats. Based on a population estimated at 303,338 bobcats, take of up to 20 bobcats by WS annually would represent 0.01% of the estimated statewide population, if the population remains at least stable. Based on a review of information in Florida, there is no indication the densities of bobcats in the State are declining. In addition, the continued unlimited take allowed during the trapping season and the hunting season by the FWC provides an indication that overharvest in not likely to occur.

Coyote Population Information and Effects Analysis

Coyotes are a familiar mammal to most people. Their coloration is blended, primarily gray mixed with a reddish tint. The belly and throat are a paler color than the rest of the body (Beckoff 1982). Coyotes have long rusty or yellowish legs with dark vertical lines on the lower foreleg. They are similar in appearance to gray and red wolves (National Audubon Society 2000). Coloration in coyotes varies greatly, ranging from nearly black to red or nearly white in some individuals and local populations. Most have dark or black guard hairs over their back and tail (Green et al. 1994). Coyotes sometimes breed with domestic dogs producing hybrids called "*coydogs*" (National Audubon Society 2000). The size of coyotes varies from about 20 to 40 lbs (9 to 18 kg) (Voigt and Berg 1987).

Currently, coyotes range throughout the United States with the highest densities occurring on the Plains and in the south-central United States, including Texas. Many references indicate that coyotes were originally found in relatively open habitats, particularly grasslands and sparsely wooded areas of the western United States. Today, coyotes have adapted to and now exist in virtually every type of habitat, arctic to tropic, in North America. Coyotes live in deserts, swamps, tundra, grasslands, brush, dense forests, from below sea level to high mountain ranges, and at all intermediate altitudes. High densities of coyotes can also appear in the suburbs of major cities (Green and Gipson 1994). The distribution of coyotes into eastern North America began to expand beginning around 1900 to 1920. Now, all eastern states and Canadian provinces have at least a small population of coyotes (Voigt and Berg 1987).

Coyotes often include many items in their diet. Rabbits are one of the most common prey items. Other items in the coyote's diet include carrion, rodents, ungulates (usually fawns), insects (such as grasshoppers), as well as livestock and poultry. Coyotes readily eat fruits such as watermelons, berries, persimmons and other vegetative matter when it is available. In some areas, coyotes feed on human refuse at dumpsites and take small domestic pets such as cats and dogs (Voigt and Berg 1987).

Coyotes breed between January and March and are able to breed prior to reaching one year of age (Kennely and Johns 1976), but the percentage of yearlings having litters varies from zero to 80% in different populations (Gier 1968). This variation is influenced by a number of factors, which causes large annual variations in total number of coyotes breeding. In a study in Texas, the percentage of females having litters varied from 48% to 81% (Knowlton 1972). Pups are born after a gestation period of 60 to 63 days, with litter sizes varying primarily with prey availability. Gier (1968) reported average litter sizes of 4.8 to 5.1 in years with low rodent numbers, but litters of 5.8 to 6.2 during years with high rodent numbers. Litter sizes of one to 19 pups have been reported (National Audubon Society 2000).

The coyote is probably the most extensively studied carnivore (Bekoff 1982), and considerable research has been conducted on population dynamics. Coyote densities as high as two per square kilometer (5 per square mile) have been reported in the southwestern and west-central United States, but are lower in other portions of the country, including eastern North America; although, few studies have accurately determined densities (Voigt and Berg 1987). Although coyote densities vary based on local habitat quality, Knowlton (1972) published that density estimates of 0.5 to 1.0 coyotes per square mile would likely be applicable to coyote densities across much of their range. However, methods for estimating carnivore populations are crude and often produce estimates with broad confidence intervals (Crawford et al. 1993).

Because determinations of absolute coyote densities are frequently unknown (Knowlton 1972), many researchers have estimated coyote populations using various methods (Clark 1972, Knowlton 1972, Camenzind 1978, USDI 1979, Pyrah 1984). The cost to accurately determine absolute coyote densities over large areas can be prohibitive (Connolly 1992) and would not appear to be warranted given the coyote's overall relative abundance. The presence of unusual food concentrations and the assistance provided to a breeding pair by non-breeding coyotes at the den can influence coyote densities and complicate efforts to estimate abundance (Danner and Smith 1980). Coyote densities are lowest in late winter prior to whelping, highest immediately after whelping, followed by a continued decline to the next whelping season (Parker 1995).

Predator abundance indices suggest that densities of coyotes in North America increase from north to south (Knowlton and Stoddart 1985, Parker 1995). Coyote densities range from 0.2 per square mile when populations are low (pre-whelping) to 3.6 coyotes per square mile when populations are high (post-whelping) (Knowlton 1972, USDI 1979). Although coyote densities vary considerably between habitat types and vary based on numerous environmental variables, Knowlton (1972) concluded that coyote densities might approach a high of five to six coyotes per square mile under extremely favorable conditions with densities of 0.5 to 1.0 per square mile possible over the entire range of the coyote in the United States. Such an estimate is speculative but represents some the best available information for estimating coyote populations.

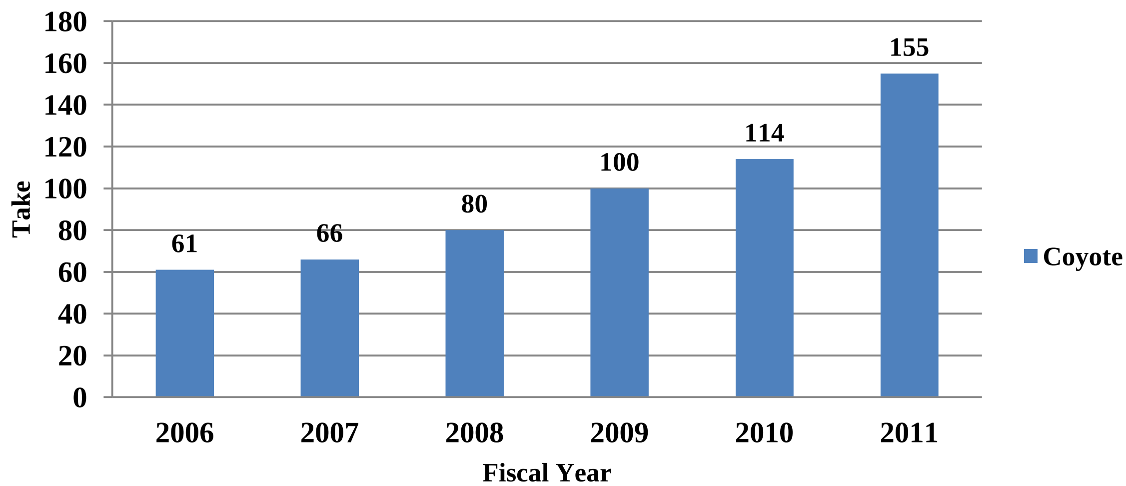
Population modeling information suggests that a viable coyote population can withstand an annual removal of 70% of their population without causing a decline in the population (Connolly and Longhurst 1975, Connolly 1995). The unique resilience of the coyote, its ability to adapt, and its perseverance under adverse conditions is commonly recognized among biologists and land managers. Despite intensive historical damage management efforts in livestock production areas and despite sport hunting and trapping for fur, coyotes continue to thrive and expand their range, occurring widely across North and Central America (Miller 1995). Connolly and Longhurst (1975) determined that, "*...if 75% of the coyotes are killed each year, the population would be exterminated in slightly over 50 years*." However, Connolly and Longhurst (1975) go on to explain that their "*...model suggests that coyotes, through compensatory reproduction, can withstand an annual population mortality of 70%*" and that coyote populations would regain pre-control densities (through recruitment, reproduction, and migration) by the end of the fifth year after control was terminated even though 75% mortality had occurred for 20 years.

In addition, other researchers (Windberg and Knowlton 1988) recognized that immigration, (not considered in the Connolly and Longhurst (1975) model) could result in rapid occupancy of vacant territories, which helps to explain why coyotes have thrived in spite of intensive damage management activities (Connolly 1978).

The statewide population of coyotes in Florida is currently not available. Although coyote densities vary considerably between habitat types and vary based on numerous environmental variables, Knowlton (1972) estimated an average population density was likely 0.5 to 1.0 coyotes per square mile over the entire range of the coyote in the United States. Using a coyote population density of 0.5 to 1.0 coyote per square mile and the total area of Florida of 53,625 square miles (United States Census Bureau 2010), a statewide coyote population could be estimated at 26,800 to 53,600 coyotes. If the population density were half of the lowest estimated population density determined by Knowlton (1972), the statewide coyote population would be estimated at 13,400 coyotes based on 0.25 coyotes per square mile.

Coyotes are considered a furbearer in Florida, with a continuous open season and no limit on the number of coyotes that can be harvested (FWC 2012). The number of coyotes lethally removed to alleviate damage or are harvested during the continually open season in the State is currently unknown. Between FY 2006 and FY 2011, WS has lethally removed 576 coyotes in the State to alleviate damage or threats of damage. The highest level of take occurred during FY 2011 when 155 coyotes were lethally removed. The number of coyotes addressed by WS has increased annually between FY 2006 and FY 2011 (see Figure 4.1). Overall, WS has lethally removed an average of 96 coyotes per year from FY 2006 through FY 2011. In addition, WS live-captured and released two coyotes and dispersed 44 coyotes using non-lethal methods from FY 2006 and FY 2011 to alleviate damage or threats of damage. Based on previous requests for assistance and in anticipation of additional efforts to address damage, up to 200 coyotes could be lethally removed annually by WS during all damage management activities within the State.

Figure 4.1 – Number of coyotes lethally taken by WS in Florida, FY 2006 – FY 2011



Using a statewide coyote population ranging from 26,800 to 53,600 coyotes, take of up to 200 coyotes annually would represent from 0.4% to 0.8% of the estimated population. Under the worst-case scenario, take of up to 200 coyotes annually by WS would represent 1.5% of a statewide population estimated at 13,400 coyotes, if the statewide population remains at least stable. Although exact population estimates for coyotes in Florida and annual harvest rates are not available, the unlimited take and the continuous open season allowed by the FWC during hunting and trapping seasons and to alleviate damage indicates coyotes are not at risk of overharvesting. Since the statewide population could reasonably be expected to be higher than 13,400 coyotes, the proposed take of 200 coyotes annually could actually be a smaller percentage of the actual statewide population.

Eastern Cottontail Population Information and Effects Analysis

There are nine species of cottontail rabbits in North America, north of Mexico. The eastern cottontail is the most abundant and widespread of all those species. The eastern cottontail is approximately 37 to 48 cm (15 to 19 inches) in length and weighs 0.9 to 1.8 kg (2 to 4 lbs). Males and females are nearly the same size and color. Cottontails do not distribute themselves evenly across the landscape, but tend to concentrate in favorable habitats such as brushy fence rows or field edges, gullies filled with debris, brush piles, areas of dense briars invaded with Japanese honeysuckle, or landscaped backyards where food and cover are suitable. Rabbits are rarely found in dense forest or open grasslands, but fallow crop fields may provide suitable habitat. Within these habitats, they spend their entire lives in an area of 10 acres or less. Occasionally they may move a mile or so from summer range to winter cover or to a new food supply. In suburban areas, rabbits are numerous and mobile enough to fill any "*empty*" habitat created when other rabbits are removed. Population densities vary with habitat quality, but one rabbit per 0.4 hectares (1 acre) is a reasonable average (Craven 1994). Rabbits live only 12 to 15 months, yet make the most of time available reproductively. They can raise as many as six litters per year of one to nine young (usually four to six), having a gestation period of 28 to 32 days. If no young were lost, a single pair together with their offspring could produce 350,000 rabbits in five years (National Audubon Society 2000).

No population estimates were available for cottontail rabbits in Florida. Information on population densities of rabbits in Florida is also unavailable. Using a statewide density of rabbits of one rabbit per acre (Craven 1994), the population could be estimated at several million rabbits. The FWC considers rabbits as resident game animals that can be harvested during a hunting season (FWC 2012). Rabbit populations in the State are sufficient to allow the FWC to permit a continuous open hunting season for rabbits in the State, with daily take limits (FWC 2012). The number of rabbits harvested annually in the State during the continually open season for rabbits is currently unknown.

From FY 2006 through FY 2011, WS has lethally removed 23 rabbits to alleviate damage and threats of damage in the State, with the highest level of take occurring in FY 2011 when eight rabbits were lethally removed. Based on previous requests for assistance and in anticipation of additional efforts to alleviate damage or threats, WS could lethally remove up to 200 rabbits annually to alleviate damage and threats of damage. Studies show that even if hunters take as many as 40% of the rabbits available in autumn, the rabbit population the following year would not be adversely affected because of the tremendous reproductive potential of rabbits (Fergus 2006). The continual open season for rabbits in the State provides an indication that rabbit densities in the State are sufficient to sustain continual harvest throughout the year.

Gray Fox Population Information and Effects Analysis

The gray fox is common in many parts of the United States where deciduous woodlands provide habitat; yet, the secretive grey fox is seldom observed in the wild. The gray fox is somewhat smaller in stature than the red fox, having shorter legs and extremities. Gray fox exhibit striking pelage, which has grizzled upper parts resulting from individual guard hairs being banded with white, gray, and black. A predominance of black-tipped hairs in the middle of the back forms a dark longitudinal stripe that extends into a conspicuous black mane of coarse hair at the top of the black-tipped tail. Portions of the neck, sides, and limbs are cinnamon-colored. The ventral areas of a gray fox are buff colored. White shows on the ears, throat, chest, belly, and back legs, and the black, white, and reddish facial markings provide distinctive accents (Fritzell 1987).

Gray fox adults weigh from three to seven kg (6.5 to 15 lbs), with males being slightly larger than females. Generally, adult gray fox measure 80 to 113 cm (31.5 to 44 inches) from the tip of the nose to the tip of the tail. They inhabit wooded, brushy, and rocky habitats from extreme southern Canada to northern Venezuela and Colombia, excluding portions of the mountainous northwestern United States, the Great Plains, and eastern Central America. Gray fox occur over most of North America, north and east from southern California, Arizona, and central Texas (Fritzell 1987).

Gray fox prefer habitat with dense cover such as thickets, riparian areas, swampland, or rocky pinyon-cedar ridges. In eastern North America, gray fox are closely associated with edges of deciduous forest. They can also be found in urban areas where suitable habitat exists (Phillips and Schmidt 1994).

Gray fox mate from January through March and produce litters of one to seven kits after a gestation period of 53 days (National Audubon Society 2000). Gray fox rear young in a maternity den, commonly located in woodpiles, rocky outcrops, hollow trees, or brush piles (Phillips and Schmidt 1994). The male parent helps tend to the young but does not den with them. The young are weaned at three months and hunt for themselves at four months, when they weigh about 3.2 kg (7 lbs). Rabies and distemper are associated with this species (National Audubon Society 2000).

Accurate estimates of carnivore populations are rare and those for gray fox populations are no exception. Published estimates of gray fox density vary from 1.2 to 2.1 per square kilometers (3.1 - 5.4 per square mile) depending on location, season, and method of estimation (Errington 1933, Gier 1948, Lord, Jr. 1961, Trapp 1978). Over areas larger than 5,000 square kilometers (1,930 square mile), in which habitat quality varies, densities are likely lower. However, exceptionally high fox densities have been recorded in some situations (Grinnell et al. 1937, Hallberg and Trapp 1984).

Home ranges for gray fox vary throughout the year. Both males and females travel over larger areas during fall and winter, probably in response to increased energy demands and a declining food base (Follmann 1973, Nicholson 1982). During April, when young fox require regular feeding, a female's home range is less extensive than it is without the demands of those young (Follman 1973). Although exceptions exist, eastern gray fox generally have larger home ranges than western animals (Fritzell 1987). For instance, 16 adult fox were tracked for more than one month in Alabama (Nicholson 1982) and Missouri (Haroldson and Fritzell 1984) and it was determined that they all had home ranges larger than 200 hectare (500 acres), and many exceeded 500 hectares (1,235 acres).

Gray fox feed on a wide variety of plant and animal matter and their diet consists of a wider variety of food items than other North American canids (Fritzell 1987). Although active primarily at twilight and at night, the gray fox is sometimes seen foraging by day in brush, thick foliage, or timber. The only American canid with true climbing ability, gray fox occasionally forage in trees and often takes refuge in them, especially leaning or thickly branched trees. The gray fox feeds heavily on cottontail rabbits, mice, voles, other small mammals, birds, insect, and plant material, including corn, apples, persimmons, nuts, cherries, grapes, pokeweed fruit, grass, and blackberries. Grasshoppers and crickets are often a very important part of the diet in late summer and autumn (National Audubon Society 2000).

Gray fox can be found statewide in Florida in areas with suitable habitat but is more abundant in the northern portion of the State. Like many of the furbearing species, current population estimates are not available. If gray fox only occupied 50% of the land area of Florida and the density of gray fox in the State was 3.1 gray fox per square mile, the statewide population could be estimated at nearly 83,000 gray fox based on a the total area of Florida being 53,625 square miles. If gray fox only occupied 25% of the total area of the State and if the density of gray fox was 3.1 fox per square mile, the statewide population could be estimated at 42,600 fox. Gray fox can be found in a variety of habitats, including urban areas in the State, so gray fox occupying only 25% of the land area of the State would be unlikely since fox can be found statewide. However, similar to the other furbearing species, gray fox occupying a percentage of the land area was used to provide a minimum population estimate to determine the magnitude of the proposed take by WS to alleviate or prevent damage.

There is no open hunting or trapping season for gray fox in Florida. However, gray fox can be live-trapped or humanely destroyed throughout the year when those fox are associated with causing damage when a permit has been issued by the FWC (see 68A-9.010, FAC). The number of gray fox lethally removed by other entities to alleviate damage is currently unknown. WS has lethally removed 34 gray fox in the State from FY 2006 through FY 2011, including the lethal take of one gray fox unintentionally. Gray fox have been lethally taken unintentionally previously and could be lethally taken unintentionally during other damage management activities. The highest level of annual take occurred in FY 2011 when 17 gray fox were lethally removed by WS, with 16 fox taken intentionally to alleviate damage and one fox taken unintentionally during other damage management activities. In addition, WS has live-captured and released 28 gray fox between FY 2006 and FY 2011, including 20 that were live-captured unintentionally during other damage management activities and released unharmed.

Based on previous requests for assistance and in anticipation of additional efforts to address damage, up to 50 gray fox could be lethally removed by WS during all damage management activities, including the unintentional take of gray fox during other damage management activities. Using the lowest population estimate of 42,600 fox, the take of 50 gray fox by WS would represent 0.1% of the population. Since the statewide population of gray fox is likely higher than 42,600 fox, WS' take of gray fox would represent a lower percentage of the actual statewide population. Although take by other entities to alleviate damage is unknown, no additional information indications take by other entities has or would reach a magnitude that would affect the statewide population of gray fox.

Red Fox Population Information and Effects Analysis

The red fox is a typically proportioned member of the dog family. The bushy and unusually long tail, pointed ears, slender muzzle, and slanted eyes coupled with its small dog size and typical reddish coloration, make the red fox instantly recognizable to most people. Red fox are also the most common and well-known species in the genus *Vulpes*, which includes about 10 other species worldwide (Honacki et al. 1982). Typically, black-tipped ears, black cheek patches, white throat parts, a lighter underside, and black "*leg stockings*" are found on most red fox. The white tip of the tail (which is much more prominent in North American fox than elsewhere) can be used to distinguish brownish fox pups from similarly colored coyote pups, which lack a white tail tip (Voigt 1987).

Red fox found in North America weigh from 3.5 to 7 kg (7.7 to 15.4 lbs). Males average about one kg (2.2 lbs) heavier than females. Generally, adult fox measure 100 to 110 cm (39 to 43 inches) from the tip of the nose to the tip of the tail. Juveniles in their first autumn are similar in size to adults (Voigt 1987). They occur over most of North America, north and east from southern California, Arizona, and central Texas. Red fox are found throughout most of the United States with the exception of a few isolated areas. Prehistoric fossil records suggest red fox were plentiful in many parts of Canada but red fox may not have inhabited much of the United States. However, it has been suggested that climatic factors, interbreeding with the introduced European red fox, extirpation of the gray and red wolf, and clearing of land for agriculture has possibly contributed to the present-day expansion and range of red fox in North America (Voigt 1987).

Red fox are adaptable to most habitats within their range, but usually prefer open country with moderate cover. Some of the highest fox densities reported occur in the north-central United States in areas where woodlands are interspersed with farmlands. Red fox have also demonstrated their adaptability by establishing breeding populations in many urban areas of the United States, Canada, and Europe (Phillips and Schmidt 1994). In many areas, competition with other canids and the availability of suitable year-round food resources limit fox survival. Habitat can determine the availability of food resources and the presence or absence of other canids. Because those two factors strongly influence red fox survival, habitat limits fox numbers but seldom limits distribution (Voigt 1987).

Red fox mate from January through March and produce litters of one to 10 kits after a gestation period of 51 to 53 days. Fox rear young in a maternity den, commonly an enlarged woodchuck or badger den, usually in sparse ground cover on a slight rise, with a good view of all approaches (National Audubon Society 2000). Juvenile fox are able to breed before reaching a year old, but in areas of high red fox densities, most yearlings do not produce pups (Harris 1979, Voigt and MacDonald 1984, Voigt 1987). Gier (1968) reported average litter sizes of 4.8 to 5.1 in years with low rodent numbers, but litters of 5.8 to 6.2 during years with high rodent numbers. Litter sizes of one to 19 pups have been reported (National Audubon Society 2000). Offspring disperse from the denning area during the fall and establish breeding areas in vacant territories, sometimes dispersing considerable distances. Red fox are generally solitary animals as adults, except when mating (Phillips and Schmidt 1994). Rabies and distemper are associated with this species.

The red fox is a skilled nonspecific predator, foraging on a variety of prey. Fox are also an efficient scavenger, and in parts of the world, garbage and carrion are extremely important to its diet (Voigt 1987). Fox are opportunists, feeding mostly on rabbits, mice, bird eggs, insects, and native fruit. They usually kill animals smaller than a rabbit, although fawns, pigs, kids, lambs, and poultry are sometimes taken (Phillips and Schmidt 1994). They also feed on squirrels, woodchucks, crayfish, and even grasses (National Audubon Society 2000).

The density of red fox populations is difficult to determine because of the animals secretive and elusive nature. Estimates are prone to error even in open areas with good visibility. Methods used to estimate numbers have included aerial surveys, questionnaires to rural residents and mail carriers, scent post surveys, intensive ground searches, and indices derived from hunting and trapping harvest (Voigt 1987). In Great Britain, where food is abundant in many urban areas, densities as high as 30 fox per square kilometer (78 per square mile) have been reported (Harris 1977, MacDonald and Newdick 1982, Harris and Rayner 1986), while in southern Ontario, densities of about one fox per square kilometer (2.6 per square mile) occur during spring. This includes both pups and adults. In small areas of the best habitat, three times as many fox have been observed (Voigt 1987). However, those densities rarely occur extensively because of the dispersion of unsuitable habitat, high mortality, or from competition with coyotes (Voigt and Earle 1983). Cyclical changes in fox numbers occur routinely and complicate density estimates, as well as management. Those cycles can occur because of changes in prey availability, or disease outbreaks, especially rabies, among red fox. For fox populations to remain relatively stable, mortality and reproduction must balance approximately. Home ranges for red fox in the eastern United States are usually from 500 to 2,000 hectares (1,235 to 4,940 acres) in rural settings such as farmland (Voigt and Tinline 1980), but such sizes may not apply among fox populations in urban settings.

Red fox can be found statewide in Florida in suitable habitat; however, red fox are not likely native to the State. Red fox found in the northern panhandle region of the State likely originated from natural range expansion that occurred throughout much of the United States (FWC 2013). In other parts of the State, red fox were likely introduced and became established beginning in the 1950s (FWC 2013). The current population of red fox in the State is unknown. If red fox only occupied 50% of the total area in the State and the density of red fox in the State was 2.6 red fox per square mile, the statewide population could be estimated at nearly 70,000 red fox. If fox only occupied 25% of the total area of the State, the population could be estimated at 35,000 fox.

Similar to gray fox, there is a continuous closed season for red fox in Florida (*i.e*., red fox cannot be harvested during hunting or trapping seasons in the State). However, red fox can be addressed to alleviate damage and threats of damage when a permit has been issued by the FWC (see 68A-9.010, FAC). WS has lethally removed 63 red fox in the State from FY 2006 through FY 2011, including the lethal take of three red fox unintentionally. Red fox have been lethally taken unintentionally previously and could be lethally taken unintentionally during other damage management activities. The highest level of annual take occurred in FY 2006 when WS intentionally removed 18 red fox to alleviate damage or threats of damage. In addition, WS has live-captured and released six red fox between FY 2006 and FY 2011, including four that were live-captured unintentionally during other damage management activities and released unharmed. WS has also dispersed one red fox using non-lethal methods.

Based on previous requests for assistance and in anticipation of additional efforts to address damage, up to 100 red fox could be lethally removed by WS annually during all damage management activities, including the unintentional take of red fox during other damage management activities. Using the lowest population estimate of 35,000 fox, take of 100 red fox by WS would represent 0.3% of the population. Since the statewide population of red fox is likely higher than 35,000 fox, WS' take of red fox would represent a lower percentage of the actual statewide population. Although take by other entities to alleviate damage is unknown, no additional information indications take by other entities has or would reach a magnitude that would affect the statewide population of red fox.

Raccoon Population Information and Effects Analysis

The raccoon is a stocky mammal about 61 to 91 cm (2 to 3 feet) long, weighing 4.5 to 13.5 kg (10 to 30 lbs). It is distinctly marked, with a prominent black mask over the eyes and a heavily furred, ringed tail. The animal is a grizzled salt-and-pepper gray and black above, although some individuals are strongly washed with yellow (Boggess 1994).

When compared to other omnivores (*i.e*., animals that eat both plant and animal matter), the raccoon is considered to be one of the most omnivorous. Raccoons will eat carrion, garbage, birds, mammals, insects, crayfish, mussels, other invertebrates, and a wide variety of grains, various fruits, other plant materials, and most or all foods prepared for human or animal consumption (Sanderson 1987). They occasionally kill poultry (Boggess 1994).

The raccoon is found throughout most of the United States, with the exception of the higher elevations of mountainous regions and some areas of the arid southwest (Boggess 1994, National Audubon Society 2000). Raccoons are more common in the wooded eastern portions of the United States than in the more arid western plains (Boggess 1994), and are frequently found in cities or suburbs as well as rural areas (National Audubon Society 2000). Movements and home ranges of raccoons vary according to sex, age, habitat, food sources, season, and other factors. In general, males have larger home ranges then females. Home range diameters of raccoons have been reported as being one to three kilometers (0.6 to 2.9 mi) maximum, with some home range diameters of dense suburban populations to be 0.3 to 0.7 kilometers (0.2 to 0.4 mi).

Absolute raccoon population densities can be difficult or impossible to determine because of the difficulty in knowing what percentage of the population had been counted or estimated with the additional difficulty of knowing how large an area the raccoons were using (Sanderson 1987). Due to their adaptability, raccoon densities reach higher levels in urban areas than that of rural areas. Relative raccoon population densities have been variously inferred by take of animals per unit area. For instance, Twichell and Dill (1949) reported removing 100 raccoons from tree dens in a 41 hectares (101 acres) waterfowl refuge area, while Yeager and Rennels (1943) studied raccoons on 881 hectares (2,177 acres) in Illinois and reported trapping 35 to 40 raccoons in 1938-1939, 170 in 1939-1940, and 60 in 1940-1941. Slate (1980) estimated one raccoon per 7.8 ha (19.3 acres) in New Jersey in predominantly agricultural land on the inner coastal plain. Raccoon densities of 100 per square mile (1 raccoon per 6.4 acres) have been attained around abundant food sources (Kern 2002). Riley et al. (1998) summarized rural raccoon densities based on published literature that ranged from two to 650 per square mile in rural habitats, with an average of 10 to 80 raccoons per square mile. Relative density studies conducted in eastern Tennessee report raccoon densities ranging from three to 26 per square kilometer (seven to 67 raccoons per square mile) (USDA unpublished data 2010).

In Florida, raccoons cause damage to gardens, residential and non-residential buildings, fish, domestic fowl, and pets, as well as general property damage. Results of their feeding may be the total loss of ripened sweet corn in a garden. Damage to buildings generally occurs when they seek to gain entry or begin denning in those structures. Raccoons may den in uncapped chimneys, or may tear off shingles or fascia boards to gain access to attics or wall spaces. They may also damage or destroy sod by rolling it up in search of earthworms and other invertebrates (Boggess 1994).

The public are also concerned about health and safety issues associated with raccoons. Those diseases include, but are not limited to, canine distemper and rabies, and the roundworm *Baylisascaris procyonis*, the eggs of which survive for extremely long periods in raccoon feces and soil contaminated by them. Ingestion of those eggs can result in serious or fatal infections in other animals as well as humans (Davidson and Nettles 1997; see Table 1.3).

Raccoons can be found throughout the State and thrive in a variety of habitats including rural, suburban, and urban areas. However, the statewide population of raccoons is currently unknown. Using the summarized density ranges for raccoons in rural areas provided by Riley et al. (1998) and if raccoons only inhabited 50% of the land areas of Florida, a statewide population could be estimated to range from a low of nearly 54,000 raccoons to a high of over 17 million raccoons. If raccoons only inhabited 25% of the land areas of Florida, a statewide population could be estimated to range from a low of nearly 27,000 raccoons to a high of over 8.5 million raccoons. Using the average number of raccoons per square mile of 10 to 80 raccoons, the statewide population could be estimated at 268,000 to 2.2 million raccoons if raccoons only occupied 50% of the available land area of the State. If raccoons only inhabited 25% of the land areas of Florida and raccoon densities ranged from 10 to 80 raccoons per square mile, a statewide population could be estimated to range from a low of nearly 134,000 raccoons to a high of over 4.25 million raccoons. Similar to estimates derived for the other mammal species addressed in this EA, estimating that raccoons inhabit only 25% to 50% of the land area of the State is intended to determine a minimum population estimate to compare the potential range of WS' proposed take of raccoons and to determine the magnitude of WS' proposed take.

Raccoons are classified as furbearers in Florida with continuously open hunting and trapping seasons with unlimited take allowed (*i.e*., raccoons can be harvested anytime using legal methods) (FWC 2012). The number of raccoons reported as harvested in the State during the annual hunting and trapping seasons is unknown. As with other furbearing species, raccoons can also be lethally taken to alleviate damage or threats of damage. The total number of raccoons taken annually in the State to alleviate damage or threats of damage is currently unknown.

During all damage management activities conducted by WS from FY 2006 through FY 2011, WS lethally remove 3,438 raccoons, which is an annual take of 573 raccoons. The highest annual level of lethal take occurred in FY 2007 when 953 raccoons were lethally removed by WS to alleviate damage or threats of damage. WS has also live-captured and released 2,876 raccoons between FY 2006 and FY 2011. In addition, WS has dispersed 22 raccoons using non-lethal methods between FY 2006 and FY 2011 to alleviate damage or threats of damage. Potential impacts to the raccoon population and to non-targets from the ORV program were discussed in a separate EA (USDA 2005*b*). WS' activities conducted under the ORV program are primarily non-lethal and do not involve the lethal take of raccoons for monitoring purposes.

Raccoons could also be lethally taken or live-captured as non-targets during damage management activities targeting other wildlife. Of the 3,438 raccoons lethally removed by WS between FY 2006 and FY 2011, eight raccoons were lethally removed unintentionally during activities targeting other species. In addition, of the 2,876 raccoons live-captured and released between FY 2006 through FY 2011, 84 raccoons were live-captured unintentionally but were released unharmed.

Based on previous requests for assistance received by WS to alleviate damage and in anticipation of additional efforts to address damage, up to 2,000 raccoons could be lethally removed by WS annually under all wildlife damage management activities, including unintentional take during other wildlife damage management activities. Using the population estimate of 54,000 raccoons in the State if raccoons only inhabited 50% of the total area of the State, the take of 2,000 raccoons would represent 3.7% of the population. Using a population estimated at 27,000 raccoons, if raccoons occupied only 25% of the land area within the State, the lethal take of up to 2,000 raccoons by WS would represent 7.4% of the estimated population.

Activities conducted to prevent the further spread of raccoon rabies in the State generally do not result in the lethal take of raccoons. Raccoons are live-captured, sampled, and released on-site as part of the post-baiting protocols (USDA 2005*b*). However, if raccoons were visibly injured or exhibit signs of disease, those raccoons are often euthanized and processed for rabies testing. The number of raccoons lethally taken in the State during the post-baiting trapping varies, but is not likely to exceed 50 individuals annually. However, the statewide cumulative take of raccoons by WS in Florida under all damage and disease management activities would not exceed 2,000 raccoons annually.

Raccoon populations can remain relatively abundant if annual harvest levels are below 49% (Sanderson 1987). In addition, the statewide population is likely much higher than 27,000 raccoons or even 54,000 raccoons. As with many of the other mammals species harvested for fur in the State, the unlimited harvest levels allowed by the FWC provides an indication that overharvest of raccoons is not likely to occur during annual harvest seasons and from damage management activities. Although the statewide population of raccoons and the annual take levels are unknown, the cumulative take of raccoons would be of low magnitude when compared to the actual statewide population. In addition, the live-capture and subsequent release of raccoons would not likely result in adverse effects to the statewide population since those animals would be released unharmed (USDA 2005*b*).

Virginia Opossum Population Information and Effects Analysis

Opossums are the only marsupials (possess a pouch in which young are reared) found north of Mexico (Seidensticker et al. 1987). They frequent most of the eastern and central United States, except Minnesota, northern Michigan, and New England, extending west to Wyoming, Colorado, and central New Mexico (National Audubon Society 2000). They are also found in parts of the southwestern United States, California, Oregon, and Washington (Jackson 1994). It has been documented that human activities have aided in the range expansion of opossum (Gardner 1982). Adult opossums range in size from less than 1 kg (2.2 lbs) to about 6 kg (13 lbs), depending on sex and time of year. They grow throughout life (Seidensticker et al. 1987). They have a broad range of pelage colors, but opossum are usually considered as "*gray*" or "*black*" phase. Their fur is grizzled white above; long white hairs cover black tipped fur below. They climb well and feed on a variety of foods, including carrion, which forms much of its diet. In addition, opossum eat insects, frogs, birds, snakes, small mammals, earthworms, berries, and other fruits; persimmons, apples, and corn are favorite foods (National Audubon Society 2000). They use a home range of four to 20 hectares (10 to 50 acres), foraging throughout this area frequently (Jackson 1994), but concentrating on a few sites where fruits abound, when they are in season (Seidensticker et al. 1987).

The reproductive season of the Virginia opossum typically occurs from December to February, depending on latitude (Gardner 1982). Gestation is short (average of 12.8 days) with one to 17 young born in an embryonic state, which climb up the mothers belly to the marsupium (pouch), attach to teats, and begin to suckle (Gardner 1982, National Audubon Society 2000). Those young remain in the pouch for about two months. After two months, young begin to explore outside of the pouch and may be found traveling on their mother's back with their tails grasping hers (Whitaker, Jr., and Hamilton, Jr. 1998). Opossums live for only one to two years, with as few as 8% of a population of those animals surviving into the second year in a study in Virginia conducted by Seidensticker et al. (1987). In that five-year study, Seidensticker et al. (1987) also observed that there was a wide variation in opossum numbers, in what was considered excellent habitat for the species. Those variations were observed seasonally and in different years. However, the mean density during the study was 10.1 opossum per square mile with a range of 1.3 opossum per square mile to 20.2 opossum per square mile (Seidensticker et al. 1987). This was comparable to other opossum population densities in similar habitats in Virginia. Verts (1963) found a density estimate of 10.1 opossum per square mile in farmland areas in Illinois, while Wiseman and Hendrickson (1950) found a density of 6.0 opossum per square mile in mixed pasture and woodlands in Iowa. However, VanDruff (1971) found opossum densities in waterfowl nesting habitat as high as 259 opossum per square mile.

Opossum are common throughout Florida in appropriate habitat. Population estimates for opossum in the State are not available. Therefore, a population estimate will be derived based on the best available information for opossum to provide an indication of the magnitude of take proposed by WS to alleviate damage and threats of damage. As stated previously, the total area of Florida covers 53,625 square miles. If opossum were only found on 50% of the land area of the State and using a mean density of 10.1 opossum per square mile found by Seidensticker et al. (1987) in Virginia, the population would be estimated at nearly 271,000 opossum. Using the range of opossum densities found by Seidensticker et al. (1987) estimated at 1.3 opossum per square mile to 20.2 opossum per square mile and only 50% of the land area of the State being occupied by opossum, the statewide population would range from a low of 34,900 opossum to a high of nearly 541,600 opossum. Opossum can be found in a variety of habitats, including urban areas, so opossum occupying only 50% of the land area of the State is unlikely since opossum can be found almost statewide. However, opossum occupying only 50% of the land area was used to provide a minimum population estimate to determine the magnitude of the proposed take by WS to alleviate or prevent damage.

Opossum are considered a furbearing species in the State and can be harvested during annual hunting and trapping seasons. During the development of the EA, opossum could be harvested during continuously open hunting and trapping seasons with no limit on the number that could be taken (FWC 2012). The number of opossum harvested annually in the State is currently unknown. In addition, the number of opossum lethally removed to alleviate damage or threats of damage by other entities is unknown.

As part of damage management activities conducted by WS in the State, 488 opossum have been lethally taken from FY 2006 through FY 2011. Of those opossum lethally taken by WS, seven were lethally removed unintentionally during damage management activities targeting other species. The highest annual level of take occurred in FY 2008 when 132 opossum were lethally taken by WS. On average, WS has lethally removed 81 opossum annually from FY 2006 through FY 2011 to alleviate damage and threats in the State. In addition, WS has purposefully live-captured and released 398 opossum from FY 2006 through FY 2011 with an additional 1,420 opossum live-captured unintentionally during other damage management activities and released unharmed. Opossum are primarily live-captured as non-targets during surveillance activities relating to the ORV rabies program (USDA 2005*b*). WS has also dispersed two opossum using non-lethal methods from FY 2006 through FY 2011. Based on previous requests for assistance received by WS and in anticipation of additional efforts to address damage or threats, WS could lethally remove up to 150 opossum annually in the State as part of efforts to reduce or eliminate damage under the proposed action alternative.

Based on a statewide population ranging from 34,900 opossum to 541,600 opossum, the lethal take of up to 150 opossum annually by WS under the proposed action alternative, would represent 0.03% to 0.4% of the estimated population. If only 25% of the area of Florida supported opossum, the take of 150 opossum annually by WS would represent 0.06% to 0.9% of populations estimated at 17,450 to 270,800 opossum.

Although the total number of opossum lethally taken in the State during the annual hunting and trapping seasons and for damage management is unknown, the cumulative take of opossum, including the proposed take of up to 150 opossum annually by WS, would be of a low magnitude when compared to the statewide population. The unlimited harvest allowed by the FWC during the harvest seasons provides an indication that population densities of opossum in the State are sufficient that overharvest is not likely to occur, including lethal take to alleviate or prevent damage. In addition, the live-capture and subsequent release of opossum would not likely result in adverse effects to the statewide population since those animals would be released unharmed.

Striped Skunk Population Information and Effects Analysis

Although easily recognized by their black and white fur, the striped skunk may be most readily recognized by the odiferous smell of their musk. They are common throughout the United States and Canada (Rosatte 1987). Striped skunks are primarily nocturnal and do not have a true hibernation period; although, during extremely cold weather, skunks may become temporarily dormant. The striped skunk is an omnivore, feeding heavily on insects such as grasshoppers, crickets, beetles, bees, and wasp (Chapman and Feldhamer 1982). The diet of the striped skunk also includes small mammals and the eggs of ground-nesting birds and amphibians. Striped skunks are typically not aggressive and attempt to flee when approached by humans (Rosatte 1987). However, when provoked, skunks will give a warning and assume a defensive posture prior to discharging their foul-smelling musk. This musk is comprised of sulfur-alcohol compounds known as butylmercaptan (Chapman and Feldhamer 1982).

Adult skunks begin breeding in late February. Yearling females (born in the preceding year) mate in late March. Gestation usually lasts about seven to 10 weeks. Litters commonly consist of five to nine young with two litters per year possible (Hall and Kelson 1959). The home range of striped skunks is usually not consistent. Home ranges appear to be reliant upon life history requirements such as winter denning, feeding activities, dispersal, and parturition (Rosatte 1987). During the breeding season, males may travel larger areas in search of females. Skunk densities vary widely according to season, food sources, and geographic area. Densities have been reported to range from one skunk per 77 acres to one skunk per 10 acres (Rosatte 1987). According to Chamberlain and Leopold (2001), very little information regarding striped skunk densities in the southeast exists besides those based on harvest numbers and trapper/hunter observations.

Population estimates for striped skunks in Florida are currently not available. Striped skunks can be found in a variety of habitats across the State. However, if skunks only inhabited 50% of the land area of the State and densities occurred at one skunk per 77 acres, the statewide population could be estimated at 223,000 skunks based on the land area of the State. If skunks only inhabit 25% of the land area of the State and densities occurred at one skunk per 77 acres, the statewide population could be estimated at 111,500 skunks based on the land area of the State. Similar to other furbearing species, skunks can be found throughout the State and the estimates are intended to evaluate the magnitude of take proposed under the proposed action.

Skunks can be lethally taken throughout the year with no limit on the number that can be taken. The number of skunks harvested annually is unknown. Skunks are also lethally taken to alleviate damage or threats of damage; however, the number of skunks lethally taken annually in the State to alleviate damage or threats of damage is currently unknown. To alleviate damage, WS has lethally removed one skunk between FY 2006 and FY 2011, which was removed in FY 2007 using a firearm. Based on previous requests for assistance received by WS to alleviate damage and in anticipation of additional efforts to address damage and threat s of damage, up to 25 skunks could be lethally removed by WS annually when requested, including skunks that were unintentionally lethally removed during other wildlife damage management activities. Using a statewide population estimated at 223,000 skunks, the take of 25 skunks would represent 0.01% of the estimated statewide population. If the statewide population of skunks were 111,500 skunks, the take of skunks by WS would represent 0.02% of the population. The unlimited take allowed by the FWC with no closed season provides an indication that skunk densities in the State are sufficient to maintain a sustained harvest level and adverse effects from harvest and damage management purposes are not likely to cause overharvest of the species leading to population declines.

Although the number of striped skunks lethally taken in the State during the annual hunting season and for damage management is unknown, the cumulative take of striped skunks, including the proposed take of up to 25 skunks annually by WS, would be of a low magnitude when compared to the actual statewide population.

Spotted Skunk Population Information and Effects Analysis

Spotted skunks are one of the smallest skunks at about half the size of a house cat. The legs are short, and the tail long and bushy with a white tip. It has a black pelage with broken white stripes, and a white patch on the nose, and front of the ears. The average total length is 403 to 610 mm and tail length is 193 to 280 mm. The adult male weighs from 444 to 999 grams (1 to 2.5 lbs), and the female weighs from 363 to 567 grams (0.8 to 1.25 lbs) (Whitaker, Jr. and Hamilton, Jr. 1998).

The eastern spotted skunk ranges from Costa Rica and northeastern Mexico through the Great Plains of the central United States to the Canadian border. Spotted skunks are also found throughout the southeastern United States. The eastern spotted skunk has been found in open lowlands, mountainous country, and at altitudes of 2,400 m (7,875 feet) (Baker and Baker 1975). Few studies have been published on the home range, population density, and mortality of spotted skunks. Crabb (1948) found that the western spotted skunk in Iowa maintained a home range of 64.8 ha (160 acres) at densities of 2.2 skunks per square kilometer (5.7 per square miles). Crab (1948) also found skunks had a home range of 64.8 ha (160 acres) but noted movements of 4.8 km (3 mi) per night. Spotted skunks appear to be somewhat nomadic without occupying a specific territory, and do not defend a home range (Crabb 1948).

Spotted skunk mate by April with a gestation period that has been reported to range from 50 to 70 days with an average litter size of two to six young. Young are blind when born and average 1/3 ounce each. Some males become sexually mature and breed at five months. The young develop teeth after approximately 40 days with weaning occurring after 55 days. Once weaned, the young forage with their mother until late fall when they disperse (National Audubon Society 2000).

The male provides no care to the young. The eyes of the young open at around one month and they can emit musk at about 46 days. This species is nocturnal and they climb trees more than other skunks. They are quicker and more alert, also. There is no true hibernation, just short inactive periods in the winter to conserve body fat. Several may den together in the winter. Populations up to 13 or more can be found per square mile. The males may wander farther, and dens distributed over the area seem to belong to the whole population, except during the breeding season. They have a characteristic handstand defense mechanism that makes the skunk appear larger. Skunk densities vary widely according to season, food sources, and geographic area.

Spotted skunks feed on a variety of items including beetles, grubs, bees, honey, mice, moles, rats, chipmunks, eggs, and fresh carrion (Kinlaw 1995). They are more predaceous than other species of skunks, and mammals appear to be a more important food source than arthropods (Howard and Marsh 1982). For example, Crabb (1941) found mammals in 90% of scats collected during winter in Iowa. Eastern cottontails appeared to be a major food item, along with meadow and prairie voles.

Adult spotted skunks can stay in burrows for several weeks during cold spells losing up to 30% of their body weight with no ill effects. Underground dens are either excavated or abandoned by other animals. Dens of spotted skunks generally have two to five entrances with one to three nest chambers. Dens can have up to 60 feet of tunnels. Sections below the frost line are used in the winter when all but one entrance may be sealed. Deserted woodchuck and other small animal burrows are frequently used as a den. Occasionally, owls prey upon spotted skunks.

Population estimates and density information is currently not available for Florida. Spotted skunks can be found in a variety of habitats across the State. However, if skunks only inhabit 50% of the land area of the State and densities occurred at 2.2 skunks per square kilometer, the statewide population could be estimated at 152,800 skunks based on the land area of the State. If skunks only inhabit 25% of the land area of the State and densities occurred at 2.2 skunks per square kilometer, the statewide population could be estimated at 76,400 skunks based on the land area of the State. Similar to other furbearing species, skunks can be found throughout the State and the estimates are intended to evaluate the magnitude of take proposed under the proposed action.

Although statewide populations of spotted skunks are not known, spotted skunks maintain sufficient densities in the State that the FWC allows spotted skunks to be harvested during a continually open season, which allows an unlimited number of spotted skunks to be harvested annually. However, the number of spotted skunks harvested annually in the State is currently unknown. Spotted skunks could also be removed by other entities to alleviate damage and threats of damage in the State; however, the number of spotted skunks lethally removed to alleviate damage in the State is also unknown. Between FY 2006 and FY 2011, the WS program in Florida lethally removed eight spotted skunks with the highest annual take occurring in FY 2008 when six spotted skunks were lethally removed.

Based on previous requests for assistance and in anticipation of additional efforts to manage damage, WS could lethally remove up to 50 spotted skunks annually in the State under the proposed action alternative, including spotted skunks that could be lethally taken unintentionally to alleviate damage associated with other wildlife. Using a statewide population estimated at 152,800 skunks, the take of 50 skunks would represent 0.03% of the estimated statewide population. If the statewide population of skunks were 76,400 skunks, the take of skunks by WS would represent 0.07% of the population. The unlimited take allowed by the FWC with no closed season provides an indication that skunk densities in the State are sufficient to maintain a sustained harvest level and adverse effects from harvest and damage management purposes are not likely to cause overharvest of the species leading to population declines.

Although the number of spotted skunks lethally taken in the State during the annual hunting season and for damage management is unknown, the cumulative take of spotted skunks, including the proposed take of up to 50 skunks annually by WS, would be of a low magnitude when compared to the actual statewide population.

Feral and Free-ranging Cat Population Information and Effects Analysis

Feral cats are domesticated cats living in the wild. Free-ranging cats are those cats that are considered to belong to, possessed, or otherwise owned by a person, but are allowed the ability to wander freely within the environment. In general, most feral cats are small in stature, weighing from three to eight pounds (1.4 to 3.6 kg), standing eight to 12 inches (20 to 30.5 cm) high at the shoulder, and 14 to 24 inches (35.5 to 61 cm) long. The tail adds another 20 to 30.5 cm (8 to 12 inches) to their length. Colors range from black to white to orange, and a variety of combinations of those colors. Other hair characteristics also vary greatly (Fitzwater 1994). Other cats that are not considered feral, but may be considered free ranging are capable of attaining much higher weights.

Feral cats are found in commensal relationships wherever people are found. In some urban and suburban areas, cat populations equal human populations. In many suburban and eastern rural areas, feral cats are the most abundant predators. They are opportunistic predators and scavengers that feed on rodents, rabbits, shrews, moles, birds, insects, reptiles, amphibians, fish, carrion, garbage, vegetation, and leftover pet food (Fitzwater 1994).

Feral cats produce two to 10 kittens during any month of the year. An adult female may produce three litters per year where food and habitat are sufficient. Cats may be active during the day but typically are more active during twilight or night. House cats have been reported to live up to 27 years, but feral cats probably average only three to five years. They are territorial and move within a home range of roughly four square kilometers (1.5 square miles). After several generations, feral cats can be considered wild in habits and temperament (Fitzwater 1994).

Feral and free-ranging domestic cats are exotic species to North America. Exotic species are recognized as one of the most widespread and serious threats to the integrity of native wildlife populations and natural ecosystems. Exotic species present special challenges for wildlife managers because their negative effects are poorly understood by the general public, many exotic species have become such an accepted component of the environment that many people regard them as "*natural*", some exotic species have advocacy groups that promote their continued presence, and few policies and laws deal directly with their control. Perhaps no issue has captured more of the challenges for contemporary wildlife management than the impacts of feral or free-ranging human companion or domestic animals. The domestic cat is the companion animal that recently has attracted the most attention for its impact on wildlife species (The Wildlife Society 2010).

Where it has been documented, the impact of feral cats on wildlife populations in suburban and rural areas, directly by predation, and indirectly by competition for food, has been enormous (Coleman and Temple 1989). In the United Kingdom, one study determined that house cats might take an annual toll of some 70 million animals and birds (Churcher and Lawton 1987). American birds face an estimated 117 to 157 million exotic predators in the form of free-ranging domestic cats, which are estimated to kill at least one billion birds every year in the United States. Cats have contributed to declines and extinctions of birds worldwide, with feral cats considered one of the most important drivers of global bird extinctions (Dauphine and Cooper 2009). The lowest feral cat population in the United States has been estimated at 70 million cats with hundreds of cats per square mile in some urban areas (Mott 2004).

Feral and free-ranging cats also pose a health and safety threat to household pets. Feral and stray cats are at increased risk of feline immunodeficiency virus, feline leukemia, feline panleukopenia virus, also known as feline distemper, and rabies. All of these diseases can be transmitted to unvaccinated pet cats allowed to free-range. Feline panleukopenia virus is highly contagious, may survive in the environment for up to a year, and may be transmitted to indoor cats through indirect routes, such as on shoes (Berthier et al. 2000, Truyen et al. 2009). In addition, feral and free-ranging cats serve as a reservoir for wildlife and human diseases, including cat scratch fever, histoplasmosis, leptospirosis, mumps, plague, rabies, ringworm, salmonellosis, toxoplasmosis, tularemia, and various parasites (Fitzwater 1994).

The number of feral cats in Florida is unknown. Feral and free-ranging cats are considered by many wildlife biologists and ornithologists to be a detriment to native wildlife species. Feral cats prey upon native wildlife species and compete with native predators for prey. Thus, removing feral cats could be considered as providing some benefit to the natural environment by eliminating predation and competition from an introduced species.

During direct operational assistance projects conducted by WS from FY 2006 through FY 2011, WS intentionally removed using lethal methods 171 feral cats across the State. Feral and free-ranging cats were also live-captured and released by WS. Between FY 2006 through FY 2011, 131 feral or free-ranging cats were intentionally live-captured and released unharmed or were relinquished to a local animal control facility for care and to determine their adoptability. In addition, 14 cats were unintentionally live-captured by WS across the State from FY 2006 through FY 2011. Those cats unintentionally live-captured were released unharmed or relinquished to a local animal control facility.

In most cases, WS would employ live-capture methods to alleviate damage or threats of damage associated with feral or free-ranging cats. Once live-captured, WS would transfer custody of the cats to a local animal control facility. After relinquishing the feral cats to a local animal control facility, the care and the final disposition of the cat would be the responsibility of the animal control facility. However, in some cases, WS may be requested to lethally remove feral cats to alleviate damage or threats. In anticipation of receiving requests to lethally remove feral cats, up to 250 feral cats could be removed by WS annually. Based upon the above information, WS' limited removal of feral cats would have minimal effects on local or statewide populations in Florida. Some local populations may be temporarily reduced at a local site if cats were removed using non-lethal or lethal methods. In those cases where feral cats were causing damage or were creating a nuisance and complete removal of the local population could be achieved, this could be considered as providing some benefit to the natural environment since feral cats are not considered part of the native ecosystem.

Feral Dog Population Information and Effects Analysis

Like domestic dogs, feral dogs, which are often referred to as wild or free-ranging dogs, manifest themselves in a variety of shapes, sizes, colors, and even breeds. McKnight (1964) noted German shepherds, Doberman pinschers, and collies as breeds that often become feral. Most feral dogs today are descendants of domestic dogs that appear similar to dog breeds that are locally common (Green and Gipson 1994). The primary feature that distinguishes feral from domestic dogs is the degree of reliance or dependence on humans, and in some respect, their behavior toward people. Feral dogs survive and reproduce independently of human intervention or assistance. While it is true that some feral dogs use human garbage for food, others acquire their primary subsistence by hunting and scavenging like other wild canids.

Feral and domestic dogs often differ markedly in their behavior toward people. Scott and Causey (1973) based their classification of those two types by observing the behavior of dogs while confined in cage traps. Domestic dogs usually wagged their tails or exhibited a calm disposition when a human approached; whereas, most feral dogs showed highly aggressive behavior, growling, barking, and attempting to bite. Some dogs were intermediate in their behavior and could not be classified as either feral or domestic based solely on their reaction to humans. Since many feral dogs have been pursued, shot at, or trapped by people, their aggressive behavior toward humans is not surprising. Gipson (1983) described the numerous lead pellets imbedded under the skin of a feral dog caught in Arkansas as a testament to its relationship with people (Green and Gipson 1994).

Feral dogs are usually secretive and wary of people. Thus, they are active during dawn, dusk, and at night, much like other wild canids. They often travel in packs or groups and may have rendezvous sites, similar to wolves. Travel routes to and from gathering sites or den sites may be well defined. Food scraps and other evidence of concentrated activity may be observed at gathering sites.

The appearance of tracks left by feral dogs varies with the size and weight of the animal. Generally, dog tracks are more round and show more prominent nail marks than those of coyotes, and they are usually larger than fox tracks. Since a pack of feral dogs likely consists of animals in a variety of sizes and shapes, the tracks from a pack of dogs will be correspondingly varied, unlike the tracks of a group of coyotes (Green and Gipson 1994).

Feral dogs may occur where people permit their dogs to roam free or where people abandon unwanted dogs. Feral dogs probably occur in all of the 50 states, Canada, and Central and South America. They are also common in Europe, Australia, Africa, and on several remote ocean islands, such as the Galapagos. Home ranges of feral dogs vary considerably in size, with size likely influenced by the availability of food. Dog packs that are primarily dependent on garbage may remain in the immediate vicinity of a landfill, while other packs that depend on livestock or wild game may forage over an area of 130 km^2 (50 square miles) or more (Green and Gipson 1994).

Feral dogs are often found in forested areas or scrublands near human habitation. Some people will not tolerate feral dogs in close proximity to human activity; thus, they take considerable effort to eliminate them in such areas. Feral dogs may be found on lands where human access is limited, such as military reservations and large airports. They may also live in remote sites, where they feed on wildlife and native fruits. The only areas that do not appear to be suitable for feral dogs are places where food and escape cover are not available, or where large native carnivores, particularly wolves, are common and prey on dogs (Green and Gipson 1994).

Like coyotes, feral dogs are best described as opportunistic feeders. They can be efficient predators, preying on small and large animals, including domestic livestock. Many rely on carrion, particularly road-killed animals, crippled waterfowl, green vegetation, berries, and other fruits, and refuse at garbage dumps (Green and Gipson 1994).

Feral dogs are highly adaptable, social carnivores. Gipson (1983) suggested that family groups of feral dogs are more highly organized than previously believed. Pup rearing may be shared by several members of a pack. Survival of pups born during autumn and winter has been documented, even in areas with harsh winter weather. Gipson (1983) found that only one female in a pack of feral dogs studied in Alaska gave birth during two years of study, even though other adult females were present in the pack. The breeding female gave birth during late September or early October during both years. Gipson (1983) indicated that all pups from both litters had similar color markings, suggesting that the pups had the same father. Adult males of different colors were present in the pack.

Nesbitt (1975) commented on the rigid social organization of a pack of feral dogs where nonresident dogs were excluded, including females in estrus. In one instance, Nesbitt (1975) used three separate female dogs in estrus as bait (dogs were chained in the back of a corral-type trap) over a 59-day period and captured no feral dogs. Nesbitt (1975) then baited the same trap with carrion, and a pack of feral dogs, including four adult males, entered the trap within one week (Green and Gipson 1994).

Hybridization between feral dogs and other wild canids can occur, but non-synchronous estrus periods and pack behavior (that is, excluding non-resident canids from membership in the pack) may preclude much interbreeding. Dens may be burrows dug in the ground or sheltered spots under abandoned buildings or farm machinery. Feral dogs commonly use former fox or coyote dens (Green and Gipson 1994).

Feral dogs can cause damage by preying on livestock, poultry, house cats, or domestic dogs. They may also feed on fruit crops including melons, berries, grapes, and native fruit. They may also attack people, especially children. This is especially true where they feed at and live around landfills near human dwellings (Green and Gipson 1994). In some locales, they may present a serious threat to deer (Lowry 1978) and other valuable wildlife (Green and Gipson 1994).

Most requests for assistance would be referred to a local animal control facility since requesters are usually unable to determine if a dog is feral or a pet. From FY 2006 through FY 2011, WS lethally removed one feral dog during damage management activities in Florida. WS has also live-captured and released seven feral dogs during damage management activities conducted from FY 2006 through FY 2011. WS employed non-lethal harassment methods to disperse 32 dogs between FY 2006 and FY 2011. Based on previous requests for assistance and in anticipation of receiving additional requests for assistance, WS could lethally remove up to 10 feral dogs per year under the proposed action alternative. In most cases, WS would employ non-lethal harassment methods to disperse feral dogs or would employ live-capture methods to alleviate damage or threats of damage associated with dogs. Once live-captured, WS would transfer custody of the dogs to a local animal control facility. After relinquishing the dogs to a local animal control facility, the care and the final disposition of the dog would be the responsibility of the animal control facility. Feral dogs could also be lethally removed unintentionally during other damage management activities; however, WS does not anticipate the cumulative lethal take of feral dogs to exceed 10 dogs annually.

Based upon the above information, WS' limited lethal removal of feral dogs would not adversely affect overall populations in Florida. Any activities involving lethal control actions by WS would be restricted to isolated individual sites. Some local populations may be temporarily reduced because of removals aimed at reducing damage at a local site. In those cases where feral dogs were causing damage or posing as a nuisance and complete removal of the local population could be achieved, this could be considered as providing some benefit to the natural environment since feral dogs are not considered part of the native ecosystem.

White-tailed Deer Population Information and Effects Analysis

White-tailed deer are small to medium-sized mammals with tan or reddish brown pelts above in summer and grayish brown in winter. The belly, throat, noseband, eye-ring, and inside of the ears are white and their tail is brown with white above, often with a dark stripe down the center and white below. Deer are known for raising their tail while alarmed and in flight, called "*flagging*," in which the tail appears as a large, bright flash of white. This communicates danger to other deer and helps young follow their mothers in flight (National Audubon Society 2000). The range in size of white-tailed deer is extreme. White-tailed deer in the northern extremes of its range, where there is good habitat, will achieve weights of greater than 136 kg (300 lbs). In Florida, adult male deer average 52 kg (115 lbs) while females average 41 kg (90 lbs). By comparison, the tiny Florida Keys subspecies (*O. v. clavium*) commonly weighs less than 23 kg (50 lbs) (National Audubon Society 2000).

Male white-tailed deer are called bucks. They exhibit antlers, which are a pair of bony outgrowths of the frontal bone that normally are shed annually. The antlers begin growing in the early summer at which time they are covered with a skin that grows as the antlers do. The skin has short fine hairs called "*velvet*", containing a network of blood vessels, which nourish the growing bone beneath. By late summer, the antlers are fully developed, and the "*velvet*" is rubbed off against small saplings by the animal as the bone hardens. The antlers then serve as sexual ornaments and rival males may use them as weapons in courtship battles during the breeding season, which is called the "*rut*". After the mating season, the antlers decalcify and detach from the frontal bone within two to three days of each other, fall to the ground, and are often quickly found and gnawed on by various rodents for the calcium (National Audubon Society 2000). Antler size depends upon nutrition, age, and genetics (Craven and Hygnstrom 1994).

The white-tailed deer reproductive season varies according to geographic range. It may occur by the first two weeks in November in the north, but occurs as late as January or February in the south. Females, called "*does*", may have one to three young, or "*fawns*", after a gestation period of approximately 202 days (Craven and Hygnstrom 1994). A young doe bred for the first time will usually have only one fawn, older does two or three. The female remains near the fawns, returning to feed them only once or twice a day. Twin fawns are separated, which serves to protect them. Weaning occurs between 1 and 2 ½ months. Fawns stay with the mother until fall or winter, sometimes up to two years, but the doe generally drives off her young the previous year shortly before giving birth (National Audubon Society 2000).

When compared to other land mammals in North America, the white-tailed deer currently occupies the largest geographic range of any other mammal (Pagel et al. 1991). Rural areas containing a matrix of forest and agricultural crops can contain the highest deer densities (Roseberry and Woolf 1998). Biologists and resource managers in Florida have been challenged with managing escalating populations of deer in many urban/suburban areas and in some rural areas. As deer populations increase, there is an increasing occurrence of damage from white-tailed deer to agricultural crops (DeVault et al. 2007), increasing incidences of Lyme disease (Fernandez 2008), a rise in deer-vehicle collisions (Conover et al. 1995), and a disruption in forest health, regeneration, and forest dependent species (Tilghman 1989). Additionally, white-tailed deer are ranked as the second most hazardous species to aviation according to the percentage of strikes that caused damage from 1990 through 2010 (Dolbeer et al. 2012).

By the 1930s, white-tailed deer were nearly extirpated from southern Florida with the statewide population estimated at 20,000 deer (Schaefer and Main 2008). Today, white-tailed deer are present statewide in Florida, and occupy almost all land types that contain suitable habitat with the deer population in Florida estimated to be above 700,000 individuals (Schaefer and Main 2008). Current statewide population estimates are not available. White-tailed deer densities are sufficient to allow deer to be harvested during annually hunting seasons in the State. The authority for management of resident wildlife species, including deer, is the responsibility of the FWC. The FWC collects and compiles information on white-tailed deer population trends and harvest and uses this information to manage deer populations. The primary tool for the management of deer populations in Florida is through adjusting the allowed lethal take during the deer harvest season in the State. Hunting is the primary cause of adult deer mortality in the State (Garrison and Gedir 2006). Garrison and Gedir (2006) estimated that 120,000 deer were harvested annually in Florida. During the 2011-2012 hunting season, surveys estimated that hunters harvested 136,189 deer in the State (Responsive Management 2012).

Mortality can also occur from vehicle collisions, predation (*e.g*., coyotes, dogs, panthers, bobcats), illegal take, tangling in fences, disease, parasites, malnutrition, poaching, and adverse weather (Crum 2003, Garrison and Gedir 2006). Annual deer mortality in Florida from other sources (*e.g*., illegal take, disease, and predation) is currently unknown. From July 1, 2010 through June 30, 2011, State Farm Mutual Automobile Insurance Company (2011*b*) estimated 13,135 deer-vehicle collisions occurred in Florida.

Between FY 2006 and FY 2011, WS lethally removed 374 deer to alleviate damage, with the highest annual take occurring in FY 2011 when 189 deer were removed using lethal methods. WS also used non-lethal harassment methods to disperse 337 deer to alleviate damage in the State and two deer were live-captured unintentionally by WS during other damage management activities from FY 2006 through FY 2011 and were released unharmed.

After review of the number of requests for assistance received by WS since FY 2006 and in consultation with the FWC, WS' anticipates additional efforts to manage damage associated with deer in the State. Based on consultation with FWC, a review of previous requests for assistance, and in anticipation of additional efforts to manage damage, WS anticipates the use of non-lethal and lethal methods to resolve deer damage and threats to increase.

An increasing number of requests for assistance would likely result in the escalated use of lethal and non-lethal methods to resolve damage and threats associated with deer as permitted by the FWC. After review of previous activities conducted by WS and in anticipation of additional efforts to manage damage, WS anticipates that future lethal take would not exceed 500 deer annually. In addition, WS may be requested by the FWC and/or the FDAC to assist with sampling and managing the spread of diseases found in free-ranging and/or captive deer populations. In the case of a disease outbreak, WS could lethally take up to 2,000 additional white-deer for sampling and/or to prevent further spread of diseases. Therefore, WS' total annual take would not exceed 2,500 deer annually under the proposed action. Any take of deer by WS in Florida, with the exception of deer that could be taken at airports for the protection of human health and safety, must be authorized and permitted by the FWC (FWC Statute 68A-9.012).

If requested, WS could also assist with sampling and removing deer from captive facilities where deer are confined inside a perimeter fence. The detection of a disease at a captive facility often raises concerns of the potential spread of diseases to free-ranging herds. The spread of diseases among deer inside these facilities is often increased due to their close contact with one another. Often, once a disease is detected in a confined deer herd, the entire herd is destroyed to ensure the containment of the disease. Any involvement with the depopulation of deer confined inside a perimeter fence by WS would be at the request of the FWC and/or the FDAC.

As proposed in this alternative, in those cases where WS was requested to assist with the removal of a captive deer herd in Florida, the take would not exceed 2,000 deer for purposes of disease monitoring or surveillance. Deer confined inside perimeters fences for the purposes of non-traditional farming, including confined for hunting, are not included in statewide deer population estimates. However, since take of deer by WS for disease surveillance or monitoring could occur in free-ranging or captive herds, the potential take of up to 2,000 deer for disease surveillance and monitoring by WS will be considered as part of the impact analysis on the statewide free-ranging deer population. Therefore, the analyses will evaluate the lethal take (killing) of up to 2,500 deer annually by WS.

In addition to WS' intentional take of deer to resolve or prevent damage, WS also conducts other damage management activities that pose a risk for the unintentional lethal take of deer. Based on the limited unintentional take that occurred from FY 2006 through FY 2011 during other program activities in Florida and after the review of program activities, the unintentional take of deer by WS during other activities would not be expected to increase to any appreciable extent. The unintentional take of deer by WS would continue to be nominal when compared to the number of deer harvest annually. All take, including unintentional take, would be reported to the FWC. Annual cumulative take would be evaluated by WS to ensure WS' take, whether intentional or unintentional, would not adversely affect deer populations in the State.

Since deer harvest and other mortality events fluctuate annually in the State, the analysis of impacts of WS' take on the statewide deer population under this alternative will be evaluated using several scenarios. To address requests for assistance with managing damage, WS anticipates that up to 500 deer could be lethally removed annually. In the event of a disease threat, the take of deer by WS for disease monitoring and surveillance would not exceed 2,000 deer when requested by the FWC and/or the FDAC. Under a worst-case scenario, 2,500 deer could be taken by WS annually under this alternative. Since the worst-case scenario would represent the highest level of annual take, the analyses will evaluate a take of 2,500 deer to determine the maximum possible potential impact although take of 2,500 deer annually is unlikely and will likely be less than 500 deer.

During the 2011-2012 hunting season, an estimated 136,189 deer were harvested in Florida, with the average annual harvest being 120,000 deer. If WS' take reached 2,500 deer during the 2011-2012 season, WS' take of 2,500 deer would have represented 1.8% of the 2011-2012 harvest. Using the average annual harvest estimated at 120,000 deer, the take of 2,500 would have represented 2.1% of the average annual harvest.

As stated previously, the deer population in Florida was estimated at over 700,000 deer. The total deer mortality in the State could be estimated at 149,324 deer, based on harvest and vehicle collision data. If the deer population estimate were 700,000 deer, then the take of deer from all known sources would represent 21.3% of the deer population. If WS had taken 2,500 deer, the total mortality of deer would have been estimated at 151,824 deer. When combined with the total known mortality in the State, WS' take of up to 2,500 deer would have represented 21.7% of the population. If WS had lethally removed 2,500 deer, WS' take would have represented an increase of 0.4% when compared to the total mortality if no take by WS had occurred (*i.e.*, 21.3% without take by WS compared to 21.7% if WS' take had been 2,500 deer). With oversight of the FWC, the magnitude of take of deer by WS annually to resolve damage and threats would be low.

GonaCon™ was officially registered by the EPA in 2009 for use in reducing fertility in female white-tailed deer. According to the label, only WS or state wildlife management agency personnel or individuals working under their authority can use the reproductive inhibitor. Additionally, in order for GonaCon™ to be used in any given state, the product must also be registered with the state and approved for use by the appropriate state agency responsible for managing wildlife. The reproductive inhibitor Gonacon™ is currently not registered for use in Florida. However, if Gonacon™ becomes available to manage deer in the State, the use of the inhibitor could be evaluated under the proposed action as a method available that could be used in an integrated approach to managing damage.

Population management from the use of reproductive inhibitors to induce a decline in a localized deer population occurs through a reduction in the recruitment of fawns into the population by limiting reproductive output of adults. A reduction in the population occurs when the number of deer being recruited into the population cannot replace those individuals that die from other causes each year, which equates to a net loss in the number of individuals in the population and a reduction in the overall population. Although not generally considered a lethal method since no direct take occurs, reproductive inhibitors can result in the reduction of a target species' population. WS' use of GonaCon™ would target a local deer population identified as causing damage or threatening human safety. Although a reduction in a local deer population would likely occur from constant use of GonaCon™, the actual reduction in the local population annually would be difficult to derive prior to the initiation of the use of the vaccine.

One of the difficulties in calculating and analyzing any actual reduction that could occur from the use of the vaccine in a targeted population prior to application of the vaccine is the variability in the response of deer to the vaccine. Previous studies on GonaCon™ as a reproductive inhibitor have shown variability in the immune response of deer to the vaccine (Miller et al. 2000). Not all deer injected with GonaCon™ develop sufficient antibodies to neutralize the GnRH produced in the body. Those deer continue to enter into a reproductive state and produce fawns even after vaccination. The number of deer that do not develop sufficient antibodies after the initial vaccination cannot be predicted beforehand. In one study, 88% of the deer vaccinated with GonaCon™ did not produce fawns the following reproductive season while 12% of the deer injected with GonaCon™ produced fawns (Gionfriddo et al. 2009). The year following the initial vaccination, the number of deer that were vaccinated the first year that did not produce fawns declined to 47% while the number of deer producing fawns increased to 53% (Gionfriddo et al. 2009) demonstrating the diminishing results that are likely over time if deer are not provided a booster shot periodically.

Since the effects of GonaCon™ appear to be reversible if deer are not provided with a booster shot periodically, the reduction in a local population of deer from the use of GonaCon™ can be maintained at appropriate levels where damages or threats were resolved by increasing or decreasing the number of deer receiving booster injections. Although localized deer populations would likely be reduced from the use of GonaCon™, the extent of the reduction would be variable. For example, not all vaccinated deer would likely be prevented from entering into a reproductive state and those deer that were initially prevented from entering into a reproductive state often become reproductively active in subsequent years as the antibody levels neutralizing the GnRH hormone diminish over time. Therefore, the actual decline in the number of deer in a localized population achieved from the use of GonaCon™ would be difficult to predict prior to the use of the reproductive inhibitor. However, since the decline would occur through attrition over time and since the ability of the inhibitor to prevent reproduction diminishes with time, the actual decline in a localized population would be gradual and could be monitored. In addition, the reduction in a local deer population could be fully reversed if deer were no longer vaccinated or provided booster shots and other conditions (*e.g.,* food, disease) were favorable for population growth.

Turner et al. (1993) noted that although contraception in white-tailed deer may be used to limit population growth, it would not reduce the number of deer in excess of the desired level in many circumstances. Turner et al. (1993) further contended that initial population reductions by various other means may be necessary to achieve management goals, and that reproduction control would be one facet of an integrated program. Although immunocontraceptive technology has been effective in laboratories, pens, and in island field applications, it has not been effective in reducing populations of free-ranging white-tailed deer over large geographical areas.

The magnitude of WS' activities to alleviate damage and threats associated with deer in the State would be low, with the oversight and permitting of WS' activities occurring by the FWC. If take by WS had reached 2,500 deer, WS' take would have represented 1.8% of the statewide harvest during the 2011-2012 season. If WS' take had reached 2,500 deer, the total known mortality would have increased only 0.4% when compared to total known mortality if 2,500 deer had not be taken by WS. Based on a statewide deer population estimated at 700,000 deer, take of up to 2,500 deer by WS would have represented 0.4% of the estimated population. However, as stated previously, WS' annual take would likely be less than 500 deer with take reaching 2,500 only when WS was requested to remove deer from enclosed facilities. Deer confined within enclosed facilities are not included in statewide deer population estimates or included in statewide harvest estimates; therefore, the potential take by WS under this alternative would actually represent a lower magnitude of the statewide population and annual harvest levels. WS would report take to the FWC and monitor take to ensure activities did not adversely affect the statewide deer population. The permitting of WS' take by the FWC would ensure WS' take would meet the objectives of the statewide wildlife management plan.

River Otter Population Information and Effects Analysis

Historically, river otters inhabited aquatic ecosystems throughout much of North America, excluding the frozen Arctic and arid Southwest (Hall and Kelson 1959). Information on historic numbers and distribution is limited. As its broad geographic distribution suggests, the river otter is able to adapt to diverse aquatic habitats. Otters are found in both marine and freshwater environments, ranging from coastal to high mountainous habitat. Riparian vegetation adjacent to lakes, streams, and other wetland areas is a key component of otter habitat.

Human encroachment, habitat destruction, and overharvest have eliminated river otters from marginal portions of their range. However, present distribution spans the North American continent from east to west and extends from southern Florida to northern Alaska (Melquist and Dronkert 1987). River otter populations have remained stable in Florida despite declines in other parts of the country. However, the current statewide otter population is currently unknown.

Densities of river otter in linear waterways have been reported ranging from one otter per 0.7 miles in southeast Alaska (Woolington 1984) to one otter per 10.6 miles (Reid 1984) in northeastern Alberta. Melquist and Dronkert (1987) summarized studies estimating river otter densities, which showed that densities were about 1 per 175 to 262 acres in Texas coastal marshes, and ranged from 1 per 1.8 miles to 1 per 3.6 miles of waterway (stream or river). The results of a Missouri study found 1 otter per 2.5 to 5.0 miles of linear waterways (Erickson et al. 1984).

There are approximately 51,858 river and stream miles in Florida (FDEP 2008). As was discussed previously, otter are closely associated with aquatic habitats where they forage and den along shorelines. Using 51,858 miles of streams in Florida and the range of 1 otter per 2.5 to 5.0 miles of waterway would result in a statewide population estimate ranging from 10,370 otter to 20,740 otter. If only 50% of those streams supported river otter, the minimum statewide river otter population could be estimated to range from 5,185 to 10,370 river otter in Florida. This would be considered a worst-case scenario since the otter population is likely to inhabit a much larger portion of the streams and rivers of Florida. In addition, otter also inhabit other aquatic habitats besides rivers and streams; therefore, the population estimates would likely be higher.

River otters are considered a furbearer in Florida and at the time this EA was developed could be harvested from December 1 through March 1 yearly (FWC 2012). During the open season, there is no limit on the number of otters that can be harvested by individual hunters and trappers. The number of otters harvested during the open seasons is currently unknown.

From FY 2006 through FY 2011, WS killed 16 river otters in Florida, which is an average take of three otter taken annually. Of those otters lethally taken by WS from FY 2006 through FY 2011, 10 otter were taken as unintentional non-targets during other damage management activities. The highest unintentional take occurred during FY 2007 when five otters were unintentionally taken during other damage management activities. However, no river otter have been lethally taken by WS since FY 2008. Non-target take of otters during aquatic rodent damage management activities are discussed here to evaluate cumulative take. WS has also unintentionally live-captured three otters during other damage management activities between FY 2006 and FY 2011 with those otters released unharmed. In addition, WS has dispersed one otter from FY 2006 through FY 2011. Based on previous requests for assistance and anticipating additional efforts to address damage, WS reasonably expects the intentional take of otter would not exceed 25 otters annually in Florida to resolve requests to manage damage to resources. WS anticipates receiving requests primarily from aquaculture producers that are experiencing unacceptable predation of fish stock by river otters.

As was discussed previously, river otters are also likely to be lethally removed by WS as unintentional non-targets during other activities to alleviate wildlife damage. To evaluate the potential cumulative impacts on the river otter population from the activities proposed under this alternative, WS will evaluate cumulative take using the highest annual non-target take of otter that occurred during previous activities. As stated previously, the highest annual non-target take by WS occurred during FY 2007 when five otter were killed unintentionally. Based upon the aforementioned population estimate, WS' lethal take of 25 river otters annually under the proposed action would represent 0.5% of the otter population in Florida estimated at 5,185 otters and 0.2% of a statewide population estimated at 10,370 otters. If the highest unintentional take by WS of five otters was combined with the proposed take under this proposed action of up to 25 otters, WS' cumulative take would represent 0.6% of a statewide population estimated at 5,185 otters and 0.3% of a statewide population estimated at 10,370 otters.

The proposed take and the cumulative take of otters in the State by WS would be of low magnitude when compared to the actual statewide population estimates. Similarly, WS' annual take would not inhibit the ability of those persons interested to harvest otter during the regulated harvest season. The unlimited take allowed by the FWC also provides an indication that harvest and damage management activities are not sufficient to cause the overharvest of otters.

Feral Swine Population Information and Effects Analysis

Feral swine, also known as "*wild pigs*", "*wild boars*," and "*feral hogs*", are medium-sized hoofed mammals that look like domestic pigs. They usually have coarser and denser coats than their domestic counterparts and exhibit modified canine teeth called "*tusks*" that are usually 7.5 to 12.5 cm (3 to 5 inches) long but may be up to 23 cm (9 inches) long. These tusks curl out and up along the sides of the mouth. Lower canines are also prominent but smaller. Young feral swine have pale longitudinal stripes on the body until they are six weeks of age. Adults of the species average 90 cm (3 feet) in height and 1.32 to 1.82 m (4 feet 6 inches to 6 feet). Males may attain a weight of 75 to 200 kg (165 to 440 lbs), while females may weigh 35 to 150 kg (77 to 330 lbs). Feral swine mate any time of year but peak breeding times usually occur from January through February and again in early summer. Litter sizes are usually three to 12 piglets (National Audubon Society 2000). Given adequate nutrition, a wild pig population can double in just four months. Feral hogs may begin to breed before six months of age and sows can produce two litters per year (Barrett and Birmingham 1994). Feral swine can be found in variable habitat in much of the southern United States, as well as most of the United States. Populations are usually clustered around areas with ample food and water supplies. Evidence of the presence of feral swine may be rooted up earth, tree rubs at ground level to 900 cm (36 inches) high, with clinging hair or mud, and muddy wallows.

Feral swine in Florida are typically descendants of domestic pigs, often with traces of Eurasian wild boar stock. Feral swine are known in the United States to be destructive invaders, with quickly growing populations. Feral swine population estimates in Florida are estimated at anywhere between 500,000 and 1 million individuals. One of the fastest breeding mammals in North America, a female pig will begin breeding as early as six months of age and breeds twice a year. Litter sizes average between four to six young, but have been observed as high as eight to 12 young. With such reproductive potential, populations of feral swine can expand nearly exponentially.

Due to their large and fast growing populations in combination with their proclivity to root up the soil when feeding, these omnivores can be very destructive to the habitats in which they are found. The damage they cause includes the disruption of forest regeneration as they root up and consume seeds and seedlings of native species (Lipscomb 1989), competition with native species for food resources (Henry and Conley 1972), habitat modification effecting niche microhabitats for various species (Singer et al. 1984), accelerated soil erosion (Sierra 2001), and direct predation (Schaefer 2004).

Damage in areas supporting feral swine populations is sometimes a serious natural resource management concern for land managers. Substantial damage has occurred to natural resources, including destruction of fragile plant communities, killing tree seedlings, and erosion of soils (Barrett and Birmingham 1994). Food sources for feral hogs includes acorns, hickory nuts, pecans, beech nuts, and a wide variety of vegetation including roots, tubers, grasses, fruit, and berries, but feral hogs also eat crayfish, frogs, snakes, salamanders, mice, eggs and young of ground-nesting birds, young rabbits, and any other easy prey or carrion encountered. Feral swine have been known to kill and eat deer fawns (National Audubon Society 2000). They have also been reported to kill considerable numbers of domestic livestock, especially young animals, in some areas (Barrett and Birmingham 1994). Several diseases are associated with feral swine populations (see Table 1.3).

On Wildlife Management Areas (WMA) in Florida, feral swine are treated as a game animal by the FWC. Feral swine may be hunted on WMAs during most hunting seasons (except spring turkey). A hunting license and a WMA stamp are required to hunt swine on WMAs. On some WMAs, there are daily take limits and size limits on feral swine take (FWC 2011). On private property, feral hogs in Florida are considered "*trespass livestock*", and may be hunted throughout the year using rifles, shotguns, crossbows, bows, or pistols, and no hunting license is required. There is no size or bag limit, and either sex may be harvested on private property (FWC 2012).

From FY 2006 through FY 2011, WS lethally removed 9,465 feral swine, while conducting feral swine damage management activities in Florida. In addition, 20 feral swine were dispersed using non-lethal methods. Removal of a small number of feral swine or a single individual will sometimes reduce damage considerably where natural resources, agriculture, or property is affected (Barrett and Birmingham 1994). However, damage may increase dramatically in areas where feral swine have ample resources and opportunity to expand.

Based on previous requests for assistance and based on additional efforts, WS anticipates that up to 4,000 feral swine could be killed annually in the State to alleviate damage associated with requests for assistance and for disease surveillance. Using a low population estimate of 500,000 feral swine in the State of Florida and the lethal take of 4,000 feral swine by WS, WS' lethal take would represent 0.8% of the population. However, such population reduction is not expected to affect the overall statewide population feral swine because of the high reproductive rates exhibited by these animals (Barrett and Birmingham 1994). Damage management activities associated with feral swine would target single animals or local populations of feral swine at sites where their presence was causing unacceptable damage or threats to agriculture, human health and safety, natural resources, or property. Feral swine are not native to North America, including Florida. The National Invasive Species Council specifically lists feral swine as an invasive species pursuant to Executive Order 13112. Executive Order 13112 directs federal agencies to address invasive species to the extent practicable and permitted by law.

Black Rat Population Information and Effects Analysis

Black rats can be found throughout the world, including Florida. Black rats are variable in color ranging from light brown to black. Black rats measure 32.5 to 45.5 cm (12.75 to 18 inches) in length. They weigh from 115 to 350 g (4 to 12 oz) (National Audubon Society 2000). They inhabit a variety of habitats, and thrive in human dominated landscapes. Black rats breed throughout the year, and may produce two to eight young per litter (National Audubon Society 2000). Home ranges of black rats vary greatly depending on the type of habitat in which they are found. Common predators of black rats are snakes, owls, dogs, and cats (National Audubon Society 2000). While black rat population estimates are difficult to determine, the species is abundant and generally considered a pest due to its proclivity to harbor diseases and compete with native species. In Florida, black rats are considered a non-native species in the State. Black rats were first observed in the State during the late 1700s and were widely distributed across the State by the 1800s. Black rats can be found statewide in the Florida but no population estimates are available for black rats in the State.

The only regulations involving managing damage and threats caused by rats are measures to reduce potential impacts to non-target species from damage management activities. Landowners may lawfully live-trap or humanely destroy nuisance black rats throughout the year, without a permit. Since FY 2006, requests for assistance received by WS to manage damage caused by black rats have been to reduce threats to human health and safety, damage to buildings, and threats to nesting sea birds. From FY 2006 through FY 2011, the WS program reported the lethal removal of 58 black rats statewide from all damage management projects.

Black rats could be taken by WS during wildlife hazard management, assessment, and monitoring at airports and airbases. Although black rats do not cause direct hazards to aviation safety, they serve as prey attractants to raptors and mammalian predators that may pose serious threats to aircraft safety. Removal of black rats by WS would occur primarily at airports by methods that may include trapping and the use of registered rodenticides (see Appendix B for a description of the rodenticides) or to reduce predation risks or competition with other wildlife, such as on islands. Typically, any lethal take at airports would be associated with small mammal trapping surveys or with operational activities managing a prey base to reduce hazards created by avian or mammalian predators in the aircraft operations area. Removal could also occur to alleviate agricultural damage at feedlots or other agricultural facilities. The level of WS' involvement in those activities would vary considerably from year to year depending on the number of airports/airbases, agricultural facilities, and natural resource agencies requesting assistance from WS.

Based on previous requests for assistance and in anticipation of additional efforts, WS could lethally remove up to 2,500 black rats annually in the State when requested to alleviate damage and threats of damage; however, determination of the exact number of rats killed during damage management activities can be difficult when rodenticides are employed. This is because most rats that are killed by those methods die underground or in structures. The statewide population of black rats is unknown; however, black rats are not considered a native species in the State. Black rats can be lethally removed in the State at any time with no limit on the number that can be removed. The number of black rats removed annually in the State is currently unknown.

The methods that would be primarily employed by WS under this alternative to address damage or threats of damage occurring from black rats would be live-capture methods, body-gripping traps (*i.e.*, snap traps), and rodenticides. Black rats live-captured would be euthanized using those methods and procedures addressed in WS Directive 2.505. As was mentioned previously, the actual lethal take of target individuals when using rodenticides can be difficult to estimate because most rats killed by those methods die underground. However, as stated previously, WS does not expect the total take of black rats in the State to exceed 2,500 rats annually. When employing rodenticides, total take of rats would be based on surveys conducted of the area baited with rodenticides to determine the local population size. The removal of black rats is often requested to benefit native wildlife species that are being negatively affected by black rats through competition for resources or from predation.

Although population estimates are not available, rats are generally prolific breeders and are generally abundant throughout their range. Additionally, populations of rats fluctuate greatly over time. Due to the species' relatively high reproductive rates and because management activities would be restricted to specific local sites, WS' activities under the proposed action would have minimal impacts on overall populations of black rats in the State. WS' activities would be conducted pursuant to Executive Order 13112. Any removal of black rats, including complete removal of rats from islands, would provide some benefit to the native environment by reducing competition with native wildlife. However, any take by WS under this alternative would not reach a level that would likely adversely affect the statewide population of black rats.

Norway Rat Population Information and Effects Analysis

The Norway rat is a stocky burrowing rodent with coarse fur that is usually brownish or reddish gray above and whitish gray on the belly. Blackish individuals occur in some locations. Norway rats can measure up to 25 cm long not including the tail, which is typically the same length as the body. The average weight of Norway rats is 550 g in males and about 350 g in females (National Audubon Society 2000). Norway rats breed throughout the year, producing up to five litters per year (National Audubon Society 2000). Home ranges of Norway rats vary greatly depending on the type of habitat in which they are found. Common predators of Norway rats are snakes, owls, dogs, and cats (National Audubon Society 2000). They are also called the brown rat, house rat, barn rat, sewer rat, gray rat, or wharf rat and are slightly larger than the roof rat.

Norway rats make a network of interconnecting tunnels for nesting and are colonial. They may burrow to make nests under buildings and other structures, beneath concrete slabs, along stream banks, around ponds, in garbage dumps, and at other locations where suitable food, water, and shelter are present (Timm 1994). Norway rats live in close association with people (Burt and Grossenheider 1976, Timm 1994, National Audubon Society 2000), and in urban areas they live in and around residences, in cellars, warehouses, stores, slaughterhouses, docks and sewers. On farms, rats may inhabit granaries, barns, livestock buildings, silos, and kennels (Timm 1994). In summer, rats may inhabit cultivated fields (National Audubon Society 2000).

Similar to black rats, Norway rats are found throughout the world, including Florida. They inhabit a variety of habitats, and thrive in human dominated landscapes. Norway rats are more closely associated with human habitation than black rats. Like black rats, Norway rats are not a native species in North America. Norway rats were first observed in the State during the early 1800s and today, can be found statewide. Like other rat species, Norway rats are provided no protection from lethal take, which is allowed at any time using available methods with no limit on the number that can be lethally removed. The number of Norway rats lethally taken in the State to manage damage or threats of damage is currently unknown. While Norway rat population estimates are difficult to determine, the species is abundant and generally considered a pest due to its proclivity to harbor diseases and compete with native species.

WS has not previously received requests for assistance to manage damage caused specifically by Norway rats; however, WS could receive requests for assistance to manage damage and threats of damage associated with Norway rats. Similar to black rats, Norway rats could be taken by WS during wildlife hazard management, assessment, and monitoring at airports and airbases. Although rats do not cause direct hazards to aviation safety, they serve as prey attractants to raptors and mammalian predators that may pose serious threats to aircraft safety. Requests for assistance are also likely to be received to address damage to property, agricultural resources, and to reduce threats occurring to native wildlife.

Based on previous requests for assistance and in anticipation of additional efforts, WS could lethally remove up to 2,500 Norway rats annually in the State when requested to alleviate damage and threats of damage; however, determination of the exact number of rats killed during damage management activities can be difficult when rodenticides are employed. This is because most rats that are killed by those methods die underground or in structures. The statewide population of Norway rats is unknown; however, Norway rats are not considered a native species in the State. Norway rats can be lethally removed in the State at any time with no limit on the number that can be removed. The number of Norway rats removed annually in the State is currently unknown.

The methods that would be primarily employed by WS under this alternative to address damage or threats of damage occurring from Norway rats would be live-capture methods, body-gripping traps (*i.e.*, snap traps), and rodenticides. Norway rats live-captured would be euthanized using those methods and procedures addressed in WS Directive 2.505. As was mentioned previously, the actual lethal take of target individuals when using rodenticides can be difficult to estimate because most rats killed by those methods die underground. However, WS does not expect the total take of Norway rats in the State to exceed 2,500 rats annually. When employing rodenticides, total take of rats would be based on surveys conducted of the area baited with rodenticides to determine the local population size. The removal of

Norway rats is often requested to benefit native wildlife species that are being negatively affected by Norway rats through competition for resources or from predation.

As was stated previously, the statewide population of rats is unknown; however, rats can be found statewide and are considered a non-native species. Any removal of rats could be viewed as providing some benefit to the native environment. Activities conducted by WS to manage damage or threats of damage associated with Norway rats would occur pursuant to Executive Order 13112. Although the statewide population of Norway rats is unknown, the proposed take of up to 2,500 rats annually would not reach a level where adverse effects would occur to the statewide population give the statewide distribution. Although Norway rats could be completely removed from islands during efforts to reduce competition between rats and native wildlife, the statewide population is not likely to be adversely affected.

Gambian Rat Population Information and Effects Analysis

Gambian rats are large, pouch-cheeked, burrowing rodents native to central Africa. Adults average from 1 to 1.47 kg (2.2 to 3.23 lbs) and range from 645 to 910 mm, occasionally larger, including the tail. Gambian rats have coarse, brown fur and a dark ring around their eyes. Males and females are similar in size, with little sexual dimorphism. In captivity, their average life span is five to seven years, but some have been known to live for as long as eight years. They are documented to be very strong swimmers, as well as very strong climbers. They are omnivorous, consuming a variety of vegetables and fruits, insects, crabs, and snails (Ajayi 1975, Smithers 1983, Fiedler 1988, Fiedler 1994). Gambian rats also have a high fecundity (*i.e*., ability to produce many offspring), with gestation times ranging from 27 to 42 days and four to five litters per year of one to five offspring (Rosevear 1969, Ajayi 1975, Hayssen et al. 1993).

Gambian rats are nocturnal animals, foraging at night. These rats consume approximately 5 g of food per 100 g of body weight per day. They are also known hoarders, storing large amounts of food in their burrows. They have been documented to transport 3 kg of food to a burrow in 2.5 hours of foraging, which, in addition to their daily food consumption, could make them an immense agricultural pest where an invasive population becomes established (Ajayi 1977).

In their native range, Gambian rats are sometimes considered pests in urban areas where they infest sewers. In rural areas, they frequently destroy farm crops and build burrows in the soil, which leads to soil desiccation and loss of plant crops. They often inhabit barns and other farm buildings, which can lead to property damage.

Gambian rats were imported into Florida as pets until 2003 when the importation of the rats was banned due to a Monkey Pox outbreak. Around 1999, up to eight Gambian rats reportedly escaped from a pet breeder on Grassy Key, Florida (Perry et al. 2006). Authorities were alerted to the escaped population by a local resident after seeing national media reports associating Gambian rats with an outbreak of monkey pox in the United States (CDC 2003). Those individuals likely began breeding and their population began to increase. The presence of breeding population on Grassy Key was confirmed in August 2004 (Perry et al. 2006). Modeling predicted that Gambian rats could establish viable population throughout Florida and the Gulf Coast of the United States if rats from Grassy Key were introduced into mainland Florida (Peterson et al. 2006).

After a breeding population was confirmed, efforts were undertaken to begin evaluating possible eradication efforts, including the use of rodenticides (Engeman et al. 2006, Engeman et al. 2007). By 2006, Gambian rats from the breeding population on Grassy Key had dispersed to Crawl Key (Engeman et al. 2006). Surveys conducted in 2006 and 2007 indicated that Gambian rats could be found over much of Grassy Key. In 2006, a collaborative effort between WS, the FWC, and the USFWS was launched in an effort to eradicate the isolated, invasive, Gambian rat population on Crawl and Grassy Key utilizing a combined effort of zinc phosphide rodenticide and cage trap grids (Engeman et al. 2006, Engeman et al. 2007, Witmer and Hall 2011). Early efforts to evaluate potential eradication efforts were conducted by the NWRC (Engeman et al. 2006, Engeman et al. 2007, Witmer and Hall 2011). In FY 2008, the WS program in Florida lethally removed 41 Gambian rats as part of those efforts. In FY 2009, WS lethally removed 10 rats, while two rats were live-capture and released with radio collars for tracking purposes. Capture rates of Gambian rats declined steadily from September 2007 through September 2009 as efforts to remove rats continued (Witmer and Hall 2011). The last known Gambian rat was live-captured and released with a radio collar on Grassy Key in September 2009. The individual was presumed to have died based on the tracking signal originating from the same location for over a six-month period (Witmer and Hall 2011). Intensive survey efforts conducted in 2010 revealed no evidence of Gambian rats on Grassy Keys. Survey efforts will continue to occur for several years to monitor for the presence of Gambian rats (Witmer and Hall 2011).

If Gambian rats were detected during surveys or were identified in other areas, WS could be requested to participate in efforts to remove Gambian rats. Activities conducted by WS would follow those procedures implemented previously to address Gambian rats, including the use of traps and zinc phosphide (Engeman et al. 2006, Engeman et al. 2007, Witmer et al. 2010*a*, Witmer et al. 2010*b* , Witmer and Hall 2011). When using zinc phosphide or other rodenticides, determination of the exact number of rats killed during damage management activities can be difficult to determine. This is because most rats that are killed by those methods die underground or in structures. As with previous efforts, any additional efforts targeting Gambian rats would be to eradicate and prevent the dispersal of rats to other areas (Engeman et al. 2006, Engeman et al. 2007, Witmer et al. 2010*a*, Witmer et al. 2010*b* , Witmer and Hall 2011). Therefore, any take by WS would occur within those objectives. However, WS anticipates that less than 250 Gambian rats could be taken by WS annually under the proposed action alternative if a population were discovered.

Beaver Population Information and Effects Analysis

The North American beaver is a semi-aquatic mammal occurring in rivers, streams, lakes, reservoirs, and wetlands across North America. Beaver are large, bulky rodents whose most prominent features include a large scaly, paddle-shaped tail and orange-colored incisors (Hill 1982). Most adults weigh from 15.8 to 38.3 kg (35 to 50 lbs) with some occasionally reaching more than 45 kg (100 lbs), and are the largest North American rodents (Miller and Yarrow 1994). They range in most of Canada and the United States, with the exception of portions of Florida and the desert southwest. In Florida, beaver only inhabit the northern portion of the state, throughout the panhandle roughly as far south as the Suwannee River. Beaver are active throughout most of the year and are primarily nocturnal, but beaver can be seen during the daylight hours. Beaver living along a river or large stream generally make bank burrows with multiple underwater entrances. Those in smaller streams, lakes, and ponds usually build dams and a lodge (National Audubon Society 2000). Sign of beaver in an area include gnawing around the bases of trees and trees, which have fallen because of this gnawing. Tree parts are stripped of bark, which is a primary beaver food.

Beaver are unique in their ability to create and modify their habitat by building dams (Boyle and Owens 2007). Beaver have a wide range and are extremely abundant, being found widely distributed over much of North America, including most of the United States. Beaver were trapped extensively during the 19th and part of the 20th centuries, and as a result, disappeared from much of their range (Novak 1987). Now reestablished over most of the continent, and protected from overexploitation, the beaver population has exceeded the societal carrying capacity in some areas. Dams built and maintained by beaver may flood stands of commercial timber, highways, and croplands. However, the dams also help reduce erosion, and the ponds formed by dams may create a favorable habitat for many forms of life (Hill 1982).

Beaver occur mostly in family groups that are comprised of two adult parents with two to six offspring from the current or previous breeding season. The average family group has been documented as ranging from 3.0 to 9.2 individuals (Novak 1987). Beaver abundance has been reported in terms of families per kilometer of stream or per square kilometer of habitat. Novak (1987) summarized reported beaver family abundance as ranging from 0.31 to 1.5 families per kilometer of stream, which converts to 0.5 to 2.4 families per mile of stream. Densities in terms of families per square kilometer have been reported to range from 0.15 to 3.9 (Novak 1987), which is the same as 0.24 to 6.3 per square mile. Novak (1987) indicates that rates of beaver populations are density dependent, which means that rates of increase generally occur as a population is reduced and become less as a population increases toward its carrying capacity[13]. This natural function of most wildlife populations helps to mitigate population reductions. Logan et al. (1996) indicated that wildlife populations being held at a level below carrying capacity could sustain a higher level of harvest because of the compensatory mechanisms that cause higher rates of increase in such populations.

Beaver have a relatively low biotic potential due to their small litter size and a long juvenile development period. Population matrix models showed that survival of kits (1st year juveniles) and yearlings (2nd year juveniles) is the most critical factor in population viability. Survival of those age classes is partly dependent on the ability of beaver to successfully disperse and re-colonize habitats. Beaver are strong dispersers, and populations can recover quickly from local reductions when dispersal corridors are maintained (Boyle and Owens 2007).

Coyotes, black bears, bobcats, fishers (*Mustela pennanti*), red fox, river otters, mink, and large raptors such as hawks and owls have been documented preying on beaver (Tesky 1993, Baker and Hill 2003, Jackson and Decker 2004). With the exception of coyote, bear, and bobcat predation, most predation likely occurs to kits, yearlings, and young adults. With little exception, those predator species do not appear to exert significant predation pressure on beaver populations (Baker and Hill 2003).

The current population of beaver in the State is unknown. Beaver population estimates are often derived from density estimates for beaver based on the number of beaver colonies per a linear unit of measure (*e.g.*, stream miles) or per unit of area (*e.g.*, habitat) (Baker and Hill 2003). Beaver densities specific to Florida are currently unavailable. Beaver densities by habitat calculated from other studies in the United States and Canada have ranged from 0.4 beaver colonies per square mile to a high of 12 beaver colonies per square miles (Novak 1987). Density estimates in the United States and Canada based on stream miles have ranged from 0.5 beaver colonies per stream mile to two beaver colonies per stream mile (Novak 1987). To derive a population estimate, the number of beaver per colony must also be known. Currently, the average number of beaver per colony in Florida is currently unknown. From other studies, the average size of beaver colonies has ranged from 3.2 beaver to 9.2 beaver per colony (Novak 1987). In the southeastern United States, the average number of beaver per colony in Alabama was estimated at 4.6 beaver (Wilkinson 1962) and the average beaver per colony in Georgia was estimated at 5.3 beaver (Parrish 1960). There are over 7.5 million acres of freshwater wetlands in Florida along with 51,858 miles of rivers and streams in the State (FDEP 2008).

Using the lowest beaver colony density per linear measure derived from other studies of 0.5 beaver per stream mile and using the assumption that only 25% of the stream miles in Florida are suitable beaver habitat and occupied by beaver colonies, a statewide population of beaver in the State using the lowest calculated number of beaver per colony of 4.6 beaver in the southeastern United States, a statewide population of beaver inhabiting rivers and streams could be estimated at over 30,000 beaver. Of the

[13]Carrying capacity is the maximum number of animals that the environment can sustain and is determined by the availability of food, water, cover, and the tolerance of crowding by the species in question.

51,858 miles of streams and rivers in the State, 2,956 miles are considered intermittent streams where water is not present throughout the year. Using only those river miles with water present throughout the year, a beaver population in the State could be estimated at 28,000 beaver using the lowest densities of colonies and the lowest number of beaver per colony.

The actual statewide population of beaver is likely larger than 28,000 beaver since the population estimate was only based on perennial stream miles using the lowest density information and did not include beaver that could inhabit other aquatic habitats or create their own habitats by impounding water in areas associated with water runoff or storage (*e.g.*, drainage ditches, irrigation canals, storm water storage facilities). Beaver occupying only 25% of the streams and rivers was used since beaver do not inhabit the entire state and the percentage of rivers and streams occurring in that portion of the State where beaver occur is unknown. However, similar to the other furbearing species, the population estimate for beaver was determined to provide a minimum population estimate to evaluate the magnitude of the proposed take by WS to alleviate or prevent damage.

The authority for management of resident wildlife species in Florida, including beaver, is the responsibility of the FWC. The FWC collects and compiles information on beaver population trends and take, and uses this information to manage beaver populations in the State. The primary tool for the management of beaver populations in Florida is through adjusting the allowed lethal take during the trapping season in the State, which is determined and regulated by the FWC. When beaver are causing damage or about to cause damage, beaver can be taken without a permit during anytime of the year. The FWC, with management authority over beaver, currently allows beaver to be harvested in the State during a continuously open season with no limit on the number of beaver that can be harvested (FWC 2012).

From FY 2006 through FY 2011, WS lethally removed 583 beaver to alleviate damage or threats of damage, which is an average of 98 beaver removed annually by WS. The highest level of lethal take by WS occurred during FY 2009 when 192 beaver were lethally removed to alleviate damage or threats of damage. Based on the number of requests received previously by WS and in anticipation of additional efforts to alleviate damage, WS could lethally remove up to 250 beaver annually under all damage management activities.

As stated previously, beaver can also be harvested annually during continuously open hunting and trapping seasons with no limit on the number of beaver that can be harvested. In addition, beaver can be lethally removed at any time to alleviate damage or threats of damage. The number of beaver harvested in the State and lethally removed to alleviate damage is currently unknown. The FWC allowing beaver to be lethally removed at any time throughout the year with no limit on the number of beaver that can be harvested or removed to alleviate damage provides an indication that population levels in the State are sufficient to sustain the level of harvest occurring and that overharvest is not likely to occur. An allowable harvest level for beaver has been estimated at 30% of the population (Novak 1987).

Based on a statewide population estimated at 28,000 beaver, the annual take by WS of up to 250 beaver would represent 0.9% of the population. As indicated previously, the actual statewide population of beaver is likely much larger than 28,000 beaver since the population estimate was only based on perennial stream miles using the lowest density information. Therefore, the proposed take of up to 250 beaver annually by WS is likely a much lower percentage of the actual statewide population.

Under the proposed action alternative, WS could also be requested to breach or remove beaver dams to alleviate or prevent flooding damage. In addition, WS could be requested to install devices to control the water flow through dams to alleviate flooding or install exclusion devices to prevent damming. WS would only utilize manual methods (*e.g.*, hands and hand tools) to breach dams. To remove dams, WS could also use manual methods. When dams were breached or removed, the building material used to create the dam (*e.g*., sticks, logs, and other vegetative matter) would be discarded on the bank or would be released to flow downstream. Mud and small materials, such as bark and other plant debris, could also escape downstream and would tend to settle out within a short distance of the dam. Small to medium limbs, along with sediments, may drift further distances downstream. Dam breaching and removal would generally be conducted in conjunction with the removal of beaver responsible for constructing the dam since beaver would likely repair and/or rebuild dams quickly if dams were breached or removed prior to the beaver being removed. Therefore, the removal or breaching of beaver dams would not adversely affect beaver populations in the State since those activities would be conducted in association with removing beaver from the site; therefore, the take would be included in the estimated annual take levels of beaver addressed previously.

Wildlife Disease Surveillance and Monitoring

The ability to efficiently conduct surveillance for and detect diseases is dependent upon rapid detection of the pathogen if it is introduced. Effective implementation of a surveillance system would facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It would also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups.[14]

Under disease sampling strategies that could be implemented to detect or monitor diseases in the United States, WS' implementation of those sampling strategies would not adversely affect mammal populations in the State. Sampling strategies that could be employed involve sampling live-captured mammals that could be released on site after sampling occurs. The sampling (*e.g.*, drawing blood, tissue sample, fecal sample) and the subsequent release of live-captured mammals would not result in adverse effects since those mammals are released unharmed on site. In addition, sampling of sick, dying, or hunter harvested mammals would not result in the additive lethal take of mammals that would not have already occurred in the absence of a disease sampling program. Therefore, the sampling of mammals for diseases would not adversely affect the populations of any of the mammals addressed in this EA nor would result in any take of mammals that would not have already occurred in the absence of disease sampling (*e.g.*, hunter harvest).

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

Mammal populations in the State would not be directly impacted by WS from a program implementing technical assistance only. However, persons experiencing damage or threats from mammals may implement methods based on WS' recommendations. Under a technical assistance only alternative, WS would recommend and demonstrate for use both non-lethal and lethal methods legally available for use to resolve mammal damage. Methods and techniques recommended would be based on WS' Decision Model using information provided from the requestor or from a site visit. Requestors may implement WS' recommendations, implement other actions, seek assistance from other entities, or take no action. However, those people requesting assistance would likely be those persons that would implement damage abatement methods in the absence of WS' recommendations.

Under a technical assistance only alternative, those persons experiencing threats or damage associated with mammals in the State could lethally take mammals despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of mammals lethally taken would likely be similar to the other alternatives since take could occur through the issuance of a permit by the FWC, take of non-native mammal species could occur without the need for a permit from the FWC, and take

[14]Data collected by organizations/agencies conducting research and monitoring will provide a broad species and geographic surveillance effort.

would continue to occur during the harvest season for those species. WS' participation in a management action would not be additive to an action that would occur in the absence of WS' participation.

With the oversight of the FWC, it is unlikely that mammal populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and therefore, direct operational assistance could be provided by other entities, such as the FWC, private entities, and/or municipal authorities. If direct operational assistance was not available from WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (White et al. 1989, USFWS 2001, FDA 2003).

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not conduct damage management activities in the State. WS would have no direct involvement with any aspect of addressing damage caused by mammals and would provide no technical assistance. No take of mammals by WS would occur under this alternative. Mammals could continue to be lethally taken to resolve damage and/or threats occurring either through permits issued by the FWC, during the regulated hunting or trapping seasons, or in the case of non-native species, take can occur anytime using legally available methods. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Local mammal populations could decline, stay the same, or increase depending on actions taken by those persons experiencing mammal damage. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of mammals out of frustration or ignorance. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in lethal take levels similar to the proposed action.

Since mammals could still be taken under this alternative, the potential effects on the populations of those mammal species in the State would be similar to the other alternatives for this issue. WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct mammal damage management activities without WS' direct involvement. Therefore, any actions to resolve damage or reduce threats associated with mammals could occur by other entities despite WS' lack of involvement under this alternative.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

As discussed previously, a concern is often raised about the potential impacts to non-target species, including T&E species, from the use of methods to resolve damage caused by mammals. The potential effects on the populations of non-target wildlife species, including T&E species, are analyzed below.

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

The potential for adverse effects to non-targets occurs from the employment of methods to address mammal damage. Under the proposed action, WS could provide both technical assistance and direct operational assistance to those people requesting assistance. The risks to non-targets from the use of non-lethal methods, as part of an integrated direct operational assistance program, would be similar to those risks to non-targets discussed in the other alternatives.

Personnel from WS would be experienced with managing wildlife damage and would be trained in the employment of methods, which would allow WS' employees to use the WS Decision Model to select the most appropriate methods for taking targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target wildlife, WS would employ the most selective methods for the target species, would employ the use of attractants that were as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. SOPs to prevent and reduce any potential adverse impacts on non-targets are discussed in Chapter 3 of this EA. Despite the best efforts to minimize non-target exposure to methods during program activities, the potential for WS to disperse or lethally take non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that were not the primary reason the exclusion was erected; therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded was large enough. The use of auditory and visual dispersal methods to reduce damage or threats caused by mammals would also likely disperse non-targets in the immediate area the methods were employed. Therefore, non-targets may be permanently dispersed from an area while employing non-lethal dispersal techniques. However, like target species, the potential impacts on non-target species would likely be temporary with target and non-target species often returning after the cessation of dispersal methods.

Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage would be intended to elicit fright responses in wildlife. When employing those methods to disperse or harass target species, any non-targets near methods when employed would also likely be dispersed from the area. Similarly, any exclusionary device constructed to prevent access by target species could also exclude access to non-target species. The persistent use of non-lethal methods would likely result in the dispersal or abandonment of those areas where non-lethal methods were employed of both target and non-target species. Therefore, any use of non-lethal methods would likely elicit a similar response from both non-target and target species. Although non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods can restrict or prevent access of non-targets to beneficial resources. However, non-lethal methods would not be employed over large geographical areas and those methods would not be applied at such intensity levels that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods would generally be regarded as having minimal impacts on overall populations of wildlife since individuals of those species were unharmed. Overall, the use of non-lethal methods would not adversely affect populations of wildlife since those methods would often be temporary.

Only those repellents registered with the EPA pursuant to the FIFRA and the FDAC would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for mammals pose a very low risk to non-targets when exposed to or when ingested.

Other non-lethal methods available for use under this alternative would include live traps, nets, and repellents. Live traps and nets restrain wildlife once captured; therefore, those methods would be considered live-capture methods. Live traps would have the potential to capture non-target species. Trap and net placement in areas where target species were active and the use of target-specific attractants would likely minimize the capture of non-targets. If traps and nets were attended to appropriately, any non-targets captured could be released on site unharmed.

Chemical repellents would also be available to reduce mammal damage. WS may recommend or employ commercially available repellents when providing technical assistance and direct operational assistance. Only those repellents registered with the EPA pursuant to the FIFRA and registered with the FDACS would be recommended or used by WS under this alternative. The active ingredients in many commercially available repellents are naturally occurring substances (*e.g.*, capsaicin, fish oil, whole egg solids), which are often used in food preparation (EPA 2001). When used according to label instructions, most repellents would be regarded as safe since 1) they are not toxic to animals, if ingested; 2) there is normally little to no contact between animals and the active ingredient, and 3) the active ingredients are found in the environment and degrade quickly (EPA 2001). Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for mammals pose a very low risk to non-targets when exposed to or when ingested.

Exposure of non-target wildlife to GonaCon™ could occur primarily from secondary hazards associated with wildlife consuming deer that have been injected with GonaCon™. Since GonaCon™ would be applied directly to deer through hand injection after the animal was live-captured and restrained, the risk of directly exposing non-target wildlife to GonaCon™ while being administered to deer would be nearly non-existent. Several factors inherent with GonaCon™ reduce risks to non-target wildlife from direct consumption of deer injected with the vaccine (EPA 2009). The vaccine itself and the antibodies produced by the deer in response to the vaccine are both proteins, which if consumed would be broken down by stomach acids and enzymes (EPA 2009, USDA 2010). The EPA determined that the potential risks to non-target wildlife from the vaccine and the antibodies produced by deer in response to the vaccine "*...are not expected to exceed the Agency's concern levels*" (EPA 2009).

Potential impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal take would occur. Non-lethal methods would be available under all the alternatives analyzed; however, the use of Gonacon™ would be restricted to use by the FWC or persons under their supervision under Alternative 2, if registered. WS' involvement in the use of or recommendation of non-lethal methods would ensure the potential impacts to non-targets were considered under WS' Decision Model. Potential impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

WS could also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage, when those methods were deemed appropriate for use using the WS Decision Model. Lethal methods available for use to manage damage caused by mammals under this alternative would include the recommendation of take during hunting and/or trapping seasons, shooting, body-gripping traps, cable restraints, rodenticides, euthanasia chemicals, and euthanasia after live-capture. Available methods and the application of those methods to resolve mammal damage is further discussed in Appendix B.

The use of firearms would essentially be selective for target species since animals would be identified prior to application; therefore, no adverse impacts would be anticipated from use of this method. Similarly, the use of euthanasia methods would not result in non-target take since identification would occur prior to euthanizing an animal.

Zinc phosphide is a toxicant used to kill rodents, lagomorphs, and nutria. Zinc phosphide is two to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Hill and Carpenter 1982, Johnson and Fagerstone 1994). Risks would be minimal based on: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (*i.e*., causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Johnson and Fagerstone 1994). Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals.

Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siegfried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from the consumption of grain treated with zinc phosphide or, for scavenging bird species, from eating poisoned rodents. Use of rolled oats instead of whole grain also appears to reduce bird acceptance of bait. Uresk et al. (1988) reported on the effects of zinc phosphide on six non-target rodent populations. Uresk et al. (1988) determined that no differences were observed from pretreatment until after treatment in populations of eastern cottontail rabbits and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by non-target wildlife could occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse populations in areas treated with zinc phosphide; however, the effect was not statistically significant because of high variability in densities and the reduction was not long-term (Deisch et al. 1990).

Ramey et al. (2000) reported that five weeks after treatment, no ring-necked pheasants (*Phasianus colchicus*) had been killed because of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect non-target populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground-feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poisoned grain remaining for their consumption was low (*i.e*., bait was accepted by prairie dogs before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide.

Reduced impacts on birds associated with the use of zinc phosphide have also been reported by Tietjen and Matschke (1982). Deisch et al. (1989) reported on the effect zinc phosphide has on invertebrates. Deisch et al. (1989) determined that zinc phosphide bait reduced ant densities; however, spider mites, crickets, wolf spiders, ground beetles, darkling beetles and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Deisch 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the population of insects that were sampled (Deisch et al. 1989). Long-term effects were not directly related to rodenticides, but more to habitat changes (Deisch 1986) as vegetative cover and prey diversity increased without prairie dogs grazing and clipping the vegetation (Deisch et al. 1989). In addition, zinc phosphide treated baits would be placed underground or used in bait stations. The application of baits below ground or in bait stations would limit the direct exposure risks by most non-target species.

Use of zinc phosphide on various types of fruit, vegetable, or cereal baits (*e.g.*, apples, carrots, sweet potatoes, oats, barley) has proven to be effective at suppressing target wildlife populations. All chemicals that could be used by WS would be registered under the FIFRA and administered by EPA and the FDACS. Specific bait applications would be designed to minimize non-target hazards (Evans 1970). WS' personnel that use chemical methods would be certified as pesticide applicators by the FDACS and would be required to adhere to all certification requirements set forth in FIFRA and the Florida pesticide control laws and regulations. No chemicals would be used on federal or private lands without authorization from the land management agency or property owner/manager.

Anticoagulant rodent baits with brodifacoum or diphacinone as active ingredients could be used in bait stations to target small rodents. WS could utilize locking bait stations to restrict access of non-target species to rodenticides, such as anticoagulants. The use and proper placement of bait stations would minimize the likelihood that the bait would be consumed by non-target species. There may be secondary hazards from anticoagulant baits. Those risks are reduced somewhat by the fact that the predator scavenger species would usually need exposure to multiple carcasses over a period of days. Areas where anticoagulants could be used would be monitored and carcasses picked up and disposed of in accordance with label directions.

While every precaution would be taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by mammals, the use of such methods could result in the incidental lethal take of unintended species. The unintentional take and capture of wildlife species during damage management activities conducted under the proposed action alternative would primarily be associated with the use of body-gripping traps and cable restraints, and in some situations, with live-capture methods, such as foothold traps and cage traps. The unintentional lethal take of non-targets by WS from FY 2006 through FY 2011 is shown in Table 4.1 while those non-targets live-captured and released unharmed are shown in Table 4.2.

In total, WS has lethally removed 37 non-targets unintentionally during damage management activities conducted from FY 2006 through FY 2011. The species with the highest level of take were river otters, which were primarily lethally taken during damage management activities targeting beaver. WS has lethally removed 10 river otters as non-targets between FY 2006 and FY 2011, which is an average of two otter per year. Of those species lethally removed by WS as non-targets, red fox, gray fox, opossum, otter, raccoons, deer, and bobcats are also known to cause damage and could be addressed to alleviate damage or threats of damage by WS when requested under the proposed action alternative.

Table 4.1 – WS' lethal non-target take by species in Florida from FY 2006 through FY 2011

Species	Fiscal Year						Total
	2006	2007	2008	2009	2010	2011	
Red Fox	0	0	0	0	2	1	**3**
Gray Fox	0	0	0	0	0	1	**1**
Virginia Opossum	0	0	2	0	4	1	**7**
River Otter	4	5	1	0	0	0	**10**
Raccoons	1	0	0	1	1	5	**8**
White-tailed Deer	0	0	0	0	0	1	**1**
Bobcat	0	0	0	0	0	1	**1**
Turtle (Common Snapping)	1	0	0	0	0	0	**1**
American Alligator	0	0	0	0	0	2	**2**
Turkey Vulture	0	0	0	1	0	1	**2**
Wild Turkey	0	0	0	0	0	1	**1**

As shown in Table 4.2, most non-targets captured by WS during damage management activities are live-captured and subsequently released unharmed. The primary species live-captured are opossum, raccoons, and armadillos. Opossum and armadillos are primarily live-captured during activities that target raccoons as part of the ORV program (USDA 2005*b*). Under the ORV program, WS employs cage traps to live-capture raccoons for sampling (USDA 2005*b*). The ORV program and the post-baiting trapping program are further described in the EA addressing those activities (USDA 2005*b*). The capture and limited lethal take that could occur as part of the ORV program and trapping activities are further addressed in the ORV program EA (USDA 2005*b*). However, those non-targets are addressed in this EA to ensure a cumulative evaluation of potential effects on non-target populations occurs from those activities that could be conducted under the proposed action alternative.

Table 4.2 – Non-targets captured and released by WS in Florida from FY 2006 through FY 2011

Species	Fiscal Year						Total
	2006	2007	2008	2009	2010	2011	
Armadillo	14	0	54	1	4	8	**81**
Bobcat	1	1	0	1	0	3	**6**
Feral Cat	0	0	5	5	4	0	**14**
White-tailed Deer	0	0	2	0	0	0	**2**
Gray Fox	2	5	0	0	4	9	**20**
Red Fox	0	0	0	0	4	0	**4**
Mouse	0	0	1	0	0	0	**1**
Virginia Opossum	56	177	842	125	208	175	**1,583**
River Otter	0	0	0	0	2	1	**3**
Rabbit	0	1	3	2	3	2	**11**
Raccoons	0	0	17	63	0	4	**84**
Fox squirrel	1	0	0	0	0	0	**1**
Turtle spp.	4	2	7	0	0	1	**14**
American Alligator	0	0	0	0	0	2	**2**

WS would monitor the take of non-target species to ensure program activities or methodologies used in mammal damage management would not adversely affect non-targets. Methods available to resolve and prevent mammal damage or threats when employed by trained, knowledgeable personnel would be selective for target species. WS would report to the FWC any non-target take to ensure take by WS was considered as part of management objectives established for those species by the FWC. The potential impacts to non-targets would be similar to the other alternatives and would be considered minimal to non-existent.

As discussed previously, the use of non-lethal methods to address damage or threats would generally be regarded as having no impact on a species' population since those individuals addressed using non-lethal methods would be unharmed and no actual reduction in the number of individuals in a species' population occurs. Similarly, the live-capture and release of non-targets would generally be regarded as having no adverse effects on a species' population since those individuals would be released unharmed and no actual reduction in the number of individuals in a population occurs. Therefore, the live-capture and subsequent releasing of non-targets during damage management activities conducted under the proposed action alternative would not result in declines in the number of individuals in a species' population.

The lethal take of non-targets could result in declines in the number of individuals in a population; however, as shown in Table 4.1, the lethal take of non-targets by WS during damage management activities occurs rarely. A total of 37 non-targets have been lethally taken by WS during damage management activities conducted from FY 2006 through FY 2011, which is an average of seven non-targets lethally taken annually by WS. The non-targets taken previously by WS are representative of non-targets that could be lethally taken by WS under the proposed action alternative. Although additional species of non-targets could be lethally taken by WS, take of individuals from any species is not likely to increase substantively above the number of non-targets taken annually by WS during previous damage management activities. In addition, many of the species lethally taken or live-captured from FY 2006 through FY 2011 are also considered target species in this EA and the level of take analyzed for each of those species under Issue 1 includes non-target take that could occur by WS. Therefore, the take of those species is evaluated cumulatively under Issue 1, including take that could occur when a species is considered a target or non-target. WS would continue to monitor activities, including non-target take to ensure the annual take of non-targets does not result in adverse effects to a species' population. All the species lethally taken previously, except turkey vultures and snapping turtles, can be harvested in the State during annual harvest seasons. The take of the turkey vulture in FY 2009 and FY 2011 occurred within permitted levels allowed by depredation permits issued to WS by the United State Fish and Wildlife Service for the take of vultures to alleviate damage. The take of the common snapping turtle in FY 2006 occurred before rule changes prohibiting their take.

While every precaution would be taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by mammals, the use of such methods could result in the incidental take of unintended species. Those occurrences would be rare and should not affect the overall populations of any species under the proposed action.

T&E Species Effects

Special efforts would be made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. SOPs to avoid effects on T&E species are described in Chapter 3 of this EA.

Federally Listed Species - The current list of species designated as threatened and endangered in Florida, as determined by the USFWS and the National Marine Fisheries Services, was reviewed during the development of this EA. Appendix C contains the list of species currently listed in the State along with common and scientific names.

Based on a review of those T&E species listed in the State during the development of the EA, WS determined that activities conducted pursuant to the proposed action would not likely adversely affect those species listed in the State by the USFWS and the National Marine Fisheries Services nor their critical habitats. As part of the development of the EA, WS consulted with the USFWS under Section 7 of the ESA. The USFWS concurred with WS' determination that activities conducted pursuant to the proposed action would not likely adversely affect those species currently listed in the State or their critical habitats (H. Rauschenberger, USFWS pers. comm. 2012).

State Listed Species – The current list of State listed species designated as endangered or threatened by the FWC was reviewed during the development of the EA (see Appendix C). Based on the review of species listed in the State, WS has determined that the proposed activities would not adversely affect those species currently listed by the State. The FWC has concurred with WS' determination for State listed species and WS will follow those recommendations provided during the consultation regarding listed species (B. Gruver, FWC pers. comm. 2012).

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

Under a technical assistance alternative, WS would have no direct impact on non-target species, including T&E species. Methods recommended or provided through loaning of equipment could be employed by those persons requesting assistance. Recommendations would be based on WS' Decision Model using information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize non-target impacts associated with the methods being recommended or loaned. Methods recommended could include non-lethal and lethal methods as deemed appropriate by WS' Decision Model and as permitted by laws and regulations.

The potential impacts to non-targets under this alternative would be variable and based on several factors. If methods were employed, as recommended by WS, the potential impacts to non-targets would likely be similar to the proposed action. If recommended methods and techniques were not followed or if other methods were employed that were not recommended, the potential impacts on non-target species, including T&E species would likely be higher compared to the proposed action.

The potential impacts of harassment and exclusion methods on non-target species would be similar to those described under the proposed action. Harassment and exclusion methods would be easily obtainable and simple to employ. Since identification of targets would occur when employing shooting as a method, the potential impacts to non-target species would likely be low under this alternative.

Those persons experiencing damage from mammals may implement methods and techniques based on the recommendations of WS. The potential for impacts would be based on the knowledge and skill of those persons implementing recommended methods. If those persons experiencing damage do not implement methods or techniques correctly, the potential impacts from providing only technical assistance could be greater than the proposed action. The incorrect implementation of methods or techniques recommended by WS could lead to an increase in non-target take when compared to the non-target take that could occur by WS under the proposed action alternative.

If requestors were provided technical assistance but do not implement any of the recommended actions and take no further action, the potential to take non-targets would be lower when compared to the proposed action. If those persons requesting assistance implement recommended methods appropriately and as instructed or demonstrated, the potential impacts to non-targets would be similar to the proposed action. If WS made recommendations on the use of methods to alleviate damage but those methods were not implemented as recommended by WS or if those methods recommended by WS were used inappropriately, the potential for lethal take of non-targets would likely increase under a technical assistance only alternative. Therefore, the potential impacts to non-targets, including T&E species, would be variable under a technical assistance only alternative.

If non-lethal methods recommended by WS under this alternative were deemed ineffective by those persons requesting assistance, lethal methods could be employed by those persons experiencing damage. Those persons requesting assistance would likely be those persons that would use lethal methods since a damage threshold had been met for that individual requestor that triggered seeking assistance to reduce damage. The potential impacts on non-targets by those persons experiencing damage would be highly variable. People whose mammal damage problems were not effectively resolved by non-lethal control methods would likely resort to other means of legal or illegal lethal control. This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than the proposed action. When those persons experiencing damage caused by wildlife reach a level where assistance does not adequately reduce damage or where no assistance is available, people have resorted to using chemical toxicants that are illegal for use on the intended target species. The illegal use of methods often results in loss of both target and non-target wildlife (White et al. 1989, USFWS 2001, FDA 2003). The use of illegal toxicants by those persons frustrated with the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate take of wildlife species.

The ability to reduce negative impacts caused by mammals to wildlife species and their habitats, including T&E species, would be variable under this alternative. The ability to reduce risks would be based upon the skills and abilities of the person implementing damage management actions. It would be expected that this alternative would have a greater chance of reducing damage than Alternative 3 since WS would be available to provide information and advice on appropriately employing methods and reducing the risk of non-target take.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with damage management activities in the State. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Mammals would continue to be taken under permits issued by the FWC, take would continue to occur during the regulated harvest seasons, and non-native mammal species could continue to be taken without the need for a permit. Risks to non-targets and T&E species would continue to occur from those people who implement damage management activities on their own or through recommendations by the other federal, state, and private entities. Although some risks would occur from those people that implement mammal damage management in the absence of any involvement by WS, those risks would likely be low and would be similar to those risks under the other alternatives.

The ability to reduce negative impacts caused by mammals to other wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

A common concern is the potential adverse effects that methods available could have on human health and safety. The threats to human safety of methods available under the alternatives are evaluated below by each of the alternatives.

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

The cooperator requesting assistance would be made aware through a MOU, cooperative service agreement, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator. Therefore, the cooperator would be made aware of the possible use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods. Cooperators would be made aware by signing an MOU, cooperative service agreement, or other similar document, which would assist WS and the cooperating entity with identifying any risks to human safety associated with methods at a particular location.

Under the proposed action, those methods discussed in Appendix B could be integrated to resolve and prevent damage associated with mammals in the State. WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under the proposed action. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from mammals. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under Alternative 2. Those non-lethal methods that could be used as part of an integrated approach to managing damage, that would be available for use by WS as part of direct operational assistance, would be similar to those risks associated with the use of those methods under the other alternatives.

Lethal methods available under the proposed action would include the use of euthanasia chemicals, body-gripping traps, cable restraints, the recommendation of harvest during hunting and/or trapping seasons, rodenticides, and shooting. Those lethal methods available under the proposed action alternative or similar products would also be available under the other alternatives. None of the lethal methods available would be restricted to use by WS only. Euthanasia chemicals would not be available to the public but those mammals live-captured could be killed using other methods.

WS' employees who conduct activities to manage damage caused by mammals would be knowledgeable in the use of those methods available, the wildlife species responsible for causing damage or threats, and WS' directives. That knowledge would be incorporated into the decision-making process inherent with the WS' Decision Model that would be applied when addressing threats and damage caused by mammals. When employing lethal methods, WS' employees would consider risks to human safety when employing those methods based on location and method. For example, risks to human safety from the use of methods would likely be lower in rural areas that are less densely populated. Consideration would also be given to the location where damage management activities would be conducted based on property ownership. If locations where methods would be employed occur on private property in rural areas where access to the property could be controlled and monitored, the risks to human safety from the use of methods would likely be less. If damage management activities occurred at parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety would increase. Activities would generally be conducted when human activity was minimal (*e.g.*, early mornings, at night) or in areas where human activity was minimal (*e.g.*, in areas closed to the public).

The use of live-capture traps, restraining devices (*e.g.*, foothold traps, some cable restraints), and body-gripping traps have been identified as a potential issue. Live-capture traps available for mammals would typically be walk-in style traps where mammals enter but are unable to exit. Live-traps, restraining devices, and body-gripping traps would typically be set in situations where human activity was minimal to ensure public safety. Those methods rarely cause serious injury and would only be triggered through direct activation of the device. Therefore, human safety concerns associated with live-traps, restraining devices, and body-gripping traps used to capture wildlife, including mammals, would require direct contact to cause bodily harm. Therefore, if left undisturbed, risks to human safety would be minimal. Signs warning of the use of those tools in the area could be posted for public view at access points to increase awareness that those devices were being used and to avoid the area, especially pet owners.

Other live-capture devices, such as cannon nets, pose minor safety hazards to the public since activation of the device would occur by trained personnel after target species were observed in the capture area of the net. Lasers also pose minimal risks to the public since application would occur directly to target species by trained personnel, which would limit the exposure of the public to misuse of the method.

Safety issues related to the misuse of firearms and the potential human hazards associated with the use of firearms were issues identified. To help ensure the safe use of firearms and to increase awareness of those risks, WS' employees who use firearms during official duties are required to attend an approved firearm safety-training course and to remain certified for firearm use, must attend a safety training course in accordance with WS Directive 2.615. As a condition of employment, WS' employees who carry and use firearms are subject to the Lautenberg Domestic Confiscation Law, which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence (18 USC §

922(g)(9)). A safety assessment based on site evaluations, coordination with cooperating and local agencies (if applicable), and consultation with cooperators would be conducted before firearms were deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS would work closely with cooperators requesting assistance to ensure all safety issues were considered before firearms would be deemed appropriate for use. The use of all methods, including firearms, would be agreed upon with the cooperator to ensure the safe use of those methods. The security of firearms would also occur pursuant to WS Directive 2.615.

The issue of using chemical methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods could include immobilizing drugs, euthanasia chemicals, reproductive inhibitors, rodenticides, and repellents.

The use of immobilizing drugs would only be administered to mammals that have been live-captured using other methods or administered through injection using a projectile (*e.g.*, dart gun). Immobilizing drugs used to sedate wildlife would be used to temporarily handle and transport animals to lessen the distress of the animal from the experience. Drug delivery would likely occur on site with close monitoring of the animal to ensure proper care of the animal. Immobilizing drugs would be reversible with a full recovery of sedated animals occurring. Drugs used in capturing and handling wildlife that would be available include ketamine, a mixture of ketamine/xylazine, and telazol. A list and description of immobilizing drugs available for use under the identified alternatives can be found in Appendix B.

If mammals were immobilized for sampling or translocation and released, risks could occur to human safety if harvest and consumption occurred. SOPs employed by WS to reduce risks are discussed in Chapter 3 and in Appendix B. SOPs that would be part of the activities conducted include:

- All immobilizing drugs used in capturing and handling wildlife would be under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and WS.
- As determined on a state-level basis by those veterinary authorities (as allowed by Animal Medicinal Drug Use Clarification Act), wildlife hazard management programs may choose to avoid capture and handling activities that utilize immobilizing drugs within a specified number of days prior to the hunting or trapping season for the target species to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. Ear tagging or other marking of animals drugged and released to alert hunters and trappers that they should contact state officials before consuming the animal.
- Most animals administered immobilizing drugs would be released well before hunting/trapping seasons, which would give the drug time to completely metabolize out of the animals' systems before they might be taken and consumed by people. In some instances, animals collected for control purposes would be euthanized when they are captured within a certain specified time period prior to the legal hunting or trapping season to avoid the chance that they would be consumed as food while still potentially having immobilizing drugs in their systems.

Meeting the requirements of the Animal Medicinal Drug Use Clarification Act should prevent any adverse effects to human health with regard to this issue (see Appendix D).

Euthanizing chemicals would be administered under similar circumstances to immobilizing drugs. Euthanizing chemicals would be administered to animals live-captured using other methods. Euthanasia chemicals would include sodium pentobarbital, potassium chloride, and Beuthanasia-D. Euthanized animals would be disposed of in accordance with WS Directive 2.515; therefore, would not be available for harvest and consumption. Euthanasia of target animals would occur in the absence of the public to further minimize risks, whenever possible.

The recommendation of repellents or the use of those repellents registered for use to disperse mammals in the State could occur under the proposed action as part of an integrated approach to managing mammal damage. Those chemical repellents that would be available to recommend for use or that could be directly used by WS under this alternative would also likely be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. Risks to human safety associated with the use of repellents by WS or the recommendation of repellents by WS is addressed under the technical assistance only alternative (Alternative 2). Risks to human safety would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents were discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

The recommendation of various rodenticides or the use of those rodenticides registered for use to manage rodents in the State could occur under the proposed action as part of an integrated approach to managing damage. Those rodenticides that would be available for use by WS or could be recommended by WS under this alternative would also likely be available under any of the alternatives. Therefore, risks to human safety from the recommendation of rodenticides or the direct use of rodenticides would be similar across all the alternatives. WS' involvement, either through recommending the use of rodenticides or their direct use, would ensure that label requirements of these rodenticides would be discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of rodenticides could be lessened through WS' participation.

Due to the classification of GonaCon™ as a restricted-use pesticide by the EPA, this product would be restricted to use by federal or state agencies that have successfully completed the requirements of the FDACS for the purchase and application of restricted-use pesticides. Risks to human safety would be limited primarily to the actual applicator due to the necessity to capture and inject GonaCon™ into each animal to be vaccinated. During the development of this EA, GonaCon™ was not registered for use in Florida; therefore, GonaCon™ would not available for use within the State. However, this product could be registered for use in Florida and could be administered by FWC or their agents under any of the alternatives.

Risks to human safety from the use of GonaCon™ would be minimal and would occur primarily to those persons injecting the deer through accidental self-injection or those persons handling syringes. To reduce the risks of accidental exposure through self-injection, the label of GonaCon™ requires the use of long sleeved shirts, long pants, gloves, socks, and shoes. In addition, injection would only occur after deer had been properly restrained to minimize accidental injection during application to the deer. The label also requires that children be absent from the area during application of the vaccine as well as a warning to women that accidental self-injection could cause infertility. WS' employees who were pregnant would not be involved with handling or injecting of the vaccine.

In addition, human exposure could occur through consumption of deer that were treated with GonaCon™. As was discussed previously, the vaccine and the antibodies produced in response to the vaccine are amino acid proteins that if consumed would be broken down by stomach acids and enzymes, posing no risks to human safety. The vaccine would only be used in localized areas where deer populations had exceeded the biological or social carrying capacity. Those areas would likely be places where hunting was prohibited or restricted (*e.g*., in parks); therefore, the consumption of deer would be unlikely in those areas where the vaccine would be used since hunting would be prohibited or restricted. Deer injected with the vaccine must also be marked for identification, which would allow for placement of warnings to people that could take and consume a treated deer. Based on the use pattern of GonaCon™ and the chemical make-up of the vaccine and the antibodies, the risks to human safety from the use of the vaccine would be extremely low and would occur primarily to the handler (EPA 2009).

The recommendation by WS that mammals be harvested during the regulated hunting and/or trapping season that are established by the FWC would not increase risks to human safety above those risks already inherent with hunting or trapping those species. Recommendations of allowing hunting and/or trapping on property owned or managed by a cooperator to reduce mammal populations, which could then reduce damage or threats, would not increase risks to human safety. Safety requirements established by the FWC for the regulated hunting and trapping season would further minimize risks associated with hunting and trapping. Although hunting and trapping accidents do occur, the recommendation of allowing hunting or trapping to reduce localized populations of mammals would not increase those risks.

All WS' personnel who employ methods would be properly trained in the use of those methods. Training and adherence to directives would ensure the safety of employees applying chemical methods and the safety of the public. SOPs relating to human safety risks are further described in Chapter 3 of this EA. No adverse effects to human safety have occurred from WS' use of methods to alleviate mammal damage in the State from FY 2006 through FY 2011. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low.

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations on the use of methods and the demonstration of methods to resolve damage. WS would only provide technical assistance to those people requesting assistance with mammal damage and threats. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use. Risks to human safety associated with non-chemical methods such as resource management methods (*e.g*., crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, and cage traps could be considered low based on their use profile for alleviating damage associated with wildlife. Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration of those risks, those methods could be used with a high degree of safety.

Under a technical assistance only alternative, the use of immobilizing drugs, euthanasia chemicals, and Gonacon™ would not be available to the public. However, personnel with the FWC or their designated agents could use Gonacon™ under this alternative, if registered. Drugs used in capturing and handling wildlife could be administered under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and other entities, such as the FWC. If cannon nets were recommended, persons employing nets would be present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with rocket nets during ignition and storage of the explosive charges, safety precautions associated with the use of the method, when adhered to, would pose minimal risks to human safety and would primarily occur to the handler. Nets would not be recommended in areas where public activity was high, which would further reduce the risks to the public. Nets would be recommended for use in areas where public access was restricted whenever possible to reduce risks to human safety. Overall, nets would pose minimal risks to the public.

The use of chemical methods that are considered non-lethal would be available under this alternative. Chemical methods available would include repellents. There are few chemical repellents registered for use to manage damage caused by mammals in the State. Most repellents require ingestion of the chemical to achieve the desired affects on target species. Repellents that require ingestion are intended to discourage foraging on vulnerable resources and to disperse mammals from areas where the repellents are applied. Repellents, when used according to label directions, are generally regarded as safe especially when the ingredients are considered naturally occurring. Some risk of exposure to the chemical occurs to the applicator and to others from the potential for drift as the product is applied. Some repellents also have restrictions on whether application can occur on edible plants with some restricting harvest for a designated period after application. All restrictions on harvest and required personal protective equipment would be included on the label and if followed, would minimize risks to human safety associated with the use of those products.

The recommended use of chemical methods that were considered lethal would also be available under this alternative. Lethal chemicals available would consist primarily of those Ready-To-Use toxicants targeting rodents that were available at local hardware stores for use in managing old world rodents. Those toxicants would require no special certification to use and would generally be considered safe when their use occurred in accordance with label directions. Additional lethal chemicals would be available through WS' recommendation to contact private sector wildlife control operators that have received FDACS certification for use of restricted-use pesticides. While those chemicals may not be available to individual landowners, through the use of a private sector wildlife control operator, similar chemical use and mammal damage control could be achieved.

The recommendation by WS that mammals be harvested during the regulated hunting and/or trapping season, which is established by the FWC, would not increase risks to human safety above those risks already inherent with hunting and trapping mammals. Recommendations of allowing hunting or trapping on property owned or managed by a cooperator to reduce local mammal populations, which could then reduce mammal damage or threats would not increase risks to human safety. Safety requirements established by the FWC for the regulated hunting and trapping season would further minimize risks associated with those activities. Although hunting and trapping accidents do occur, the recommendation of allowing hunting or trapping to reduce localized mammal populations would not increase those risks.

The recommendation of shooting with firearms as a method of direct lethal take could occur under this alternative. Safety issues do arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. When used appropriately and with consideration for human safety, risks associated with firearms would be minimal. If firearms were employed inappropriately or without regard to human safety, serious injuries could occur. Under this alternative, recommendations of the use of firearms by WS would include human safety considerations. Since the use of firearms to alleviate mammal damage would be available under any of the alternatives and the use of firearms by those persons experiencing mammal damage could occur whether WS was consulted or contacted, the risks to human safety from the use of firearms would be similar among all the alternatives.

If non-chemical methods were employed according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to the proposed action. If methods were employed without guidance from WS or applied inappropriately, the risks to human safety could increase. The extent of the increased risk would be unknown and variable. Non-chemical methods inherently pose minimal risks to human safety given the design and the extent of the use of those methods.

The cooperator requesting assistance would also be made aware of threats to human safety associated with the use of those methods. SOPs for methods are discussed in Chapter 3 of this EA. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the methods available to alleviate mammal damage could threaten human safety. However, when used appropriately, methods available to alleviate damage would not threaten human safety.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under the no involvement by WS alternative, WS would not be involved with any aspect of managing damage associated with mammals in the State, including technical assistance. Due to the lack of involvement in managing damage caused by mammals, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from mammals from conducting damage management activities in the absence of WS' assistance. The direct burden of implementing permitted methods would be placed on those people experiencing damage or would require those persons to seek assistance from other entities.

Similar to the technical assistance only alternative, Gonacon™, immobilizing drugs, and euthanasia chemicals would not be available under this alternative to the public. However, most rodenticides and repellents would continue to be available to those persons with the appropriate pesticide applicators license. Since most methods available to resolve or prevent mammal damage or threats would be available to anyone, the threats to human safety from the use of those methods would be similar between the alternatives. However, methods employed by those persons not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, would pose minimal risks to human safety.

Issue 4 - Effects on the Socio-cultural Elements of the Human Environment

Another concern often raised is the potential impact the alternatives could have on the aesthetic value that people often regard for mammals. The effects of the alternatives on this issue are analyzed below by alternative.

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

Under the proposed action, methods would be employed that would result in the dispersal, exclusion, or removal of individuals or small groups of mammals to resolve damage and threats. In some instances where mammals were dispersed or removed, the ability of interested persons to observe and enjoy those mammals would likely temporarily decline.

Even the use of exclusionary devices can lead to the dispersal of wildlife if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, the wildlife would likely disperse to other areas where resources would be more vulnerable.

The use of lethal methods would result in temporary declines in local populations resulting from the removal of mammals to address or prevent damage and threats. The goal under the proposed action would be to respond to requests for assistance and to manage those mammals responsible for the resulting damage. Therefore, the ability to view and enjoy mammals would remain if a reasonable effort were made to locate mammals outside the area in which damage management activities were occurring. In most cases, the mammals removed by WS could be removed by the person experiencing damage or removed by other entities if no assistance was provided by WS.

All activities would be conducted where a request for assistance was received and only after the cooperator and WS had signed a cooperative service agreement or similar document. Some aesthetic value would be gained by the removal of mammals and the return of a more natural environment, including the return of native wildlife and plant species that may be suppressed or displaced by high mammal densities.

Since those mammals that could be removed by WS under this alternative could be removed by other entities when a permit had been issued by the FWC, without the need for a permit if the species was unregulated, or during the regulated hunting or trapping seasons, WS' involvement in taking those mammals would not likely be additive to the number of mammals that could be taken in the absence of WS' involvement.

WS' take of mammals from FY 2006 through FY 2011 has been of low magnitude compared to the total mortality and populations of those species. WS' activities would not likely be additive to the mammals that could be taken in the absence of WS' involvement. Although mammals removed by WS would no longer be present for viewing or enjoying, those mammals would likely be taken by the property owner or manager if WS was not involved in the action since take by the property owner or manager could occur under a permit, during the regulated hunting and trapping seasons, or if the mammals were unregulated, take could occur without the need for a permit. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of mammals and the population estimates of those species, WS' mammal damage management activities conducted pursuant to the proposed action would not adversely affect the aesthetic value of mammals. The impact on the aesthetic value of mammals and the ability of the public to view and enjoy mammals under the proposed action would be similar to the other alternatives and would likely be low.

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

If those persons seeking assistance from WS were those persons likely to conduct damage management activities in the absence of WS' involvement, then technical assistance provided by WS would not adversely affect the aesthetic value of mammals in the State similar to Alternative 1. Mammals could be lethally taken under this alternative by those entities experiencing mammal damage or threats, which would result in localized reductions in the presence of mammals at the location where damage was occurring. The presence of mammals where damage was occurring would be reduced where damage management activities were conducted under any of the alternatives. Even the recommendation of non-lethal methods would likely result in the dispersal of mammals from the area if those non-lethal methods recommended by WS were employed by those persons receiving technical assistance. Therefore, technical assistance provided by WS would not prevent the aesthetic enjoyment of mammals since any activities conducted to alleviate mammal damage could occur in the absence of WS' participation in the action, either directly or indirectly.

Under this alternative, the effects on the aesthetic values of mammals would be similar to those addressed in the proposed action. When people seek assistance with managing damage from either WS or another entity, the damage level has often reached an unacceptable economic threshold for that particular person. Therefore, in the case of mammal damage, the social acceptance level of those mammals causing damage has reached a level where assistance has been requested and those persons would likely apply methods or seek those entities that would apply those methods based on recommendations provided by WS or by other entities. Based on those recommendations, methods could be employed by the requestor that would result in the dispersal and/or removal of mammals responsible for damage or threatening safety. If those mammals causing damage were dispersed or removed by those persons experiencing damage based on recommendations by WS or other entities, the potential effects on the aesthetic value of those mammals would be similar to the proposed action alternative. In addition, those persons could contact other entities to provide direct assistance with dispersing or removing those mammals causing damage.

The potential impacts on aesthetics from a technical assistance program would only be lower than the proposed action if those individuals experiencing damage were not as diligent in employing those methods as WS would be if conducting an operational program or if no further action was taken by the requester. If those persons experiencing damage abandoned the use of those methods or conducted no further actions, then mammals would likely remain in the area and available for viewing and enjoying for those persons interested in doing so. Similar to the other alternatives, the geographical area in which damage management activities could occur would not be such that mammals would be dispersed or removed from such large areas that opportunities to view and enjoy mammals would be severely limited.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under the no mammal damage management by WS alternative, the actions of WS would have no impact on the aesthetic value of mammals in the State. Those people experiencing damage or threats from mammals would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations. Mammals could continue to be dispersed and lethally taken under this alternative in the State. Lethal take could continue to occur when permitted by the FWC through the issuance of permits, take could occur during the regulated harvest season, and in the case of non-regulated species, take could occur any time without the need for a permit.

Since mammals would continue to be taken under this alternative, despite WS' lack of involvement, the ability to view and enjoy mammals would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of mammals dispersed or taken since WS' has no authority to regulate take or the harassment of mammals in the State. The FWC with management authority over mammals could continue to adjust all take levels based on population objectives for those mammal species in the State. Therefore, the number of mammals lethally taken annually through hunting and under permits would be regulated and adjusted by the FWC.

Those people experiencing damage or threats could continue to use those methods they feel appropriate to resolve mammal damage or threats, including lethal take or could seeking the direct assistance of other entities. Therefore, WS' involvement in managing damage would not be additive to the mammals that could be dispersed or removed. The impacts to the aesthetic value of mammals would be similar to the other alternatives.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

As discussed previously, a common issue often raised is concerns about the humaneness of methods available under the alternatives for resolving mammal damage and threats. The issues of method humaneness relating to the alternatives are discussed below.

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

Under the proposed action, WS would integrate methods using WS' Decision Model as part of technical assistance and direct operational assistance. Methods available under the proposed action could include non-lethal and lethal methods integrated into direct operational assistance conducted by WS. Under this alternative, non-lethal methods would be used by WS that were generally regarded as humane. Non-lethal methods that would be available include resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), translocation, exclusion devices, frightening devices, reproductive inhibitors, cage traps, foothold traps, nets, immobilizing drugs, and repellents.

As discussed previously, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering.

Some individuals believe any use of lethal methods to resolve damage associated with wildlife is inhumane because the resulting fate is the death of the animal. Others believe that certain lethal methods can lead to a humane death. Others believe most non-lethal methods of capturing wildlife to be humane because the animal is generally unharmed and alive. Still others believe that any disruption in the behavior of wildlife is inhumane. With the multitude of attitudes on the meaning of humaneness and the varying perspectives on the most effective way to address damage and threats in a humane manner, agencies are challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS would be to use methods as humanely as possible to effectively resolve requests for assistance to reduce damage and threats to human safety. WS would continue to evaluate methods and activities to minimize the pain and suffering of methods addressed when attempting to resolve requests for assistance.

Some methods have been stereotyped as "*humane*" or "*inhumane*". However, many "*humane*" methods can be inhumane if not used appropriately. For instance, a cage trap would generally be considered by most members of the public as "*humane*". Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately.

Therefore, the goal would be to effectively address requests for assistance using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of resource management methods, harassment methods, and exclusion devices are regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary.

Although some issues of humaneness could occur from the use of cage traps, foothold traps, reproductive inhibitors, translocation, immobilizing drugs, nets, and repellents, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods would be from injuries to animals while those animals were restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

If mammals were to be live-captured by WS, WS' personnel would be present on-site during capture events or capture devices would be checked at least once in a 24-hour period to ensure mammals captured were addressed timely to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Under the proposed action, lethal methods could also be employed to alleviate or prevent mammal damage and threats, when requested. Lethal methods would include shooting, body-gripping traps, cable restraints, euthanasia chemicals, rodenticides, and the recommendation of take during hunting and/or trapping seasons. In addition, target species live-captured using non-lethal methods could be euthanized by WS. WS' use of lethal control methods under the proposed action would follow those required by WS' directives (see WS Directive 2.505, WS Directive 2.430).

The euthanasia methods being considered for use under the proposed action for live-captured mammals are carbon dioxide, carbon monoxide, gunshot, and barbiturates or potassium chloride in conjunction with general anesthesia. Those methods are considered acceptable methods by the AVMA for euthanasia and the use of those methods would meet the definition of euthanasia (AVMA 2007). The use of carbon dioxide, carbon monoxide, barbiturates, and potassium chloride for euthanasia would occur after the animal had been live-captured and would occur away from public view. Although the AVMA guideline also lists gunshot as a conditionally acceptable method of euthanasia for free-ranging wildlife, there is greater potential the method may not consistently produce a humane death (AVMA 2007). WS' personnel that employ firearms to address mammal damage or threats to human safety would be trained in the proper placement of shots to ensure a timely and quick death.

An issue when dealing with aquatic rodent species is the use of foothold traps to create drowning sets and the humaneness of drowning. There is considerable debate and disagreement among animal interest groups, veterinarians, wildlife professionals, fur trappers, and nuisance wildlife control specialists on this issue. The debate centers on an uncertainty as to whether the drowning animals are rapidly rendered unconscious by high levels of carbon dioxide and thus are rapidly insensitive to distress and pain (Ludders et al. 1999). The inhalation of carbon dioxide at concentrations of 7.5% can increase the pain threshold and higher concentrations can have a rapid anesthetic effect on animals (AVMA 2007). For comparison, room air contains approximately 0.04% carbon dioxide (AVMA 2007).

The AVMA concluded that drowning did not meet the definition of euthanasia (Beaver et al. 2001, AVMA 2007), but provided no literature citations to support this position. Ludders et al. (1999) concluded animals that drowned were distressed because of the presence of high levels of the stress related hormones epinephrine and norepinephrine that were present in their bloodstreams. Ludders et al. (1999) showed death during drowning occurred from hypoxia and anoxia; thus, animals experienced hypoxemia. Ludders et al. (1999) reported carbon dioxide narcosis did not occur in drowning animals until the mercury levels in the arterial blood of animals exceeded 95 millimeters. Therefore, Ludders et al. (1999) also concluded drowning did not meet the definition of euthanasia. This conclusion was based on animals not dying rapidly from carbon dioxide narcosis (Ludders et al. 1999).

Death by drowning in the classical sense is caused by the inhalation of fluid into the lungs and is referred to as "*wet*" drowning (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that all submerged beaver do not die from wet drowning, but die of carbon dioxide induced narcosis, and the AVMA has stated the use of CO_2 is acceptable (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that after beaver were trapped and entered the water, they struggled for two to five minutes, followed by a period of reflexive responses. Andrews et al. (1993) stated that with some techniques that induce hypoxia, some animals have reflex motor activity followed by unconsciousness that is not perceived by the animal. Gilbert and Gofton (1982) stated it is unknown how much conscious control actually existed at this stage and they stated anoxia might have removed much of the sensory perception by five to seven minutes post submersion.

However, Gilbert and Gofton (1982) have been criticized because levels of CO_2 in the blood were not reported (Ludders et al. 1999) and there was insufficient evidence that the beaver in their study were under a state of CO_2 narcosis when they died (letter from V. Nettles, D.V.M., Ph.D., Southeastern Cooperative Wildlife Disease Study, to W. MacCallum, MDFW, June 15, 1998). Adding to the controversy, Clausen and Ersland (1970) did measure CO_2 in the blood for submersed restrained beaver, yet none of the beaver in their study died, so Clausen and Ersland (1970) could not determine if beaver died of CO_2 narcosis. Clausen and Ersland (1970) demonstrated that CO_2 increased in arterial blood while beaver were submersed and CO_2 was retained in the tissues. While Clausen and Ersland (1970) did measure the amounts of CO_2 in the blood of submersed beaver, they did not attempt to measure the analgesic effect of CO_2 buildup to the beaver (letter from V. Nettles, D.V.M., Ph.D., Southeastern Cooperative Wildlife Disease Study, to W. MacCallum, MDFW, June 15, 1998). When beaver are trapped using foothold traps with intent to "*drown*", the beaver are exhibiting a flight response. Gracely and Sternberg (1999) reported that there is stress-induced analgesia resulting in reduced pain sensitivity during fight or flight responses. Environmental stressors that animals experience during flight or fight activate the same stress-induced analgesia (Gracely and Sternberg 1999).

The use of drowning trap sets has been a traditional wildlife management technique in trapping aquatic mammals such as beaver and muskrat. Trapper education manuals and other wildlife damage management manuals written by wildlife biologists recommend drowning sets for foothold traps set for beaver (Howard et al. 1980, Randolph 1988, Bromley et al. 1994, Dolbeer et al. 1994, Miller and Yarrow 1994). In some situations, drowning trap sets are the most appropriate and efficient method available to capture beaver and muskrat. For example, a drowning set attachment should be used with foothold traps when capturing beaver to prevent the animals from injuring themselves while restrained, or from escaping (Miller and Yarrow 1994). Animals that drown die relatively quickly (*e.g.*, within minutes) versus the possible stress of being restrained and harassed by people, dogs, and other wildlife before being euthanized. Drowning sets make the captured animal and trap less visible and prevents injury from the trapped animal (*i.e.*, bites and scratches) to people who may otherwise approach a restrained animal. Furthermore, the sight of dead animals may offend some people. Drowning places the dead animal out of public view. Some sites may be unsuitable for body-gripping traps or snares because of unstable banks, deep water, or a marsh with a soft bottom, but those sites would be suitable for foothold traps.

Given the short time period of a drowning event, the possible analgesic effect of CO_2 buildup, the minimal if any pain or distress on drowning animals, the AVMA acceptance of hypoxemia as euthanasia, the AVMA acceptance of a minimum of pain and distress during euthanasia, and the acceptance of catching and drowning muskrats approved by International Humane Trapping Standards (Fur Institute of Canada 2000),WS concludes that drowning, though rarely used by WS, is acceptable. WS recognizes some people would disagree.

Research and development by WS has improved the selectivity and humaneness of management techniques. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods were used in situations where non-lethal damage management methods were not practical or effective. Personnel from WS would be experienced and professional in their use of management methods. Consequently, management methods would be implemented in the most humane manner possible. Many of the methods discussed in Appendix B to alleviate mammal damage and/or threats in the State could be used under any of the alternatives by those persons experiencing damage regardless of WS' direct involvement. The only methods that would not be available to those persons experiencing damage associated with mammals would be reproductive inhibitors, immobilizing drugs, and euthanasia drugs. Therefore, the issue of humanness associated with methods would be similar across any of the alternatives since those methods could be employed by other entities in the absence of WS' involvement. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. SOPs that would be incorporated into WS' activities to ensure methods were used by WS as humanely as possible are listed in Chapter 3.

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

The issue of humaneness of methods under this alternative would be perceived to be similar to humaneness issues discussed under the proposed action. This perceived similarity would be derived from WS' recommendation of methods that some people may consider inhumane. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requester employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to the proposed action. Under Alternative 2, WS would recommend the use of euthanasia methods pursuant to WS Directive 2.505. However, the person requesting assistance would determine what methods to use to euthanize or kill a live-captured animal under Alternative 2.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target mammal species and to ensure methods were used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of mammals or improperly identifying the damage caused by mammals along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of being perceived as inhumane. In those situations, the potential for pain and suffering would likely be regarded as greater than discussed in the proposed action.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not be involved with any aspect of mammal damage management in Florida. Those people experiencing damage or threats associated with mammals could continue to use those methods legally available. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the public to use to resolve damage and threats caused by mammals. Under Alternative 3, euthanasia or killing of live-captured animals would also be determined by those persons employing methods to live-captured wildlife.

Issue 6 - Effects of Mammal Damage Management Activities on the Regulated Harvest of Mammals

The populations of several of the mammal species addressed in this assessment are sufficient to allow for annual harvest seasons that typically occur during the fall. Hunting and trapping seasons are established by the FWC. Those species addressed in this EA that have established hunting and/or trapping seasons include beaver, bobcats, coyotes, eastern cottontails, feral swine, raccoons, river otters, striped skunks, spotted skunks, opossum, and deer. Beaver, coyotes, raccoons, skunks, feral swine, and opossum can be harvested throughout the year in the State, with no limit on the number that can be harvested. Rabbits can also be harvested throughout the year; however, daily and possession limits occur for rabbits. For many mammal species considered harvestable during a hunting and/or trapping season, the estimated number of mammals harvested during the season could be reported by the FWC in published reports.

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

The magnitude of lethal take addressed in the proposed action would be low when compared to the mortality of those species from all known sources. When WS' proposed take of mammals was included as part of the known mortality of those species and compared to the estimated populations, the impact on those species' populations was below the level of removal required to lower population levels.

With oversight of mammal populations by the FWC, the number of mammals allowed to be taken by WS would not limit the ability of those persons interested to harvest those mammal species during the regulated season. All take by WS would be reported to the FWC annually to ensure take by WS was incorporated into population management objectives established for mammal populations. Based on the limited take proposed by WS and the oversight by the FWC, WS' take of mammals annually would have no effect on the ability of those persons interested to harvest mammals during the regulated harvest season.

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

Under the technical assistance only alternative, WS would have no direct impact on mammal populations in the State. If WS recommended the use of non-lethal methods and those non-lethal methods were employed by those persons experiencing damage, mammals would likely be dispersed from the damage area to areas outside the damage area, which could serve to move those mammals from those less accessible areas to places accessible to hunters. Although lethal methods could be recommend by WS under a technical assistance only alternative, the use of those methods could only occur after the property owner or manager received a permit from the FWC or when considered a non-regulated species, could be removed at any time using legally available methods. Lethal take could also occur during the annual hunting and trapping season in areas where those activities were permitted. WS' recommendation of lethal methods could lead to an increase in the use of those methods. However, the number of mammals allowed to be taken under a permit and during the regulated hunting/trapping seasons would be determined by the FWC. Therefore, WS' recommendation of the use of lethal methods under this alternative would not limit the ability of those persons interested in harvesting mammals during the regulated season since the FWC determines the number of mammals that may be taken during the hunting/trapping season and under permits.

Alternative 3 – No Mammal Damage Management Conducted by WS

WS would have no impact on the ability to harvest mammals under this alternative. WS would not be involved with any aspect of mammal damage management. The FWC would continue to regulate populations through adjustments of the allowed take during the regulated harvest season and the continued use of permits.

Issue 7 – Effects of Beaver Dam Manipulation on the Status of Wetlands in the State

Concern has also been expressed regarding the potential effects of the proposed action and the alternatives on wetland ecosystems associated with activities that could be conducted to address beaver damage or threats. Concerns have been raised that removing and/or modifying beaver dams in an area would result in the loss of wetland habitat and the plant and animal species associated with those wetlands. In addition, concerns are often raised regarding the use of lethal methods to remove beaver to alleviate damage or threats. If beaver were lethally removed from an area and any associated beaver dam was removed or breached, the manipulation of water levels by removing/breaching the dam could prevent the establishment of wetlands in areas where water has been impounded by beaver dams for an extended period.

Over time, the impounding of water associated with beaver dams can establish new wetlands. Because beaver dams may involve waters of the United States, the removal of a beaver dam is regulated under Section 404 of the CWA. The United States Army Corps Of Engineers and the EPA regulatory definition of a wetland (40 CFR 232.2) is: "*Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas*."

Although beaver can cause damage to resources, there can be many benefits associated with beaver and beaver activities. Beaver can provide ecological benefits associated with the creation of wetland habitats (Munther 1982, Wright 2002, Rossell et al. 2005, Bergman et al. 2007, Pollock 2007, Fouty 2008*a*, Fouty 2008*b*, Hood and Bayley 2008). Beaver can also provide aesthetic and recreational opportunities for wildlife observation (Wade and Ramsey 1986, Ringleman 1991), improve water quality (Muller-Schwarze and Sun 2003), and provide cultural and economic gains from fur harvest (Hill 1976, McNeely 1995, Lisle 1996, Lisle 2003).

Beaver impoundments can increase surface and groundwater storage, which can help reduce problems with flooding by slowing the downstream movement of water during high-flow events and help to mitigate the adverse effects of drought (Fouty 2008*a*, Hey and Phillips 1995, Naiman et al. 1988, Wade and Ramsey 1986). Hood and Bayley (2008) determined that the presence of beaver could help reduce the loss of open water wetlands during warm, dry years. The presence of active beaver lodges accounted for over 80% of the variability in the amount of open water present in the mixed-wood boreal region of east-central Alberta (Hood and Bayley 2008). Hood and Bayley (2008) also found temperature and rainfall influenced the amount of open-water wetlands, but to a much lesser extent than the presence of beaver. During wet and dry years, the presence of beaver was associated with a 9-fold increase in open water area over the same areas when beaver were absent. Hood and Bayley (2008) noted that beaver could mitigate some of the adverse effects of global warming through their ability to create and maintain areas of open water. Beaver ponds and associated wetlands can provide a potential water source for livestock, serve as basins for the entrapment of streambed silt and eroding soil (Hill 1982), and help to filter nutrients from the water; thereby, maintaining the quality of nearby water systems (Arner and Hepp 1989).

Beaver may increase habitat diversity by opening forest habitats via dam building and tree cutting, which can result in a greater mix of plant species, and different-aged plant communities (Hill 1982, Arner and Hepp 1989). The creation of standing water, edge habitat, and plant diversity, all in close proximity, can result in excellent habitat for many wildlife species (Jenkins and Busher 1979, Arner and DuBose 1982, Hill 1982, Arner and Hepp 1989, Medin and Clary 1990, Medin and Clary 1991). The wetland habitat that can be created by beaver ponds can be beneficial to some fish (primarily warm water species), reptiles, amphibians, waterfowl, shorebirds, and furbearers such as muskrats, otter, and mink (Arner and DuBose 1982, Naimen et al. 1986, Miller and Yarrow 1994). For example, in Mississippi, beaver ponds over three years in age were found to have developed plant communities valuable as nesting and brood rearing habitat for wood ducks (Arner and DuBose 1982). Reese and Hair (1976) found that beaver pond habitats were highly attractive to a large number of birds throughout the year and that the value of beaver pond habitat to waterfowl was minor when compared to other species of birds (Novak 1987). Beaver ponds can be beneficial to some T&E species. The USFWS estimates that up to 43% of T&E species rely directly or indirectly on wetlands for their survival (EPA 1995).

Under the proposed action alternative, WS could recommend and/or implement methods to manipulate water levels associated with water impounded by beaver dams to alleviate flooding damage. If the technical assistance alternative was selected, WS could recommend methods to people requesting assistance that could result in the manipulation of water levels associated with water impounded by beaver dams. WS would not be involved with any aspect of activities associated with beaver dams under the no involvement by WS alternative. Methods that would generally be available under all the alternatives would include exclusion devices, and water flow devices (see Appendix B for additional information). In addition, the use of backhoes or other mechanical methods could be employed by property owners or managers to remove or breach beaver dams under any of the alternatives; however, WS would not operationally employ backhoes or other large machinery to remove or breach dams.

Exclusion devices and water control systems have been used for many years to manipulate the level of water impounded by beaver dams with varying degrees of success (United States General Accounting Office 2001). Landowner management objectives play a role in how the efficacy of a level system is perceived (Nolte et al. 2001). Nolte et al. (2001) found that survey respondents classified pond levelers installed to manage wetlands for waterfowl habitat more successful than levelers installed to provide relief from flooding. Langlois and Decker (2004) reported that "*...very few beaver problems...can actually be solved with a water level control device*" with a 4.5% success rate in Massachusetts and a 3% success rate in New York. Nolte et al. (2001) reported only 50% of installed pond levelers in Mississippi met landowner objectives and found that pond levelers placed in sites with high beaver activity more frequently failed if installed without implementing population control measures. Higher success rates have been reported for newer exclusion and water control systems ranging from 87% to 93% (Callahan 2005, Boyles 2006, Simon 2006, Boyles and Owens 2007). Lisle (2003) reported the use of water control devices or a combination of a Beaver Deceiver™ and flow management device virtually eliminated the need for maintenance and beaver removal at 20 sites where clogged culverts and flooded roads had previously been a routine issue.

When using exclusion and water control systems, those methods must be specifically designed to meet the needs of each site (Langlois and Decker 2004). Consequently, devices installed by inexperienced individuals may have a higher failure rate than those installed by a professional (Lisle 1996, Callahan 2003, Boyles 2006, Simon 2006, Spock 2006). Higher success rates reported for newer exclusion and water control devices may be indicative of increased understanding of the kinds of situations where those devices work best. For example, Callahan (2005) noted that exclusion and water control systems installed at culvert sites were more successful than similar systems installed at freestanding dams. Callahan (2003) and Callahan (2005) also provided a list of sites that were not well suited to the use of exclusion or water control devices. Boyles (2006) and Boyles and Owens (2007) reported some of the highest success rates for newer exclusion and water control systems; however, those devices were only tested at culvert sites.

Beaver build dams to raise water levels to meet their needs for security and access to forage. While pond levelers allow for the retention of some water, if the water level does not meet the needs of the beaver, they may move a short distance upstream or downstream and build a new dam, or abandon the area (Callahan 2003, Langlois and Decker 2004, Clemson University 2006). This may merely result in moving the problem to a new landowner or, depending upon site characteristics, the resulting pond may result in new or increased damage problems for the original landowner. McNeely (1995) reported the most common reasons cited for lack of success of water flow devices were clogging caused by debris or silt and beaver construction of additional dams upstream or downstream of the management device. In a study by Callahan (2005), construction of a new dam upstream or downstream of a pond leveler device was the most common cause of failure for free-standing dams (*e.g.*, dams not associated with a culvert or other similar constriction in water flow, 11 of 156 sites). Callahan (2005) also found that insufficient pipe capacity (6 sites), dammed fencing (2 sites), and lack of maintenance (2 sites) were also causes for pond leveler failures. Nolte et al. (2001) also reported the need to address problems with dams upstream or downstream of a device. At culvert sites, Callahan (2005) found a lack of maintenance was the primary cause of failure with culvert exclusion devices (4 of 227 sites). Callahan (2005) also found vandalism resulted in the failure of a culvert device at one of the sites. At two culvert sites, Callahan (2005) found dammed fencing reduced or completely impeded the operation of exclusion devices.

Most pond levelers and exclusion devices require maintenance. The amount of maintenance required can vary considerably among sites, depending on site conditions and the type of device (Nolte et al. 2001, Callahan 2005, Boyles 2006, Spock 2006). Stream flow, leaf fall, floods, and beaver activity can continuously bring debris to the intake of a water control device. Ice damage and damage from debris washed downstream during high water events may also trigger the need for maintenance (*e.g*., cleaning out the intake pipe). Although most exclusion and water control devices generally require some level of maintenance, there are reports of devices that have remained effective for a period of years with no maintenance (Nolte et al. 2001). Nolte et al. (2001) reported that post-installation maintenance had been performed by property owners or managers on 70% of the 20 successfully operating Clemson pond levels installed by WS in Mississippi. The most common action was to adjust the riser on the pipe to manipulate water levels. Other maintenance included removal of vegetation and secondary dams built after the installation of the devices. In a survey of individuals who had received assistance with exclusion and water control devices, Simon (2006) found 18 of 36 survey respondents reported maintaining their devices, while installation program staff monitored an additional 10 devices. Of those survey respondents, Simon (2006) found that 61% reported that routine maintenance took 15 minutes or less while 93% reported that maintenance took a half hour or less. Boyles (2006) reported that time spent in device maintenance ranged from one to 4.75 hours per year.

Installation and upkeep of water control devices vary from site to site. For example, transporting materials over long distances in difficult terrain to install devices in remote locations where road access is not available could increase costs compared to the ability to transport materials for installation at a culvert site along a roadway. Callahan (2005) reported that the average cost for an exclusion fence at a culvert was $750 with an average annual maintenance cost of approximately $200. Flexible leveler pipe systems cost an average of $1,000 to install and $100 per year in maintenance, while the average cost to install a combination fence and leveler was $1,400 with approximately $150 per year in maintenance (Callahan 2005). Over a ten-year period, Callahan (2005) estimated the cost of installation and annual maintenance would range from $200 to $290 per year depending on the device installed. Spock (2006) reported that exclusion and/or water control device installation cost ranged from < $600 to over $3,000 dollars, with slightly more than half the systems (58.2%) ranging between $600 and $1,000 to install. In many cases, Spock (2006) found the cost included the first year of maintenance. The more expensive installations tended to be extensive fence and leveler systems or systems with numerous leveler pipes (Spock 2006). Boyles (2006) reported that device installation cost an average of $1,349 per device and $3,180 per site with subsequent annual maintenance cost averaging $19.75 per site per year (Boyles 2006). However, unlike the study by Callahan (2005) the devices evaluated by Boyles (2006) had only been in place for a relatively short time (average time in place 15 months, range 6 to 22 months versus average time in place 36.6 months, range 3 to 75 months). The cost of maintenance may vary over time as site conditions change.

Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

Manipulation of water levels associated with water impoundments caused by beaver dams could be addressed by WS under the proposed action using either dam breaching, dam removal, or the installation of water flow devices, including exclusion devices. Those methods allow dams to be breached or removed to maintain the normal flow of water. Heavy equipment, such as backhoes or bulldozers, would not be used by WS to breach, remove, or install water flow devices; although, heavy machinery could be utilized by a cooperator or their agents. WS may utilize small all terrain or amphibious vehicles and/or watercraft for transporting personnel, equipment, and supplies to worksites.

The breaching or removal of dams could be conducted by hand. Breaching would normally be conducted through incremental stages of debris removal from the dam that allows water levels to be gradually lowered. Breaching of dams would normally occur to limit the potential for flooding downstream by gradually allowing water levels to lower as more of the dam was breached over time. Breaching also minimizes the release of debris and sediment downstream by allowing water to move slowly over or through the dam. Depending on the size of the impoundment, water levels could be slowly lowered over several hours or days when breaching dams. When breaching dams, only that portion of the dam blocking the stream or ditch channel would be altered or breached, with the intent of returning water levels and flow rates to historical levels or to a level that eliminates damage threats that would be acceptable to the property owner or resource manager. Similar to breaching dams, the removal of the dam removes the debris impounding water and restores the normal flow of water.

Beaver dams would generally be breached or removed by hand with a rake or power tools (*e.g.*, a winch). In addition to dam breaching and removal, water flow devices and exclusion methods would also be available for WS to employ during direct operational assistance or to recommend during technical assistance. Several different designs of water flow devices and exclusion methods would be available; however, the intent of all those methods would be to lower water levels by allowing water to flow through the beaver dam using pipes and wire mesh. After installation, beaver dams would be left intact with water levels maintained at desired levels by adjusting the water flow device. Water flow devices and exclusion methods allow beaver to remain at the site and maintain the beaver dam.

Although dams could be breached/removed manually, those methods can be ineffective because beaver could quickly repair or replace the dam if the beaver were not removed prior to breaching or removing the dam (McNeely 1995). Damage may be effectively reduced in some situations by installing exclusion and water control devices. Exclusion and water control devices can be designed so that the level of the beaver-created water impoundment can be managed to eliminate or minimize damage from flooding while retaining the ecological and recreational benefits derived from beaver impounding water over time. For example, WS may recommend modifications to site and culvert design (Jensen et al. 1999) as a non-lethal way of reducing problems with beaver dams at culverts.

Manipulating water levels impounded by beaver dams under the proposed action alternative would generally be conducted to maintain existing stream channels and drainage patterns, and to reduce water levels to alleviate flooding. WS could be requested to assist with manipulation of a beaver dam to alleviate flooding to agricultural crops, timber resources, public property, such as roads and bridges, private property, and water management structures, such as culverts. The intent of breaching or removing beaver dams would not be to drain established wetlands. With few exceptions, requests for assistance received by WS from public and private entities would involve breaching or removing dams to return an area to the condition that existed before the dam had been built, or before the impounded water had been affecting the area long enough for wetland characteristics to become established.

Most activities conducted by WS in Florida do not have the potential to affect wetlands, since those activities would not be conducted near or in wetlands. Under this alternative, water levels would be manipulated to return streams, channels, dikes, culverts, and canals to their original function. Most requests to alleviate flooding from impounded water would be associated roads, crops, merchantable timber, pastures, and other types of property or resources that were not previously flooded. Most dams removed would have been created because of recent beaver activity. WS' personnel receive most requests for assistance associated with beaver dams soon after affected resource owners discover damage.

Upon receiving a request to manipulate the water levels in impoundments caused by beaver dams, WS would visually inspect the dam and the associated water impoundment to determine if characteristics exist at the site that would meet the definition of a wetland under section 404 of the Clean Water Act (40 CFR 232.2). If wetland conditions were present at the site, the entities requesting assistance from WS would be notified that a permit might be required to manipulate the water levels impounded by the dam and to seek guidance from the FDEP, the EPA, and/or the United States Corps of Engineers pursuant to State laws and the Clean Water Act. If the area does not already have hydric soils, it usually takes several years for them to develop and a wetland to become established; this often takes greater than 5 years as indicated by the Swampbuster provision of the Food Security Act. Most beaver dam removal by WS would occur under exemptions stated in 33 CFR parts 323 and 330 of Section 404 of the Clean Water Act or parts 3821 and 3822 of the Food Security Act. However, manipulating water levels associated with some beaver dams could trigger certain portions of Section 404 that require landowners to obtain permits from the United States Army Corps of Engineers prior to removing a blockage. WS' personnel would determine the proper course of action upon inspecting a beaver dam impoundment. Appendix D and Appendix E describes the procedures used by WS to assure compliance with the pertinent laws and regulations.

The manipulation of water impoundment levels by WS through dam breaching, dam removal, or installation of water flow devices would typically be associated with dams constructed from recent beaver activity and would not have occurred long enough to take on the qualities of a true wetland (*i.e.* hydric soils, hydrophytic vegetation, and hydrological function). WS' activities associated with beaver dam breaching, beaver dam removal, or the installation of flow control device would only be conducted to restore the normal flow of water through drainages, streams, creeks, canals, and other watercourses where flooding damage was occurring or would occur. Beaver dam breaching or removal would not affect substrate or the natural course of streams.

In the majority of instances, beaver dam removal would be accomplished by manual methods (*i.e*., hand tools). WS' personnel would not utilize heavy equipment, such as trackhoes or backhoes, for beaver dam removal. Only the portion of the dam blocking the stream or ditch channel would be breached or removed. In some instances, WS would install water flow devices to manage water levels at the site of a breached beaver dam. From FY 2006 through FY 2010, WS breached or removed 53 dams during damage management activities associated with beaver. All drams were breached or removed using hand tools. Dams were breached or removed in accordance with exemptions from Section 404 permit requirements established by regulation or as allowed under nationwide permits (NWPs) granted under Section 404 of the Clean Water Act (see Appendix E). The majority of impoundments that WS removed were in existence for only a few months. Those impoundments were not considered wetlands as defined by 40 CFR 232.2; therefore, those impoundments did not possess the same wildlife habitat values as established wetlands.

In those situations where a non-federal cooperator had already made the decision to breach or remove a beaver damage to manipulate water levels with or without WS' assistance, WS' participation in carrying out the action would not affect the environmental status quo.

Additional concern has been raised relating to the lethal removal of beaver by WS or the recommendation of lethal methods to alleviate damage or threats of damage under the proposed action alternative. Beaver lethally removed could be replaced by other beaver requiring additional assistance later. Houston (1995) indicated that beaver tend to reoccupy vacant habitats. The likelihood that a site would be recolonized by beaver varies depending on many factors. For example, removal of beaver and a beaver dam from a relatively uniform section of irrigation canal may resolve the problem for an extended period because the relatively uniform nature of the canal does not predispose a site to repeat problems. Recolonization would also depend on the proximity and density of the beaver population in the surrounding area. Isolated areas or areas with a lower density of beaver would normally take longer for beaver to recolonize than areas with higher beaver densities. Activities conducted under the proposed action would be directed at specific beaver and/or beaver colonies and would not be conducted to suppress the overall beaver population in the State.

In accordance with WS Directive 2.101, preference would be given to non-lethal methods where practical and effective. Although use of exclusion and water control devices could greatly reduce the need for lethal beaver removal, beaver removal may still be needed in some situations even though a flow device or water control system had been installed (Wood et al. 1994, Nolte et al. 2001, Simon 2006, Spock 2006). Callahan (2005) states the trapping of beaver to alleviate damage should occur "...*where a flow device is either not feasible or fails, the water level needs to be drastically lowered, or the landowner wants no beavers or ponds on their property*". Spock (2006) reported that beaver had to be trapped out of one site when an exclusion system was augmented by the installation of a water control device. Lisle (1996) noted that it might be necessary to remove beaver that have learned to dam around exclusion and water control devices. In some instances, trapping during the annual trapping season for beaver continued to occur at or near the area where water control devices were installed but was not prompted by the failure of the devices (Lisle 1996, Simon 2006, Spock 2006).

Exclusion and water control devices may not be the most effective method in specific types of terrain and are not suitable for every site (Wood et al. 1994, Nolte et al. 2001, Langlois and Decker 2004, Callahan 2005). Exclusion devices and water control devices may not be suitable for man-made, uniform channels such as agricultural drainage ditches and irrigation canals; reservoirs; areas where human health, property or safety would be threatened with even minor elevation in water level; and areas where the landowner has expressed zero tolerance for beaver activity on their property (Callahan 2003, Callahan 2005, Simon 2006). Water control devices may be ineffective in beaver ponds in broad, low-lying areas because even a slight increase in water depth can result in a substantial increase in the area flooded (Organ et al. 1996). Exclusion and water control systems would not resolve problems related to beaver construction of bank dens. Depending upon site characteristics, beaver may build bank dens instead of lodges by burrowing into banks, levees, and other earthen impoundments. When bank dens are built in earthen levees or in banks supporting roadways or railroad tracks, they can greatly weaken the earthen structure. Burrowing into embankments can weaken the integrity of impoundments. Burrows allow water to infiltrate embankments, which can allow water to seep through the embankments causing erosion and weakening water impoundments. In those situations, removal of the beaver (either by translocation or by lethal methods) could be the only practical solution to resolve the potential for damage.

Water control devices may also be inappropriate in areas that are managed for aquatic species that need free-flowing water conditions and gravel substrate to survive. The still water and silt that accumulates behind beaver dams can be detrimental to some species. In addition, beaver dams could impede the movement of fish upstream. Avery (2004) found the removal of beaver dams resulted in substantial increases in the stream area where trout could be found. For example, a 9.8-mile treatment zone on the North Branch of the Pemebonwon River in Wisconsin and an additional 17.9 miles of seven tributaries to the treatment section of the river were maintained free of beaver dams since 1986. In 1982, prior to dam removal, wild brook trout were found in only four of the seven tributaries within the treatment zone and at only four of the 12 survey stations. In the spring of 2000, wild brook trout were present in all seven tributaries and at all 12 survey stations (Avery 2004). In some cases, water control devices could be modified to improve fish passage (Close 2003). Although the presence of beaver dams could be detrimental to some species of fish, some fish species may benefit from the presence of a beaver dam (Rossell et al. 2005, Bergman et al. 2007, Pollock et al. 2007).

Although beaver can serve a valuable role in wetland ecology, the presence of beaver dams in intensively managed wetlands could be a concern to property owners or managers. In those areas, man-made water control structures are used to manage the water level in the wetland area in order to maximize habitat value for waterfowl and specific types of wetland-dependent wildlife (USDI 2008). While general elevations or reductions in water levels might conceivably be achieved by installing pipe systems through beaver dams, the devices tend to be more difficult to adjust than the water control structures. More importantly, the primary difficulty comes when drawdowns are used to achieve wetland management objectives. Drawdowns generally involve reducing the water level until large sections of mudflat are exposed. Many plant species valuable to waterfowl and other wetland bird species need exposed mudflats to sprout. Shorebirds use the mudflats to forage for invertebrates (USDI 2008). Once the plants have matured, the water level can be gradually increased until approximately half of the marsh has open water and half has standing plants (USDI 2008). Drawdowns may also be used in fall as a means of eliminating invasive fish (USDI 2008). The extent of the water level reduction conflicts with the beaver's desire for water deep enough to provide protection, and water area of sufficient extent to provide relatively easy access to foraging sites. The extent of the water level reduction during a drawdown would likely increase the risk of new dam creation in other locations that may cause new problems (Callahan 2003).

Alternative 2 – Mammal Damage Management by WS through Technical Assistance Only

The issues regarding the effects on wetlands under this alternative would likely be similar to those issues discussed under the proposed action. This similarity would be based on WS' recommendation of methods to manage damage caused by beaver and the recommendation of methods to manage the water impounded by beaver dams. Based on information provided by the person requesting assistance or based on site visits, WS could recommend that a landowner or manager manipulate beaver dams to reduce flooding damage or threats of damage. WS would not be directly involved with conducting activities associated with the manipulation of beaver dams under this alternative. However, the recommendation of the use of methods would likely result in the requestor employing those methods or employing an agent to employ them. Therefore, by recommending methods and thus a requester employing those methods, the potential for those methods to reduce the presence of impounded water would be similar to the proposed action.

WS could instruct and demonstrate the proper use and placement of flow control and exclusionary devices, as well as recommend the breaching or removal of beaver dams, when appropriate. WS would also assist requestors by providing information on permit requirements and which state agencies need to be contacted by the requester to obtain appropriate permits to manipulate the levels of water impounded by beaver dams.

The efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requester or their agent despite WS' recommendations or demonstration. Therefore, a lack of understanding of the behavior of beaver along with inadequate knowledge and skill in using methodologies to resolve flooding could lead to incidents with a greater probability of unforeseen impacts to wetlands. In those situations, the potential for dam manipulation to adversely affect the status of wetlands would likely to be regarded as greater than those discussed in the proposed action.

WS would recommend the landowner or manager seek and obtain the proper permits to manipulate water levels impounded by beaver dams under this alternative; however, WS would not be responsible for ensuring that appropriate permits were obtained, proper methods were implemented for manipulating water levels, or for reviewing sites for the presence of T&E species. Those responsibilities would be incurred by the property owner/manager and/or their designated agent who may or may not properly follow WS' recommendations.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not be involved with any aspect of managing water levels associated with beaver dam impoundments. Under the no involvement by WS alternative, WS would not be involved with any aspect of managing damage associated with beaver in the State, including technical assistance. Due to the lack of involvement in managing damage caused by beaver, no impacts to wetlands would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage due to flooding from manipulating water levels associated with beaver dams in the absence of WS' assistance. Those methods described previously would be available to other entities to breach or remove dams, including water flow devices. The direct burden of implementing permitted methods would be placed on those persons experiencing damage.

Since the same methods would be available to resolve or prevent beaver damage or threats related to beaver dams, effects on the status of wetlands in the State from the use of those methods would be similar between the alternatives. However, manipulating water levels by those persons not experienced in identifying wetland characteristics or unaware of the requirement to seek appropriate permits to alter areas considered as a wetland, could increase threats to wetlands and the associated flora and fauna.

4.2 CUMULATIVE IMPACTS OF THE PROPOSED ACTION BY ISSUE

Cumulative impacts, as defined by the CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

Under Alternative 1 and Alternative 2, WS would address damage associated with mammals either by providing technical assistance only (Alternative 2) or by providing technical assistance and direct operational assistance (Alternative 1) in the State. WS would be the primary federal agency conducting direct operational mammal damage management in the State under Alternative 1 and Alternative 2. However, other federal, state, and private entities could also be conducting mammal damage management in the State.

WS does not normally conduct direct damage management activities concurrently with such agencies or other entities in the same area, but may conduct damage management activities at adjacent sites within the same period. In addition, commercial companies may conduct damage management activities in the same area. The potential cumulative impacts analyzed below could occur from either WS' damage management program activities over time or from the aggregate effects of those activities combined with the activities of other agencies and private entities. Through ongoing coordination and collaboration between WS and the FWC, activities of each agency and the take of mammals would be available. Damage management activities in the State would be monitored to evaluate and analyze activities to ensure they were within the scope of analysis of this EA.

The activities proposed in the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur because of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

Issue 1 - Effects of Damage Management Activities on Target Mammal Populations

The issue of the effects on target mammal species arises from the use of non-lethal and lethal methods to address the need for reducing damage and threats. Methods employed in an integrated approach to reduce damage and threats are categorized into non-lethal and lethal methods. As part of an integrated approach to managing damage and threats, WS could apply both lethal and non-lethal methods when requested by those persons experiencing damage.

Non-lethal methods can disperse or otherwise make an area unattractive to mammals causing damage; thereby, reducing the presence of mammals at the site and potentially the immediate area around the site where non-lethal methods were employed. Non-lethal methods would be given priority when addressing requests for assistance (see WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model. For example, if a cooperator requesting assistance, had already attempted to disperse mammals using non-lethal harassment methods, WS would not necessarily employ those methods again during direct operational assistance since those methods had already been proven to be ineffective in that particular situation. Non-lethal methods could be used to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse mammals from an area resulting in a reduction in the presence of those mammals at the site where those methods were employed. However, mammals responsible for causing damage or threats would be moved to other areas with minimal impacts occurring to those species' populations. Non-lethal methods would not be employed over large geographical areas or applied at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods would generally be regarded as having minimal impacts on overall populations of wildlife since individuals of those species would be unharmed. The use of non-lethal methods would not have cumulative effects on mammal populations in the State.

Lethal methods could be employed to resolve damage associated with those mammals identified by WS as responsible for causing damage or threats to human safety only after receiving a request and only after a permit had been issued for the take of the species by the FWC, when required. Therefore, the use of lethal methods could result in local population reductions in the area where damage or threats were occurring since target individuals would be removed from the population. Lethal methods would be employed to reinforce non-lethal methods and to remove mammals that have been identified as causing damage or posing a threat to human safety. The use of lethal methods could therefore result in local reductions of mammals in the area where damage or threats were occurring. The number of mammals removed from a species' population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of mammals involved with the associated damage or threat, and the efficacy of methods employed.

WS would maintain ongoing contact with the FWC to ensure activities were within management objectives for those species. WS would submit annual damage management activity reports to the FWC. The FWC would monitor the total take of mammals from all sources and would factor in survival rates from predation, disease, and other mortality data.

WS would monitor take by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take was maintained below the level that would cause undesired adverse effects to the viability of native species populations. The potential cumulative impacts on the populations of target mammal species from the implementation of the proposed action alternative were analyzed for each species in Section 4.1.

Evaluation of activities relative to target species indicated that program activities would likely have no cumulative adverse effects on mammal populations when targeting those species responsible for damage at the levels addressed in this EA. WS' actions would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place. These activities include, but would not be limited to:

- Natural mortality of mammals
- Mortality through vehicle strikes, aircraft strikes, and illegal harvest
- Human induced mortality of mammals through private damage management activities
- Human induced mortality through regulated harvest

- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in wildlife population densities

All those factors play a role in the dynamics of mammal populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. The actions taken to minimize or eliminate damage would be constrained as to scope, duration, and intensity for the purpose of minimizing or avoiding impacts to the environment. WS uses the Decision Model to evaluate damage occurring, including other affected elements and the dynamics of the damaging species; to determine appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

With management authority over mammal populations in the State, the FWC could adjust take levels, including the take of WS, to ensure population objectives for mammals were achieved. Consultation and reporting of take by WS would ensure the FWC considers any activities conducted by WS.

WS' take of mammals in Florida from FY 2006 through FY 2011 was of a low magnitude when compared to the total known take of those species and the populations of those species. The FWC considers all known take when determining population objectives for mammals and could adjust the number of mammals that could be taken during the regulated harvest season and the number of mammals taken for damage management purposes to achieve the population objectives. Any take by WS would occur at the discretion of the FWC. Any mammal population declines or increases would be the collective objective for mammal populations established by the FWC through the regulation of take. Therefore, the cumulative take of mammals annually or over time by WS would occur at the desire of the FWC as part of management objectives for mammals in the State. No cumulative adverse effects on target and non-target wildlife would be expected from WS' damage management activities based on the following considerations:

Historical outcomes of WS' damage management activities on wildlife

Damage management activities associated with mammals would be conducted by WS only at the request of a cooperator to reduce damage that was occurring or to prevent damage from occurring and only after methods to be used were agreed upon by all parties involved. WS would monitor activities to ensure any potential impacts were identified and addressed. WS would work closely with state and federal resource agencies to ensure damage management activities would not adversely affect mammal populations and that WS' activities were considered as part of management goals established by those agencies. Historically, WS' activities to manage mammals in Florida have not reached a magnitude that would cause adverse effects to mammal populations in the State.

SOP built into the WS program

SOPs are designed to reduce the potential negative effects of WS' actions on mammals, and have been tailored to respond to changes in wildlife populations that could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in programs would be defined through SOPs, and implementation would be insured through monitoring, in accordance with the WS' Decision Model (see WS Directive 2.201; Slate et al. 1992).

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

Potential effects on non-target species from conducting mammal damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages. The use of non-lethal methods during activities to reduce or prevent damage caused by mammals has the potential to exclude, disperse, or capture non-target wildlife. However, the effects of non-lethal methods are often temporary and often do not involve the take (killing) of non-target wildlife species. When using exclusion devices and/or repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion and repellents do not involve lethal take, cumulative impacts on non-target species from the use of exclusionary methods or repellents would not occur but would likely disperse those individuals to other areas. Exclusionary methods and repellents can require constant maintenance to ensure effectiveness. Therefore, the use of exclusionary devices and repellents would be somewhat limited to small, high-value areas and not used to the extent that non-targets would be excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources or fawning sites. The use of visual and auditory harassment and dispersion methods would generally be temporary with non-target species returning after the cessation of those activities. Dispersal and harassment do not involve the take (killing) of non-target species and similar to exclusionary methods would not be used to the extent or at a constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species followed by euthanasia also have the potential to affect non-target wildlife through the take (killing) or capture of non-target species. Capture methods used are often methods that would be set to confine or restrain target wildlife after being triggered by a target individual. Capture methods would be employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B are methods that would be employed to confine or restrain wildlife that would be subsequently euthanized using humane methods. With all live-capture devices, non-target wildlife captured could be released on site if determined to be able to survive following release. SOPs are intended to ensure take of non-target wildlife is minimal during the use of methods to capture target wildlife.

The use of firearms and euthanasia methods would essentially be selective for target species since identification of an individual would be made prior to the application of the method. Euthanasia methods would be applied through direct application to target wildlife. Therefore, the use of those methods would not affect non-target species.

All chemical methods would be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals would be stored and transported according with WS' Directives and relevant federal, state, and local regulations. All chemical methods would be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals would be stored and transported according to WS' Directives and relevant federal, state, and local regulations. Chemical methods available for use under the proposed action would include repellents, reproductive inhibitors, rodenticides, immobilizing drugs, and euthanasia chemicals, which are described in Appendix B. Except for repellents that would be applied directly to the affected resource and reproductive inhibitors that would be applied directly to target animals, those chemical methods available for use would be employed using baits that were highly attractive to target species and/or used in areas where exposure to non-targets would be minimal. The use of those methods often requires an acclimation period and monitoring of potential bait sites for non-target activity. All chemicals would be used according to product labels, which would ensure that proper use would minimize non-target threats. WS' adherence to Directives and SOPs governing the use of chemicals would also ensure non-target hazards would be minimal.

Repellents may be used or recommended by the WS program in Florida to manage mammal damage. The active ingredients in numerous commercial repellents are capsaicin, pepper oil, and carnivore urine. Characteristics of these chemicals and potential use patterns indicate that no cumulative impacts related to environmental fate would be expected from their use in WS' programs in Florida when used according to label requirements.

When using rodenticides, as required by WS' SOPs and applicable pesticide labels, all potential bait sites would be pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets were observed feeding on the pre-bait, the areas would be abandoned and no baiting would occur at those locations. Once sites were baited, sites would be monitored to further observe for non-target feeding activity. If non-targets were observed feeding on bait, those sites would be abandoned. WS would retrieve all dead target species to the extent possible following treatment to minimize any secondary hazards associated with or perceived to be associated with scavengers feeding on target species carcasses. When using rodenticides, appropriate bait stations would be utilized and inspected as required by the applicable label.

The amount of chemicals used or stored by WS would be minimal to ensure human safety. All label requirements of repellents and toxicants would be followed to minimize non-target hazards. Based on this information, WS' use of chemical methods, as part of the proposed action, would not have cumulative impacts on non-targets.

The methods described in Appendix B all have a high level of selectivity and could be employed using SOPs to ensure minimal impacts to non-target species. A total of 37 non-target mammals were lethally taken by WS during mammal damage management activities from FY 2006 through FY 2011, while 1,826 animals were live-captured and released unharmed. Most of the species lethally taken as unintentional non-targets were included in take analysis as target species in this EA. The cumulative take of those species, including target and non-target take were evaluated in Chapter 4 of this EA. Based on the methods available to resolve mammal damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those species' populations would occur. Therefore, take under the proposed action of non-targets would not cumulatively affect non-target species. WS' has reviewed the T&E species listed by the FWC, the National Marine Fisheries Services, and the USFWS, and has determined that damage management activities proposed by WS would not likely adversely affect T&E species. Cumulative impacts would be minimal on non-targets from any of the alternatives discussed**.**

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

Non-chemical methods described in Appendix B would be used within a limited period, would not be residual, and do not possess properties capable of inducing cumulative effects on human health and safety. Non-chemical methods would be used after careful consideration of the safety of those persons employing methods and to the public. When possible, capture methods would be employed where human activity was minimal to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed, would have no effect on human safety. All methods would be agreed upon by the requesting entities, which would be made aware of the safety issues of those methods when entering into a MOU, cooperative service agreement, or other comparable document between WS and the cooperating entity. SOPs would also ensure the safety of the public from those methods used to capture or take wildlife. Firearms used to alleviate or prevent damage, though hazards do exist, would be employed to ensure the safety of employees and the public.

Personnel employing non-chemical methods would continue to be trained to be proficient in the use of those methods to ensure the safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods would not cumulatively affect human safety.

Repellents to disperse mammals from areas of application would be available. Repellents must be registered with the EPA according to the FIFRA and with the FDACS. Many of the repellents currently available for use have active ingredients that are naturally occurring and are generally regarded as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents were applied according to label requirements, no effects to human safety would be expected. Similarly, rodenticides must also be registered for use with the EPA and the FDACS. Given the use patterns of repellents and rodenticides, no cumulative effects would occur to human safety.

WS has received no reports or documented any effects to human safety from WS' damage management activities conducted from FY 2006 through FY 2011. No cumulative effects from the use of those methods discussed in Appendix B would be expected given the use patterns of those methods for resolving mammal damage in the State.

Issue 4 - Effects on the Socio-cultural Elements of the Human Environment

The activities of WS would result in the removal of mammals from those areas where damage or threats were occurring. Therefore, the aesthetic value of mammals in those areas where damage management activities were being conducted would be reduced. However, for some people, the aesthetic value of a more natural environment would be gained by reducing mammal densities, including the return of native species that may be suppressed or dispersed by non-native species.

Some people experience a decrease in aesthetic enjoyment of wildlife because they feel that overabundant species are objectionable and interfere with their enjoyment of wildlife in general. Continued increases in numbers of individuals or the continued presence of mammals may lead to further degradation of some people's enjoyment of any wildlife or the natural environment. The actions of WS could positively affect the aesthetic enjoyment of wildlife for those people that were being adversely affected by the target species identified in this EA.

Mammal population objectives are established and enforced by the FWC through the regulation of take during the statewide harvest seasons after consideration of other known mortality factors. Therefore, WS would have no direct impact on the status of mammal populations since all take by WS occurs at the discretion of the FWC. Since those persons seeking assistance could remove mammals from areas where damage was occurring when permitted by the FWC, WS' involvement would have no effect on the aesthetic value of mammals in the area where damage was occurring. When damage caused by mammals has occurred, any removal of mammals by the property or resource owner would likely occur whether WS was involved with taking the mammals or not.

In the wild, few animals in the United States have life spans approaching that of humans. Mortality is high among wildlife populations and specific individuals among a species may experience death early in life. This is a natural occurrence and humans who form affectionate bonds with animals experience loss of those animals over time in most instances. A number of professionals in the field of psychology have studied human behavior in response to attachment to pet animals (Gerwolls and Labott 1994, Marks and Koepke 1994, Zasloff 1996, Archer 1999, Ross and Baron-Sorensen 1998, Meyers 2000). Similar observations were probably applicable to close bonds that could exist between people and wild animals. As observed by researchers in human behavior, normal human responses to loss of loved ones proceed through phases of shock or emotional numbness, sense of loss, grief, acceptance of the loss or what cannot be changed, healing, and acceptance and rebuilding which leads to resumption of normal lives

(Lefrancois 1999). Those who lose companion animals, or animals for which they may have developed a bond and affection, are observed to proceed through the same phases as with the loss of human companions (Gerwolls and Labott 1994, Boyce 1998, Meyers 2000). However, they usually establish a bond with other individual animals after such losses. Although they may lose the sense of enjoyment and meaning from the association with those animals that die or are no longer accessible, they usually find a similar meaningfulness by establishing an association with new individual animals or through other relational activities (Weisman 1991). Through this process of coping with the loss and establishing new affectionate bonds, people may avoid compounding emotional effects resulting from such losses (Parkes 1979, Lefrancois 1999).

Some mammals with which humans have established affectionate bonds may be removed from some project sites by WS. However, other individuals of the same species would likely continue to be present in the affected area and people would tend to establish new bonds with those remaining animals. In addition, human behavior processes usually result in individuals ultimately returning to normalcy after experiencing the loss of association with a wild animal that might be removed from a specific location. WS' activities would not be expected to have any cumulative effects on this element of the human environment.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

WS would continue to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by wildlife. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing humane methods.

All methods not requiring direct supervision during employment (*e.g.*, live traps) would be checked at least once a day or in accordance with Florida laws and regulations to ensure any wildlife confined or restrained were addressed in a timely manner to minimize distress of the animal. All euthanasia methods used for live-captured mammals would be applied according to WS' Directives. Shooting would occur in some situations and personnel would be trained in the proper use of firearms to minimize pain and suffering of mammals taken by this method.

WS would employ methods as humanely as possible by applying SOPs to minimize pain and that allow wildlife captured to be addressed in a timely manner to minimize distress. Through the establishment of SOPs that guide WS in the use of methods to address damage and threats associated with mammals in the State, the cumulative impacts on the issue of method humaneness would be minimal. All methods would be evaluated to ensure SOPs were adequate and that wildlife captured were addressed in a timely manner to minimize distress.

Issue 6 - Effects of Mammal Damage Management Activities on the Regulated Harvest of Mammals

As discussed in this EA, the magnitude of WS' mammal take for damage management purposes from FY 2006 through FY 2011 was low when compared to the total take of mammals and when compared to the estimated statewide populations of those species. Since all take of mammals is regulated by the FWC, take by WS that would occur annually and cumulatively would occur pursuant to mammal population objectives established in the State. WS' take of mammals (combined take) annually to alleviate damage would be a minor component to the known take that occurs annually during the harvest seasons.

The populations of several mammal species are sufficient to allow for annual harvest seasons that typically occur during the fall. Hunting and trapping seasons are established by the FWC. Those species addressed in this EA that have established harvest seasons include beaver, bobcats, coyotes, eastern cottontails, feral swine, raccoons, river otters, striped skunks, spotted skunks, opossum, and deer.

With oversight of mammal take, the FWC maintains the ability to regulate take by WS to meet management objectives for mammals in the State. Therefore, the cumulative take of mammals would be considered as part of the FWC objectives for mammal populations in the State.

Issue 7 – Effects of Beaver Dam Manipulation on the Status of Wetlands in the State

Beaver build dams primarily in smaller riverine streams (intermittent and perennial brooks, streams, and small rivers) and in drainage areas with dams consisting of mud, sticks and other vegetative materials. Their dams obstruct the normal flow of water and typically change the pre-existing hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment. The depth of bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water.

The pre-existing habitat and the altered habitat have different ecological values to the fish and wildlife native to an area. Some species would abound by the addition of a beaver dam, while others would diminish. For example, some fish species require fast moving waters over gravel or cobble beds, which beaver dams can eliminate, thus reducing the habitat's value for these species. In general, it has been found that wildlife habitat values decline around bottomland beaver impoundments because trees are killed from flooding and mast production declines. On the other hand, beaver dams can potentially be beneficial to some species of fish and wildlife such as river otter, neotropical birds, and waterfowl.

If a beaver dam is not breached and water is allowed to stand, hydric soils and hydrophytic vegetation eventually form. This process can take anywhere from several months to years depending on pre-existing conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content. If these conditions are met, then a wetland has developed that would have different wildlife habitat values than an area that has been more recently impounded by beaver dam activity.

The intent of most dam breaching is not to drain established wetlands. With few exceptions, requests from public and private individuals and entities that WS receives involve dam breaching to return an area back to its pre-existing condition within a few years after the dam was created. If the area does not have hydric soils, it usually takes many years for them to develop and a wetland to become established. This often takes greater than five years as recognized by the Swampbuster provisions. Most beaver dam removal by WS is either exempt from regulation under Section 404 of the CWA as stated in 33 CFR Part 323 or may be authorized under the United States Army Corps of Engineers Nationwide Permit System in 33 CFR Part 330.

However, the breaching of some beaver dams can trigger certain portions of Section 404 that require landowners to obtain permits from the United States Army Corps of Engineers. WS' personnel determine the proper course of action upon inspecting a beaver dam impoundment.

It should also be noted that beaver created wetlands are dynamic and do not remain in one state for indefinite periods. Large beaver ponds may eventually fill with sediment and create a beaver meadow. Beaver may be removed from an area due to natural predation or they may abandon an area due to lack of food. Once a dam is abandoned, it is subject to natural decay and damage due to weather. The dam would eventually fail and the wetland would return to a flowing stream or brook. WS' beaver management activities may accelerate or modify these natural processes by removing beaver and restoring or increasing water flow; however, they are generally processes that would occur naturally over time.

Therefore, the activities of WS to manage flooding damage by manipulating beaver dams would not be expected to have any cumulative adverse effects on wetlands in Florida when conducted in accordance with the CWA and the Swampbuster provision of the Food Security Act.

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED

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APPENDIX B

METHODS AVAILABLE FOR RESOLVING OR PREVENTING MAMMAL DAMAGE IN FLORIDA

The most effective approach to resolving wildlife damage problems would be to integrate the use of several methods, either simultaneously or sequentially. An adaptive plan would integrate and apply practical methods of prevention and reduce damage by wildlife while minimizing harmful effects of damage reduction measures on humans, other species, and the environment. An adaptive plan may incorporate resource management, physical exclusion and deterrents, and population management, or any combination of these, depending on the characteristics of specific damage problems.

In selecting damage management techniques for specific damage situations, consideration would be given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of wildlife damage. Consideration would also be given to the status of target and potential non-target species, local environmental conditions and impacts, social and legal aspects, and relative costs of damage reduction options. The cost of damage reduction may sometimes be a secondary concern because of the overriding environmental, legal, and animal welfare considerations. Those factors would be evaluated in formulating damage management strategies that incorporate the application of one or more techniques.

A variety of methods would potentially be available to the WS program in Florida relative to the management or reduction of damage from mammals. Various federal, state, and local statutes and regulations and WS directives would govern WS' use of damage management methods. WS would develop and recommend or implement strategies based on resource management, physical exclusion, and wildlife management approaches. Within each approach there may be available a number of specific methods or techniques. The following methods could be recommended or used by the WS program in Florida. Many of the methods described would also be available to other entities in the absence of any involvement by WS.

Non-chemical Wildlife Damage Management Methods

Non-chemical management methods consist primarily of tools or devices used to repel, capture, or kill a particular animal or local population of wildlife to alleviate damage and conflicts. Methods may be non-lethal (*e.g.*, fencing, frightening devices) or lethal (*e.g.*, firearms, body gripping traps). If WS' personnel apply those methods, a MOU, cooperative service agreement, or other similar document must be signed by the landowner or administrator authorizing the use of each damage management method. Non-chemical methods used or recommended by WS could include:

Exclusion pertains to preventing access to resources through fencing or other barriers. Fencing of small critical areas can sometimes prevent animals that cannot climb from entering areas of protected resources. Fencing of culverts, drainpipes, and other water control structures can sometimes prevent beaver from building dams that plug those devices. Fencing installed with an underground skirt can prevent access to areas for many mammal species that dig, including fox, feral cats, and striped skunks. Areas such as airports, yards, or hay meadows may be fenced. Hardware cloth or other metal barriers can sometimes be used to prevent girdling and gnawing of valuable trees and to prevent the entry of mammals into buildings through existing holes or gaps. Construction of concrete spillways may reduce or prevent damage to dams by burrowing aquatic rodent species. Riprap can also be used on dams and levees to deter muskrat, woodchuck, and other burrowing rodents. Exclusion and one-way devices such as netting or nylon window screening can be used to exclude bats from a building or an enclosed structure (Greenhall and Frantz 1994). Electric fences of various constructions have been used effectively to reduce damage to various crops by deer, raccoons, and other species (Boggess 1994, Craven and Hygnstrom 1994).

Beaver exclusion and the use of water control devices could be recommended or implemented by WS to alleviate flooding damage without removing beaver under the alternatives. Although dams could be breached/removed manually, those methods are usually ineffective because beaver quickly repair or replace the dam (McNeely 1995). Damage may be effectively reduced in some situations by installing exclusion and water control devices. Exclusion and water control devices can be designed so that the level of the beaver-created pond can be managed to eliminate or minimize damage while retaining the ecological and recreational benefits derived from beaver ponds. WS could also recommend that modifications occur to culvert design (Jensen et al. 1999) as a non-lethal way of reducing problems with beaver dams at culverts.

Beaver exclusion generally involves the placement of fencing to prevent beaver from accessing water intake areas, such as culverts. A variety of exclusion systems could be recommended or implemented by WS, including the Beaver Deceiver™, Beaver Bafflers™, and pre-dams (Lisle 1996, Brown and Brown 1999, Lisle 1999, Brown et al. 2001, Partington 2002, Lisle 2003). The Beaver Deceiver™ is a fencing system that is installed to prevent beaver blockage of culverts by minimizing environmental cues that stimulate beaver to construct dams, and by making culverts less attractive as dam construction sites (Lisle 1996, Lisle 1999, Lisle 2003). Beaver can be deterred from blocking culverts by the installation of a fence on the upstream end of the culvert. Installation of a fence increases the length of the area that must be dammed to impound water, and if beaver build along the fence, may increase the distance between the beaver and the source of the cues that stimulate damming behavior (*e.g*., water moving through culvert) (Lisle 1996, Lisle 1999, Lisle 2003, Callahan 2005). Beaver prefer to build dams perpendicular to water flow, so fences can be oriented at odd angles to water flow and can be set so that they do not block the stream channel. Fencing can also be used to cover the up and downstream ends of the culverts to prevent beaver from entering the deceiver from the downstream side of the culvert and to prevent any beaver that might make it past the outer fence from plugging the interior of the culvert. Efforts can also be made to reduce the sound of water flowing through the culvert by raising the water level on the down-stream side of the culvert with dam boards or beaver-made dams; by constructing flumes to replace waterfalls, or, in extreme cases, by resetting the culvert (Lisle 1996). To ensure sufficient water flow through the culvert, Beaver Deceivers™ may be used in combination with water control devices (see discussion on Beaver Deceivers™ below).

Cylindrical exclusion devices like the Beaver Bafflers™ can be attached to culvert openings to reduce the likelihood that beaver plug a culvert by spreading the water intake over a larger area (Brown et al. 2001). While cylindrical exclusion devices can be effective in some situations (Partington 2002), in a study of beaver exclusion and water control devices, cylindrical shapes attached in-line with a culvert had a higher failure rate (40%) than trapezoidal shapes (*e.g*., Beaver Deceivers™; 3% failure rate) and use of the cylindrical devices was discontinued in favor of trapezoidal fences (Callahan 2005).

Unlike Beaver Deceivers™ and cylindrical fences, pre-dam fences (*e.g*., deep-water fences, diversion dams) (Brown and Brown 1999) can be designed with the specific intention that the beaver build the dam along the fence. Pre-dam fences can be short semicircular or circular fences that are built in an arc around a water inlet. The fence serves as a dam construction platform that allows beaver to build a dam and pond at the site but prevents beaver from plugging the water intake. If the size of the upstream pond created from the impounded water were not a concern, no further modifications of the pre-dam would be needed. However, in most cases, pre-dams would be used in combination with water control devices to manage the size of the upstream pond to alleviate flooding concerns.

Fence mesh size can be selected to minimize risks to beaver and non-target species. Brown et al. (2001) noted that beaver occasionally became stuck in 6-inch mesh and that the risk of beaver entrapment was lower with 5-inch mesh. Lisle (1999) noted that the size of the mesh on the fence of the Beaver Deceivers™ (6-inch mesh) was such that it allowed most species to pass through the fence except beaver and big turtles. In some remote areas where vehicular traffic is infrequent, it may be acceptable for animals that cannot pass through the fence mesh to travel across the road. However, for culverts under busy roads, it may be necessary to design special "*doors*" that allow the passage of beaver, large turtles, and other non-targets through the device. For example, T-joints 30 centimeters in diameter have been used to allow access through Beaver Deceiver™ fences. The T-shape reduces the likelihood that beaver can haul woody debris for dam construction inside the device (Lisle 2003). Fence caps would not be attached to the up and down-stream ends of a culvert when it is necessary to allow passage of species like large turtles and beavers through a culvert.

Water control devices (*e.g.*, pond levelers) are systems that allow the passage of water through a beaver dam. The devices could be used in situations where the presence of a beaver pond is desired but it is necessary to manage the level of water in the pond. Various types of water control devices have been described (Arner 1964, Roblee 1984, Laramie and Knowles 1985, Miller and Yarrow 1994, Wood et al. 1994, Lisle 1996, Organ et al. 1996, Brown and Brown 1999, Lisle 1999, Brown et al. 2001, Close 2003, Lisle 2003, Clemson University 2006, Simon 2006, Spock 2006, Perry 2007). The devices generally involve the use of one or more pipes installed through the beaver dam to increase the flow of water through the dam. Height and placement of pipes can be adjusted to achieve the desired water level in the beaver pond. Beaver generally only check the dam for leaks, so, when site conditions permit, the inlet of the pipe is placed away from the dam to make the source of the water flow more difficult to detect and decrease the likelihood that beaver will attempt to plug the device. To minimize the sound/sensation of water movement and the associated beaver damming behavior, the end of the pipe may be capped with a series of holes or notches cut in the pipe, which allows water to flow into the pipe. Holes and notches may be placed on the underside of the pipe to reduce the sound of water movement. Alternatively, 90-degree elbow joints can be placed facing downward on the upstream end of the pipes to prevent the noise of running water and attracting beaver. A protective cage can be placed around the upstream end of the inlet pipe to prevent beaver from blocking the pipe and to reduce problems with debris blocking the pipe. As noted above, water control systems can be combined with exclusion devices to prevent beaver from blocking culverts while still maintaining a beaver pond at an acceptable level.

Cultural Methods and Habitat Management includes the application of practices that seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs, herders, shed lambing, carcass removal, or pasture selection. Strategies may also include minimizing cover where damaging mammals might hide, manipulating the surrounding environment through barriers or fences to deter animals from entering a protected area, or planting lure crops on fringes of protected crops. Continual destruction of beaver dams and removal of dam construction materials on a daily basis will sometimes cause beavers to move to other locations. Water control devices such as the 3-log drain (Roblee 1983), the T-culvert guard (Roblee 1987), wire mesh culvert (Roblee 1983), and the Clemson beaver pond leveler (Miller and Yarrow 1994) can sometimes be used to control the water in beaver ponds to desirable levels that do not cause damage. Removal of trees from around buildings can sometimes reduce damage associated with raccoons.

Some mammals that cause damage in urban environments are attracted to homes by the presence of garbage or pet food left outside and unprotected. Removal or sealing of garbage in tight trash receptacles, and elimination of all pet foods from outside areas can reduce the presence of unwanted mammals. If raccoons are a problem, making trash and garbage unavailable, and removing all pet food from outside during nighttime hours can reduce their presence. Altering how bird feeders are hung and constructing mounting poles for the feeders that cannot be climbed by raccoons can reduce the presence of localized populations along with their associated damage.

Beaver dam breaching/removal would involve the removal of debris deposited by beaver that impedes the flow of water. Removing or breaching a dam is generally conducted to maintain existing stream channels and drainage patterns, and reduce floodwaters that have affected established silviculture, agriculture, or drainage structures, such as culverts. Beaver dams are made from natural debris such as logs, sticks and mud that beaver take from the immediate area and impound water, creating habitat that they utilize to build lodges and bank dens to raise their young and/or provide protection from predators. The impoundments that WS removes or breaches would typically be created by recent beaver activity, which have not been in place long enough to take on the qualities of a true wetland (*e.g.*, hydric soils, aquatic vegetation, pre-existing function). Unwanted beaver dams can be removed by hand with a rake or power tools (*e.g.*, a winch). Beaver dam removal or breaching by hand would not affect the substrate or the natural course of the stream. Removing or breaching dams would return the area back to its pre-existing condition with similar flows and circulations.

Most beaver dam breaching operations, if considered discharge, are covered under 33 CFR 323 or 330 and do not require a permit. A permit would be required if the beaver dam breaching activity was not covered by a 404 permitting exemption or a Nationwide Permit (NWP) and the area affected by the beaver dam was considered a true wetland. The State of Florida may require additional permits (see Appendix D and Appendix E). WS' personnel would survey the site or impoundment to determine if conditions exist for classifying the site as a true wetland. If the site appears to have conditions over 3 years old or appeared to meet the definition of a true wetland, the landowner or cooperator would be required to obtain a permit before proceeding (See Appendix E for information that explains Section 404 permit exemptions and conditions for breaching/removing beaver dams).

Supplemental feeding is sometimes used to reduce damage by wildlife, such as lure crops. Food is provided so that the animal causing damage would consume it rather than the resource being protected. In feeding programs, target wildlife would be offered an alternative food source with a higher appeal with the intention of luring them from feeding on affected resources.

Animal behavior modification refers to tactics that deter or repel damaging mammals and thus, reduce damage to the protected resource. Those techniques are usually aimed at causing target animals to respond by fleeing from the site or remaining at a distance. They usually employ extreme noise or visual stimuli. Unfortunately, many of these techniques are only effective for a short time before wildlife habituate to them (Conover 1982). Devices used to modify behavior in mammals include electronic guards (siren strobe-light devices), propane exploders, pyrotechnics, laser lights, human effigies, effigies of predators, and harassment through shooting.

Live Capture and Translocation can be accomplished using hand capture, hand nets, catch poles, cage traps, suitcase type traps, cable restraints, or with foothold traps to capture some mammal species for the purpose of translocating them for release in other areas. WS could employ those methods in Florida when the target animal(s) can legally be translocated or can be captured and handled with relative safety by WS' personnel. Live capture and handling of mammals poses an additional level of human health and safety threat if target animals are aggressive, large, or extremely sensitive to the close proximity of humans. For that reason, WS may limit this method to specific situations and certain species. In addition, moving damage-causing individuals to other locations can typically result in damage at the new location, or the translocated individuals can move from the relocation site to areas where they are unwanted. In addition, translocation can facilitate the spread of diseases from one area to another. The AVMA, the National Association of State Public Health

Veterinarians, and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission (CDC 1990). Although translocation is not necessarily precluded in all cases, it would be logistically impractical, in most cases, and biologically unwise in Florida due to the risk of disease transmission. High population densities of some animals may make this a poor wildlife management strategy for those species. Translocation would be evaluated by WS on a case-by-case basis. Translocation would only occur with the prior authorization of the FWC.

Trapping can utilize a number of devices, including foothold traps, cage-type traps, and body gripping (conibear) traps, foot snares, and neck/body snares. Those techniques would be implemented by WS personnel because of the technical training required to use such devices.

Foothold Traps can be effectively used to capture a variety of mammals. Foothold traps are placed beside, or in some situations, in travel ways being actively used by the target species. Placement of traps is contingent upon the habits of the respective target species, habitat conditions, and presence of non-target animals. Effective trap placement and adjustment and the use and placement of appropriate baits and lures by trained WS' personnel also contribute to the selectivity of foothold traps. An additional advantage is that foothold traps can allow for the on-site release of non-target animals since animals are captured alive. The use of foothold traps requires more skill than some methods, but they are indispensable in resolving many damage problems. A steel-trap permit is required by FWC whenever these traps are used.

Cable Restraints are typically made of wire or cable, and can be set to capture an animal by the neck, body, and foot. Cable restraints may be used as either lethal or live-capture devices depending on how or where they are set. Cable restraints set to capture an animal by the neck are usually lethal but stops can be attached to the cable to increase the probability of a live capture depending on the trap check interval. Snares positioned to capture the animal around the body can be a useful live-capture device, but are more often used as a lethal control technique. Snares can incorporate a breakaway feature to release non-target wildlife and livestock where the target animal is smaller than potential non-targets (Phillips 1996). Snares can be effectively used wherever a target animal moves through a restricted travel lane (*e.g*., under fences or trails through vegetation). When an animal moves forward into the loop formed by the cable, the noose tightens and the animal is held. Snares must be set in locations where the likelihood of capturing non-target animals is minimized.

The foot or leg snare can be set as a spring-powered non-lethal device, activated when an animal places its foot on the trigger or pan. In some situations, using snares to capture wildlife is impractical due to the behavior or morphology of the animal, or the location of many wildlife conflicts.

Cage traps come in a variety of styles to live-capture animals. The most commonly known cage traps are box traps and corral traps. Box traps are usually rectangular and are made from various materials, including metal, wire mesh, plastic, and wood. These traps are well suited for use in residential areas and work best when baited with foods attractive to the target animal. Box traps are generally portable and easy to set-up.

Corral traps for feral swine are generally large circular traps consisting of panels anchored to the ground using steel posts with a door allowing entrance. Side panels are typically woven metal fencing referred to as hog panels or cow panels. The entrances into the traps generally consist of a door that allow entry into the trap but prevents exit. The doors are often designed to allow swine to continually enter the trap that allows for the possibility of capturing multiple swine.

The disadvantages of using cage traps are: 1) some individual target animals may avoid cage traps; 2) some non-target animals may associate the traps with available food and purposely get captured to eat the bait, making the trap unavailable to catch target animals; 3) cage traps must be checked frequently to ensure that captured animals are not subjected to extreme environmental conditions; and 4) some animals will fight to escape and may become injured; 5) expense of purchasing traps. Disadvantages associated with corral traps include: 1) the expense of purchasing the materials to construct trap, 2) once constructed, corral traps are not moveable until disassembled and transported, and 3) in remote areas, getting all the required equipment to the location can be difficult.

Trap monitors are devices that send a radio signal to a receiver if a set trap is disturbed and alerts field personnel that an animal may be captured. Trap monitors can be attached directly to the trap or attached to a string or wire and then placed away from the trap in a tree or shrub. When the monitor is hung above the ground, it can be detected from several miles away, depending on the terrain in the area. There are many benefits to using trap monitors, such as saving considerable time when checking traps, decreasing fuel usage, prioritizing trap checks, and decreasing the need for human presence in the area. Trap monitors could be used when using cage traps.

Trap monitoring devices would be employed, when applicable, that indicate when a trap has been activated. Trap monitoring devices would allow personnel to prioritize trap checks and decrease the amount of time required to check traps, which decreases the amount of time captured target or non-targets would be restrained. By reducing the amount of time targets and non-targets are restrained, pain and stress can be minimized and captured wildlife can be addressed in a timely manner, which could allow non-targets to be released unharmed. Trap monitoring devices could be employed where applicable to facilitate monitoring of the status of traps in remote locations to ensure any captured wildlife was removed promptly to minimize distress and to increase the likelihood non-targets could be released unharmed.

Hancock/Bailey Traps (suitcase/basket type cage traps) are designed to live-capture beaver. The trap is constructed of a metal frame that is hinged with springs attached and covered with chain-link fence. The trap's appearance is similar to a large suitcase when closed. When set, the trap is generally baited and opened to allow an animal to enter. When tripped, the panels of the trap close around the animal capturing the animal. One advantage of using the Hancock or Bailey trap is the ease of release of beaver or non-target animals. Beaver caught in Hancock or Bailey traps could also be humanely euthanized. Disadvantages are that those traps are very expensive (>$300 per trap), cumbersome, and difficult to set (Miller and Yarrow 1994). The trap weighs about 25 pounds and is relatively bulky to carry and maneuver. Hancock and Bailey traps can also be dangerous to set (*i.e*., hardhats are recommended when setting suitcase traps), are less cost and time-efficient than snares, footholds, or body-grip traps, and may cause serious and debilitating injury to river otters (Blundell et al. 1999).

Drop nets are nylon or cloth nets that would be suspended above an area actively used by an animal or group of animals where target individuals have been conditioned to feed (Ramsey 1968). The area would be baited and once feeding occurs under the net, the net would be released. Drop nets require constant supervision by personnel to drop the net when target individuals are present and when animals are underneath the net. This method has limited use due to the time and effort required to condition animals to feed in a location and the required monitoring of the site to drop the net when target wildlife are present. Nets are used to live-capture target individuals and if any non-targets are present, they can be released on site unharmed. Drop nets allow for the capture of several animals during a single application.

Injuries to animals do occur from the use of nets. Injuries to deer occurred when using drop nets with the rate of injury being correlated with the number of deer captured during a single application of the net (Haulton et al. 2001). Nets are not generally available to the public.

Cannon nets use nylon or cloth nets to capture wildlife that have been conditioned to feed in a given area through baiting (Hawkins et al. 1968). When using cannon nets, the net is fully deployed to determine the capture area when fired. Once the capture zone has been established, the net is rolled up upon itself and bait is placed inside the zone to ensure feeding wildlife are captured. When target animals are feeding at the site and within the capture zone of the net, the launcher is activated by personnel near the site, which launches the net over the target wildlife. The net is launched using small explosive charges and weights. Only personnel trained in the safe handling of explosive charges will be allowed to employ rocket nets when explosive charges were used. Pneumatic cannon nets could also be used, which propels the net using compressed air instead of small explosive charges. Cannon nets require personnel to be present at the site continually to monitor for feeding. Similar to drop nets, cannon nets can be used to capture multiple animals during a single application. Similar to drop nets, injury rates for cannons nets appear to be correlated with the number of animals captured during a single application of the net (Haulton et al 2001). Non-targets incidentally captured can be released on site unharmed. Cannon nets would not be available for use by the public and would not be available for use by the public under Alternative 2 and Alternative 3. A permit may be required from the FWC to use cannon nets.

Body-grip Traps are designed to cause the quick death of the animal that activates the trap. Body-grip traps may include snap traps, mole traps, and conibear traps. The conibear trap consists of a pair of rectangular wire frames that close like scissors when triggered, killing the captured animal with a quick body blow. For conibear traps, the traps should be placed so ensure the rotating jaws close on either side of the neck of the animal to ensure a quick death. Conibear traps are lightweight and easily set. Snap traps are common household rat or mouse traps. These traps are often used to collect and identify rodent species that cause damage so that species-specific control tools can be applied, such as identifying the prey base at airports. Spring-powered harpoon traps are used to control damage caused by surface-tunneling moles. Soil is pressed down in an active tunnel and the trap is placed at that point. When the mole reopens the tunnel, it triggers the trap. Two variations of scissor like traps are also used in tunnels for moles. Safety hazards and risks to humans are usually related to setting, placing, checking, or removing the traps. Body-grip traps present a minor risk to non-target animals. Selectivity of body-grip traps can be enhanced by placement, trap size, trigger configurations, and baits. When using body-grip traps, risks of non-target capture can be minimized by using recessed sets (placing trap inside a cubby, cage, or burrow), restricting openings, or by elevating traps. For example, conibear traps set to capture beaver can be placed underwater to minimize risks to non-targets. Choosing appropriately sized traps for the target species can also exclude non-targets by preventing larger non-targets from entering and triggering the trap. The trigger configurations of traps can be modified to minimize non-target capture. For example, offsetting the trigger can allow non-targets to pass through conibear traps without capture. A steel-trap permit is required by FWC whenever these traps are used.

Shooting with firearms is very selective for the target species and would be conducted with rifles, handguns, and shotguns. Methods and approaches used by WS may include use of vehicles, illuminating devices, bait, firearm suppressors, night vision/thermal equipment, and elevated platforms. Shooting is an effective method in some circumstances, and can often provide immediate relief from the problem. Shooting may at times be one of the only methods available to effectively and efficiently resolve a wildlife problem.

Ground shooting is sometimes used as the primary method to alleviate damage or threats of damage. Shooting would be limited to locations where it is legal and safe to discharge a weapon. A shooting program, especially conducted alone, can be expensive because it often requires many staff hours to complete.

Shooting can also be used in conjunction with an illumination device at night, which is especially useful for nocturnal mammals, such as deer or feral swine. Spotlights may or may not be covered with a red lens, which nocturnal animals may not be able to see, making it easier to locate them undisturbed. Night shooting may be conducted in sensitive areas that have high public use or other activity during the day, which would make daytime shooting unsafe. The use of night vision and Forward Looking Infrared (FLIR) devices can also be used to detect and shoot mammals at night, and is often the preferred equipment due to the ability to detect and identify animals in complete darkness. Night vision and FLIR equipment aid in locating wildlife at night when wildlife may be more active. Night vision and FLIR equipment could be used during surveys and in combination with shooting to remove target mammals at night. WS' personnel most often use this technology to target mammals in the act of causing damage or likely responsible for causing damage. Those methods aid in the use of other methods or allow other methods to be applied more selectively and efficiently. Night vision and FLIR equipment allow for the identification of target species during night activities, which reduces the risks to non-targets and reduces human safety risks. Night vision equipment and FLIR devices only aid in the identification of wildlife and are not actual methods of take. The use of FLIR and night vision equipment to remove target mammals would increase the selectivity of direct management activities by targeting those mammals most likely responsible for causing damage or posing threats.

Hunting/Trapping: WS sometimes recommends that resource owners consider legal hunting and trapping as an option for reducing mammal damage. Although legal hunting/trapping is impractical and/or prohibited in many urban-suburban areas, it can be used to reduce some populations of mammals.

Chemical Wildlife Damage Management Methods

All pesticides used by WS are registered under the FIFRA and administered by the EPA and FDACS. All WS personnel in Florida who apply restricted-use pesticides would be certified pesticide applicators by FDACS and have specific training by WS for pesticide application. The EPA and the FDACS require pesticide applicators to adhere to all certification requirements set forth in the FIFRA. Pharmaceutical drugs, including those used in wildlife capture and handling, are administrated by FDA and/or DEA.

Chemicals would not be used by WS on public or private lands without authorization from the land management agency or property owner or manager. The following chemical methods have been proven to be selective and effective in reducing damage by mammals.

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calms fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Fowler and Miller 1999). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. When using ketamine/xylazine combinations, xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Fowler and Miller 1999). This reduces heat production from muscle tension, but can lead to lower body temperatures when working in cold conditions.

Telazol is a more powerful anesthetic and usually used for larger animals. Telazol is a combination of equal parts of tiletamine hydrochloride and zolazepam hydrochloride (a tranquilizer). The product is generally supplied sterile in vials, each containing 500 mg of active drug, and when dissolved in sterile water has a pH of 2.2 to 2.8. Telazol produces a state of unconsciousness in which protective reflexes, such as coughing and swallowing, are maintained during anesthesia. Schobert (1987) listed the dosage rates for many wild and exotic animals. Before using Telazol, the size, age, temperament, and health of the animal are considered. Following a deep intramuscular injection of Telazol, onset of anesthetic effect usually occurs within 5 to 12 minutes. Muscle relaxation is optimum for about the first 20 to 25 minutes after the administration, and then diminishes. Recovery varies with the age and physical condition of the animal and the dose of Telazol administered, but usually requires several hours.

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. Barbiturates are a recommended euthanasia drug for free-ranging wildlife (AVMA 2007). Sodium Pentobarbital would only be administered after deer have been live-captured and properly immobilized to allow for direct injection. There are DEA restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS' personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

Potassium Chloride used in conjunction with prior general anesthesia is used as a euthanasia agent for animals, and is considered acceptable and humane by the AVMA (2007). Animals that have been euthanized with this chemical experience cardiac arrest followed by death, and are not toxic to predators or scavengers.

Beuthanasia-D combines pentobarbital with another substance to hasten cardiac arrest. Intravenous (IV) and intracardiac (IC) are the only acceptable routes of injection. As with pure sodium pentobarbital, IC injections with Beuthanasia-D are only acceptable for animals that are unconscious or deeply anesthetized. With other injection routes, there are concerns that the cardiotoxic properties may cause cardiac arrest before the animal is fully unconscious. It is a Schedule III drug, which means it can be obtained directly from the manufacturer by anyone with a DEA registration. However, Schedule III drugs are subject to the same security and record-keeping requirements as Schedule II drugs.

Fatal-Plus® combines pentobarbital other substances to hasten cardiac arrest. IV is the preferred route of injection; however, IC is acceptable as part of the two-step procedure used by WS. Animals are first anesthetized and sedated using a combination of ketamine/xylazine and once completely unresponsive to stimuli and thoroughly sedated, Fatal-Plus® is administered. Like Beuthanasia®-D, it is a Schedule III drug requiring a DEA registration for purchase and is subject to the security and record-keeping requirements of Schedule II drugs.

Carbon dioxide is sometimes used to euthanize mammals that are captured in live traps and when relocation is not a feasible option. Live mammals are placed in a sealed chamber. CO_2 gas is released into the chamber and the animal quickly dies after inhaling the gas. This method is approved as a euthanizing agent by the AVMA. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Repellents are usually naturally occurring substances or chemicals formulated to be distasteful or to elicit pain or discomfort for target animals when they are smelled, tasted, or contacted. Only a few repellents are commercially available for mammals, and are registered for only a few species. Repellents are not available for many species that may present damage problems, such as some predators or furbearing species. Repellents are variably effective and depend largely on resource to be protected, time and length of application, and sensitivity of the species causing damage. Again, acceptable levels of damage control are usually not realized unless repellents are used in conjunction with other techniques.

Zinc phosphide is an inorganic compound used to control rats, mice, voles, ground squirrels, prairie dogs, nutria, muskrats, feral rabbits, and gophers. Zinc phosphide is a heavy, finely ground gray-black powder that is partially insoluble in water and alcohol. When exposed to moisture, it decomposes slowly and releases phosphine gas (PH_3). When zinc phosphide treated bait encounters acids in the stomach, phosphate (PH3) gas is released, which may account in a large part for observed toxicity. Animals that ingest lethal amounts of bait usually succumb overnight with terminal symptoms of convulsions, paralysis, coma, and death from asphyxia. If death is prolonged for several days, intoxication that occurs is similar to intoxication with yellow phosphorous, in which the liver is heavily damaged. Prolonged exposure to phosphine can produce chronic phosphorous poisoning.

Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. For many uses of zinc phosphide formulated on grain or grain-based baits, pre-baiting is recommended or necessary for achieving good bait acceptance. Primary toxicity risks to non-target species from the direct consumption of treated bait can be minimized by using bait stations to prevent access by non-target species such as birds.

Because zinc phosphide is not stored in muscle or other tissues of poisoned animals, there is no secondary poisoning with this rodenticide. The bait however, remains toxic up to several days in the gut of the dead rodent. Other animals can be poisoned if they eat enough of the gut content of rodents recently killed with zinc phosphide.

Anticoagulant rodenticides are used to control commensal rodents and some field rodents. Common anticoagulants include brodifacoum and diphacinone. Anticoagulants are normally classified as multiple-dose toxicants. For the materials to be effective, animals must feed on the bait more than once. However, some newer formulations only require a single feeding to e effective. Bait for rats and mice must be continuously available for 2 to 3 weeks for effective population control.

GonaCon™ was developed by scientists with the NWRC as a reproductive inhibitor. GonaCon™ is a new single dose immunocontraceptive vaccine. Recent studies have demonstrated the efficacy of this single-shot Gonadotropin-releasing hormone (GnRH) vaccine on California ground squirrels, Norway rats, feral cats and dogs, feral swine, wild horses, and white-tailed deer. Infertility among treated female swine and white-tailed deer has been documented for up to two years without requiring a booster vaccination (Miller et al. 2000). This vaccine overcomes one of the major obstacles of previous two dose vaccines since target wildlife need to be captured only once for vaccination instead of twice. A single-injection vaccine would be much more practical as a field delivery system for use on free-ranging animals.

GonaCon™ was officially registered by the EPA in 2009 for use in reducing fertility in female white-tailed deer under EPA registration number 56228-40. GonaCon™ is registered as a restricted-use pesticide available for use by WS' personnel and personnel of a state wildlife management agency or persons under their authority. Additionally, in order for GonaCon™ to be used in any given state, the product must also be registered with the state and approved for use by the appropriate state agency responsible for managing wildlife. GonaCon™, when injected into the body, elicits an immune response that neutralizes the GnRH hormone being produced naturally by deer. The GnRH hormone in deer stimulates the production of other sexual hormones, which leads to the body reaching a reproductive state. The vaccine neutralizes the GnRH hormone being produced, which then prevents the production of other sexual hormones in the deer vaccinated; thereby, preventing the body of the deer from entering into a reproductive state (USDA 2010).

APPENDIX C

FEDERAL AND STATE THREATENED AND ENDANGERED SPECIES

Listed by the State of Florida as Federal Endangered (FE), Federal Threatened (FT), State Threatened (ST), or State Species of Special Concern (SSC)
(http://www.myfwc.com/media/214168/Threatened_Endangered_Species.pdf)

FISH		
Atlantic sturgeon	*Acipenser oxyrinchus*	SSC
Blackmouth shiner	*Notropis melanostomus*	ST
Bluenose shiner	*Pteronotropis welaka*	SSC
Crystal darter	*Crystallaria asprella*	ST
Gulf sturgeon	*Acipenser oxyrinchus [=oxyrhynchus] desotoi*	FT
Harlequin darter	*Etheostoma histrio*	SSC
Key silverside	*Menidia conchorum*	ST
Lake Eustis pupfish	*Cyprinodon hubbsi*	SSC
Okaloosa darter	*Etheostoma okalossae*	FE
Rivulus	*Rivulus marmoratus*	SSC
Saltmarsh topminnow	*Fundulus jenkinsi*	SSC
Shortnose sturgeon	*Acipenser brevirostrum*	FE
Smalltooth sawfish	*Pristis pectinate*	FE
Southern tessellated darter	*Etheostoma olmstedi maculaticeps*	SSC
AMPHIBIANS		
Florida bog frog	*Lithobates okaloosae*	SSC
Frosted flatwoods salamander	*Ambystoma cingulatum*	FT
Georgia blind salamander	*Haideotriton wallacei*	SSC
Gopher frog	*Lithobates capito*	SSC
Pine barrens treefrog	*Hyla andersonii*	SSC
Reticulated flatwoods salamander	*Ambystoma bishopi*	FE
REPTILES		
Alligator snapping turtle	*Macrochelys temminckii*	SSC
American alligator	*Alligator mississippiensis*	FT(S/A)
American crocodile	*Crocodylus acutus*	FT
Atlantic salt marsh snake	*Nerodia clarkii taeniata*	FT
Barbour's map turtle	*Graptemys barbouri*	SSC
Bluetail mole skink	*Eumeces egregius lividus*	FT
Eastern indigo snake	*Drymarchon corais couperi*	FT
Florida brownsnake[1]	*Storeria victa*	ST
Florida Keys mole skink	*Eumeces egregius egregius*	SSC
Florida pine snake	*Pituophis melanoleucus mugitus*	SSC
Gopher tortoise	*Gopherus polyphemus*	ST
Green sea turtle	*Chelonia mydas*	FE

Hawksbill sea turtle	*Eretmochelys imbricata*	FE
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE
Key ringneck snake	*Diadophis punctatus acricus*	ST
Leatherback sea turtle	*Dermochelys coriacea*	FE
Loggerhead sea turtle	*Caretta caretta*	FT
Peninsula ribbon snake[1]	*Thamnophis sauritus sackenii*	ST
Red rat snake[1]	*Elaphe guttata*	SSC
Rim rock crowned snake	*Tantilla oolitica*	ST
Sand skink	*Neoseps reynoldsi*	FT
Short-tailed snake	*Stilosoma extenuatum*	ST
Striped mud turtle[1]	*Kinosternon baurii*	ST
Suwannee cooter	*Pseudemys suwanniensis*	SSC

BIRDS

American oystercatcher	*Haematopus palliatus*	SSC
Audubon's crested caracara	*Polyborus plancus audubonii*	FT
Bachman's wood warbler	*Vermivora bachmanii*	FE
Black skimmer	*Rynchops niger*	SSC
Brown pelican	*Pelecanus occidentalis*	SSC
Burrowing owl	*Athene cunicularia*	SSC
Cape Sable seaside sparrow	*Ammodramus maritimus* mirabilis	FE
Eskimo curlew	*Numenius borealis*	FE
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	FE
Florida grasshopper sparrow	*Ammodramus savannarum* floridanus	FE
Florida sandhill crane	*Grus canadensis pratensis*	ST
Florida scrub-jay	*Aphelocoma coerulescens*	FT
Ivory-billed woodpecker	*Campephilus principalis*	FE
Kirtland's wood warbler	*Dendroica kirtlandii*	FE
Least tern	*Sterna antillarum*	ST
Limpkin	*Aramus guarauna*	SSC
Little blue heron	*Egretta caerulea*	SSC
Marian's marsh wren	*Cistothorus palustris marianae*	SSC
Osprey[2]	*Pandion haliaetus*	SSC
Piping plover	*Charadrius melodus*	FT
Red-cockaded woodpecker	*Picoides borealis*	FE
Reddish egret	*Egretta rufescens*	SSC
Roseate spoonbill	*Platalea ajaja*	SSC
Roseate tern	*Sterna dougallii dougallii*	FT
Scott's seaside sparrow	*Ammodramus maritimus peninsulae*	SSC
Snowy egret	*Egretta thula*	SSC
Snowy plover	*Charadrius alexandrinus*	ST

Southeastern American kestrel	*Falco sparverius paulus*	ST
Tricolored heron	*Egretta tricolor*	SSC
Wakulla seaside sparrow	*Ammodramus maritimus juncicola*	SSC
White-crowned pigeon	*Patagioenas leucocephala*	ST
Whooping crane	*Grus americana*	FE(XN)
White ibis	*Eudocimus albus*	SSC
Worthington's marsh wren	*Cistothorus palustris griseus*	SSC
Wood stork	*Mycteria americana*	FE

MAMMALS

Anastasia Island beach mouse	*Peromyscus polionotus phasma*	FE
Big Cypress fox squirrel	*Sciurus niger avicennia*	ST
Caribbean monk seal	*Monachus tropicalis*	FE
Choctawhatchee beach mouse	*Peromyscus polionotus* Allophrys	FE
Eastern chipmunk	*Tamias striatus*	SSC
Everglades mink	*Neovison vison evergladensis*	ST
Finback whale	*Balaenoptera physalus*	FE
Florida black bear[3]	*Ursus americanus floridanus*	ST
Florida mastiff bat	*Eumops glaucinus floridanus*	ST
Florida mouse	*Podomys floridanus*	SSC
Florida panther	*Puma [=Felis] concolor coryi*	FE
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	FE
Gray bat	*Myotis grisescens*	FE
Gray wolf	*Canis lupus*	FE
Homosassa shrew	*Sorex longirostris eonis*	SSC
Humpback whale	*Megaptera novaeangliae*	FE
Indiana bat	*Myotis sodalis*	FE
Key deer	*Odocoileus virginianus clavium*	FE
Key Largo cotton mouse	*Peromyscus gossypinus allapaticola*	FE
Key Largo woodrat	*Neotoma floridana smalli*	FE
Lower Keys rabbit	*Sylvilagus palustris hefneri*	FE
North Atlantic right whale	*Eubalaena glacialis*	FE
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	FE
Red wolf	*Canis rufus*	FE
Rice rat	*Oryzomys palustris natator*	FE1
Sanibel Island rice rat	*Oryzomys palustris sanibeli*	SSC
Sei whale	*Balaenoptera borealis*	FE
Sherman's fox squirrel	*Sciurus niger shermani*	SSC
Sherman's short-tailed shrew	*Blarina carolonensis shermani*	SSC
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	FT

Sperm whale	*Physeter catodon [=macrocephalus]*	FE
St. Andrew beach mouse	*Peromyscus polionotus peninsularis*	FE
West Indian manatee	*Trichechus manatus*	FE

INVERTEBRATES

CORALS

Elkhorn coral	*Acropora palmate*	FT
Pillar coral	*Dendrogyra cylindricus*	ST
Staghorn coral	*Acropora cervicornis*	FT

CRUSTACEANS

Black Creek crayfish (Spotted royal crayfish)	*Procambarus pictus*	SSC
Panama City crayfish	*Procambarus econfinae*	SSC
Santa Fe Cave crayfish	*Procambarus erythrops*	SSC
Squirrel Chimney Cave shrimp	*Palaemonetes cummingi*	FT

INSECTS

American burying beetle	*Nicrophorus americanus*	FE
Miami blue butterfly	*Cyclargus thomasi bethunebakeri*	ST
Schaus' swallowtail butterfly	*Heraclides aristodemus ponceanus*	FE

MOLLUSKS

Chipola slabshell (mussel)	*Elliptio chiplolaensis*	FT
Fat threeridge (mussel)	*Amblema neislerii*	FE
Florida treesnail	*Liguus fasciatus*	SSC
Gulf moccasinshell (mussel)	*Medionidus penicillatus*	FE
Ochlockonee moccasinshell (mussel)	*Medionidus simpsonianus*	FE
Oval pigtoe (mussel)	*Pleurobema pyriforme*	FE
Purple bankclimber (mussel)	*Elliptoideus sloatianus*	FT
Shinyrayed pocketbook (mussel)	*Lampsilis subangulata*	FE
Stock Island tree snail	*Orthalicus reses* [not incl. nesodryas]	FT

List Notations

1 Lower keys population only.
2 Monroe County population only.
3 Other than those found in Baker and Columbia Counties or in Apalachicola National Forest.

FEDERAL LISTINGS AND OCCURRENCES FOR FLORIDA

Notes:

- This report shows the listed species associated in some way with this state.
- This list does not include experimental populations and similarity of appearance listings.
- This list includes non-nesting sea turtles and whales in State/Territory coastal waters.
- This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.

Animal species listed in this state and that occur in this state	
Status	**Species**
T	Bankclimber, purple (mussel) (*Elliptoideus sloatianus*)
E	Bat, gray Entire (*Myotis grisescens*)
E	Bat, Indiana Entire (*Myotis sodalis*)
E	Bean, Choctaw (*Villosa choctawensis*)
E	Butterfly, Miami Blue (*Cyclargus (=Hemiargus) thomasi bethunebakeri*)
E	Butterfly, Schaus swallowtail (*Heraclides aristodemus ponceanus*)
T	Caracara, Audubon's crested (*Polyborus plancus audubonii*)
T	Coral, elkhorn (*Acropora palmata*)
T	Coral, staghorn (*Acropora cervicornis*)
T	Crocodile, American (*Crocodylus acutus*)
T	Darter, Okaloosa Entire (*Etheostoma okaloosae*)
E	Deer, key (*Odocoileus virginianus clavium*)
E	Ebonyshell, round (*Fusconaia rotulata*)
E	Kidneyshell, southern (*Ptychobranchus jonesi*)
E	Kite, Everglade snail (*Rostrhamus sociabilis plumbeus*)
E	Manatee, West Indian Entire (*Trichechus manatus*)
E	Moccasinshell, Gulf (*Medionidus penicillatus*)
E	Moccasinshell, Ochlockonee (*Medionidus simpsonianus*)
E	Mouse, Anastasia Island beach (*Peromyscus polionotus phasma*)
E	Mouse, Choctawhatchee beach (*Peromyscus polionotus allophrys*)
E	Mouse, Key Largo cotton (*Peromyscus gossypinus allapaticola*)
E	Mouse, Perdido Key beach (*Peromyscus polionotus trissyllepsis*)
T	Mouse, southeastern beach (*Peromyscus polionotus niveiventris*)
E	Mouse, St. Andrew beach (*Peromyscus polionotus peninsularis*)
E	Panther, Florida (*Puma (=Felis) concolor coryi*)
T	Pigtoe, fuzzy (*Pleurobema strodeanum*)
T	Pigtoe, narrow (*Fusconaia escambia*)
E	Pigtoe, oval (*Pleurobema pyriforme*)
T	Pigtoe, tapered (*Fusconaia burkei*)
T	Plover, piping (*Charadrius melodus*)
E	Pocketbook, shinyrayed (*Lampsilis subangulata*)
E	Rabbit, Lower Keys marsh (*Sylvilagus palustris hefneri*)
E	Rice rat lower FL Keys (*Oryzomys palustris natator*)
T	Salamander, frosted flatwoods (*Ambystoma cingulatum*)
E	salamander, Reticulated flatwoods (*Ambystoma bishopi*)

Animal species listed in this state and that occur in this state	
Status	**Species**
E	Sawfish, smalltooth (*Pristis pectinata*)
T	scrub-jay, Florida Entire (*Aphelocoma coerulescens*)
E	Sea turtle, green (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Shrimp, Squirrel Chimney Cave (*Palaemonetes cummingi*)
T	Skink, bluetail mole (*Eumeces egregius lividus*)
T	Skink, sand (*Neoseps reynoldsi*)
T	Slabshell, Chipola (*Elliptio chipolaensis*)
T	Snail, Stock Island tree (*Orthalicus reses (not incl. nesodryas)*)
T	Snake, Atlantic salt marsh (*Nerodia clarkii taeniata*)
T	Snake, eastern indigo (*Drymarchon corais couperi*)
E	Sparrow, Cape Sable seaside (*Ammodramus maritimus mirabilis*)
E	Sparrow, Florida grasshopper (*Ammodramus savannarum floridanus*)
E	Stork, wood (*Mycteria americana*)
T	Sturgeon, gulf (*Acipenser oxyrinchus desotoi*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
T	Tern, roseate (*Sterna dougallii dougallii*)
E	Three-ridge, fat (mussel) (*Amblema neislerii*)
E	Vole, Florida salt marsh (*Microtus pennsylvanicus dukecampbelli*)
E	Warbler (=wood), Bachman's (*Vermivora bachmanii*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, North Atlantic Right (*Eubalaena glacialis*)
E	Woodpecker, red-cockaded (*Picoides borealis*)
E	Woodrat, Key Largo (*Neotoma floridana smalli*)

Animal species listed in this state that do not occur in this state	
Status	**Species**
E	Beetle, American burying (*Nicrophorus americanus*)
E	Crocodile, American (*Crocodylus acutus*)
T	Sea turtle, green (*Chelonia mydas*)
T	Tortoise, gopher (*Gopherus polyphemus*)
E	Wolf, gray (*Canis lupus*)

Animal listed species occurring in this state that are not listed in this state	
Status	**Species**
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Warbler, Kirtland's (*Dendroica kirtlandii*)
E	Wolf, red (*Canis rufus*)

Summary of Plant listings

Plant species listed in this state and that occur in this state

Status	Species
E	Aster, Florida golden (*Chrysopsis floridana*)
E	Beargrass, Britton's (*Nolina brittoniana*)
E	Beauty, Harper's (*Harperocallis flava*)
E	Bellflower, Brooksville (*Campanula robinsiae*)
T	Birds-in-a-nest, white (*Macbridea alba*)
E	Blazingstar, scrub (*Liatris ohlingerae*)
T	Bonamia, Florida (*Bonamia grandiflora*)
T	Buckwheat, scrub (*Eriogonum longifolium var. gnaphalifolium*)
T	Butterwort, Godfrey's (*Pinguicula ionantha*)
E	Cactus, Key tree (*Pilosocereus robinii*)
E	Campion, fringed (*Silene polypetala*)
E	Chaffseed, American (*Schwalbea americana*)
E	Cladonia, Florida perforate (*Cladonia perforata*)
E	Fringe-tree, pygmy (*Chionanthus pygmaeus*)
T	Gooseberry, Miccosukee (*Ribes echinellum*)
E	Gourd, Okeechobee (*Cucurbita okeechobeensis ssp. okeechobeensis*)
E	Harebells, Avon Park (*Crotalaria avonensis*)
E	Hypericum, highlands scrub (*Hypericum cumulicola*)
E	Jacquemontia, beach (*Jacquemontia reclinata*)
E	Lead-plant, Crenulate (*Amorpha crenulata*)
E	Lupine, scrub (*Lupinus aridorum*)
E	Meadowrue, Cooley's (*Thalictrum cooleyi*)
E	Milkpea, Small's (*Galactia smallii*)
E	Mint, Garrett's (*Dicerandra christmanii*)
E	Mint, Lakela's (*Dicerandra immaculata*)
E	Mint, longspurred (*Dicerandra cornutissima*)
E	Mint, scrub (*Dicerandra frutescens*)
E	Mustard, Carter's (*Warea carteri*)
E	Pawpaw, beautiful (*Deeringothamnus pulchellus*)
E	Pawpaw, four-petal (*Asimina tetramera*)
E	Pawpaw, Rugel's (*Deeringothamnus rugelii*)
T	Pigeon wings (*Clitoria fragrans*)
E	Pinkroot, gentian (*Spigelia gentianoides*)
E	Plum, scrub (*Prunus geniculata*)
E	Polygala, Lewton's (*Polygala lewtonii*)
E	Polygala, tiny (*Polygala smallii*)
E	Prickly-apple, fragrant (*Cereus eriophorus var. fragrans*)
E	Rhododendron, Chapman (*Rhododendron chapmanii*)
E	Rosemary, Apalachicola (*Conradina glabra*)
E	Rosemary, Etonia (*Conradina etonia*)

Plant species listed in this state and that occur in this state

Status	Species
E	Rosemary, short-leaved (*Conradina brevifolia*)
E	Sandlace (*Polygonella myriophylla*)
T	Seagrass, Johnson's (*Halophila johnsonii*)
T	Skullcap, Florida (*Scutellaria floridana*)
E	Snakeroot (*Eryngium cuneifolium*)
E	Spurge, deltoid (*Chamaesyce deltoidea ssp. deltoidea*)
T	Spurge, Garber's (*Chamaesyce garberi*)
T	Spurge, telephus (*Euphorbia telephioides*)
E	Torreya, Florida (*Torreya taxifolia*)
E	Warea, wide-leaf (*Warea amplexifolia*)
E	Water-willow, Cooley's (*Justicia cooleyi*)
T	Whitlow-wort, papery (*Paronychia chartacea*)
E	Wireweed (*Polygonella basiramia*)
E	Ziziphus, Florida (*Ziziphus celata*)

Plant species listed in this state that do not occur in this state (1 species)

Status	Species
E	Pondberry (*Lindera melissifolia*)

APPENDIX D

AUTHORITY AND COMPLIANCE

I. AUTHORITIES

The authorities of WS and other agencies as those authorities relate to conducting wildlife damage management activities are discussed by agency below:

WS' Legislative Authorities

The primary statutory authorities for WS' program are the Act of March 2, 1931 (46 Stat. 1468; 7 USC 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c). The WS program is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human safety associated with wildlife. WS' directives define program objectives and guide WS' activities to manage wildlife damage management.

Florida Fish and Wildlife Conservation Commission

The FWC was formed on July 1, 1999 through a State constitutional amendment (Article IV, Section 9) that combined several previous State fish and wildlife commissions. The FWC is comprised of seven members that are appointed by the governor. The commission exercises the regulator and executive powers of the State with respect to wild animal life and aquatic life. The authority for management of resident wildlife species is the responsibility of the FWC. The FWC collects and compiles information on beaver population trends and take, and uses this information to manage beaver populations. This information has been provided to WS to assist in the analysis of potential impacts of WS' activities on the beaver population in the State. The FWC currently has a MOU with WS that established a cooperative relationship between WS and the FWC, outlines responsibilities, and sets forth annual objectives and goals of each agency.

Florida Department of Agriculture and Consumer Services (FDACS)

The Florida Department of Agriculture and Consumer Services is responsible for statewide mosquito control program coordination, pesticide registration, pesticide use regulation, structural pest control regulation, and feed, seed, and fertilizer registration and inspection. The Division of Agricultural Environmental Services assists and protects consumers by decreasing the number of pesticide, pest control, fertilizer, feed and seed licensees and products that are unlawful, unsafe, or unethical. The Division is responsible for enforcing the provisions of all or part of Chapters 388, 482, 487, 570, 576, 578, and 580, Florida Statutes. WS and the FDACS are in the process of initiating a MOU, which establishes a cooperative relationship between WS and the FDACS, outlines responsibilities, and sets forth annual objectives and goals of each agency for resolving wildlife conflicts in Florida.

United States Environmental Protection Agency

The EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which regulates the registration and use of pesticides. The EPA is also responsible for administering and enforcing the Section 404 program of the Clean Water Act with the United States Army Corps of Engineers; this established a permit program for the review and approval of water quality standards that directly affect wetlands.

II. COMPLIANCE

Several laws or statutes authorize, regulate, or otherwise would affect WS' activities. WS would comply with those laws and statutes and would consult with other agencies as appropriate. WS would comply with all applicable federal, State, and local laws and regulations in accordance with WS Directive 2.210. Those laws and regulations related to activities conducted to reduce mammal damage in the State are addressed below:

National Environmental Policy Act

All federal actions are subject to the NEPA (Public Law 9-190, 42 USC 4321 et seq.). WS follows CEQ regulations implementing the NEPA (40 CFR 1500 et seq.) along with USDA (7 CFR 1b) and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. These laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated in part by CEQ through regulations in 40 CFR, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS guidelines concerning Implementation of the NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

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

Endangered Species Act

Under the ESA, all federal agencies will seek to conserve T&E species and will utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "*any action authorized., funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency will use the best scientific and commercial data available*" (Sec.7 (a) (2)). Evaluation of the alternatives in regards to the ESA will occur in Chapter 4 of this EA.

Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods used or recommended by the WS' program in Florida would be registered with and regulated by the EPA and the FDACS and would be used by WS in compliance with labeling procedures and requirements.

National Historic Preservation Act of 1966, as Amended

The NHPA and its implementing regulations (36 CFR 800) require federal agencies to initiate the section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106. None of the mammal damage management methods described in this EA that might be used operationally by WS would cause major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the alternatives would not generally be the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources were planned under an alternative selected because of a decision on this EA, the site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

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

Native American Graves Protection and Repatriation Act

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

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 92-583, October 27, 1972; 86 Stat. 1280).

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity. As appropriate, a consistency determination would be conducted by WS to assure management actions would be consistent with the Commonwealth's Coastal Zone Management Program.

Invasive Species - Executive Order 13112

Executive Order 13112 establishes guidance to federal agencies to prevent the introduction of invasive species, provide for the control of invasive species, and to minimize the economic, ecological, and human health impacts that invasive species cause. The Order states that each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law: 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations and provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control and promote public education of invasive species.

Environmental Justice in Minority and Low Income Populations - Executive Order 12898

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 the Order is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. Environmental Justice is a priority within USDA, APHIS, and WS. APHIS plans to implement the order principally through compliance with the provisions of the NEPA.

WS' activities are evaluated for their impact on the human environment and compliance with the Order to ensure Environmental Justice. WS' personnel would us methods in as selective and environmentally conscious a manner as possible. All chemicals used by WS would be regulated by the EPA through FIFRA, FDACS, by MOUs with federal land management agencies, and by WS' Directives. The WS' operational program properly disposes of any excess solid or hazardous waste. WS' assistance is to provide on a request basis, in cooperation with state and local governments and without discrimination against people who are of low income or in minority populations. The nature of WS' damage management activities is such that they do not have much, if any, potential to result in the disproportionate environmental effects on minority or low-income populations. Therefore, no such adverse or disproportionate environmental impacts to such persons or populations are expected.

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

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. WS make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. WS has considered the impacts that this proposal might have on children. The proposed activities would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action. Additionally, the need for action identified a need to reduce threats to human safety, including risks to children; therefore, it would be expected that health and safety risks to children posed by mammals would be reduced under the alternatives.

Federal Food, Drug, and Cosmetic Act (21 USC 360)

This law places administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration.

Controlled Substances Act of 1970 (21 USC 821 et seq.)

This law requires an individual or agency to have a special registration number from the federal DEA to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994

The Animal Medicinal Drug Use Clarification Act and its implementing regulations (21 CFR 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in damage management programs. Those requirements are: (1) a valid "*veterinarian-client-patient*" relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under any alternative where WS could use those immobilizing and euthanasia drugs. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (*i.e*., a period after a drug is administered that must lapse before an animal may be used for food) for specific drugs. Animals that might be consumed by a human within the withdrawal period must be identified. WS establishes procedures in each state for administering drugs used in wildlife capture and handling that must be approved by state veterinary authorities in order to comply with this law.

Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "*Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected.*" This standard includes mammals that may cause safety and health concerns at workplaces.

Clean Water Act (Section 404)

Section 404 (33 USC 1344) of the Clean Water Act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the United States Army Corps of Engineers unless the specific activity is exempted in 33 CFR 323 or covered by a nationwide permit in 33 CFR 330. The breaching of most beaver dams is covered by these regulations (33 CFR 323 and 330).

Food Security Act

The Wetland Conservation provision (Swampbuster) of the 1985 (16 U.S.C. 3801-3862), 1990 (as amended by PL 101-624), and 1996 (as amended by PL 104-127) farm bills require all agricultural producers to protect wetlands on the farms they own. Wetlands converted to farmland prior to December 23, 1985 are not subject to wetland compliance provisions even if wetland conditions return because of lack of maintenance or management. If prior converted cropland is not planted to an agricultural commodity (crops, native and improved pastures, rangeland, tree farms, and livestock production) for more than 5 consecutive years and wetland characteristics return, the cropland is considered abandoned and then becomes a wetland subject to regulations under Swampbuster and Section 404 of the Clean Water Act.

Take of Wildlife on Airport Property in Florida

The FWC, under Rule 68A-9.012, allows wildlife to be addressed on airports without a need for a State permit, with some restrictions. Federally protected species may be addressed as permitted by a federal entity without the need for a State permit. For State listed species that are not federally protected, the Rule allows entities to harass persistently and to remove State listed species using lethal methods, except of the gopher tortoise. For all other wildlife, entities may lethally remove those individuals posing a threat of aircraft strikes at airports, except live-captured bobcats must be released on airport property or off site with the landowner's permission.

Permits to Take Wildlife or Freshwater Fish for Justifiable Purposes

The FWC under Rule 68A-9.002(1) F.A.C. "*...may issue permits authorizing the take or possession of wildlife...for scientific, educational, exhibition, propagation, management or other justifiable purposes.*" The take of nuisance wildlife can be authorized by the FWC pursuant to Rule 68A-9.010 F.A.C. which is discussed below.

Taking Nuisance Wildlife

The take of nuisance wildlife can occur under Rule 68A-9.010 F.A.C which states "[a]*ny person owning property may take nuisance wildlife or they may authorize another person to take nuisance wildlife on their behalf...*". The FWC may "*...authorize...additional methods of take for justifiable purposes by permit issued pursuant to Rule 68A-9.002, F.A.C*".

Wildlife are considered a nuisance when causing (or about to cause) property damage, presents a threat to public safety, or causes an annoyance within, under or upon a building. When beaver are causing damage or about to cause damage, the take of beaver without a permit from the FWC is authorized under Rule 68A-9.010 F.A.C.

Methods of Taking Fur-Bearing Animals and Nuisance Wildlife

Under Florida Administrative Code (F.A.C.) (68A-24.002(3) F.A.C.), "*no person shall use, place, or maintain any...steel trap for the purpose of taking or attempting to take wildlife*". Under Rule 68A-9.010(2)(b) F.A.C, steel traps cannot be used to take nuisance wildlife. However, the FWC can authorize the use of steel traps for the take of destructive wildlife through the issuance of permits (Rule 68A-9.010 F.A.C), including the take of beaver to alleviate or prevent damage. WS' use of steel-jawed traps to alleviate beaver damage will occur only after a permit has been issued by the FWC for such purposes. If a permit is not issued to WS, WS will not employ steel-jawed traps for alleviating beaver damage.

APPENDIX E

CRITERIA FOR BEAVER DAM BREACHING/REMOVAL

Beaver dam breaching is generally conducted to maintain existing stream channels and drainage patterns, and reduce floodwaters. Beaver dams are made from natural debris such as logs, sticks, and mud that beaver take from the area. This portion is dislodged during a beaver dam breaching operation. The impoundments that WS removes are normally from recent beaver activity and have not been in place long enough to take on the qualities of a true wetland (*i.e*., hydric soils, aquatic vegetation, preexisting function). Beaver dam breaching by hand does not affect the substrate or the natural course of the stream and returns the area back to its preexisting condition with similar flows and circulations.

Wetlands are recognized by three characteristics: hydric soils, hydrophytic vegetation, and general hydrology. Hydric soils either are composed of, or have a thick surface layer of, decomposed plant materials (muck); sandy soils have dark stains or streaks from organic material in the upper layer where plant material has attached to soil particles. In addition, hydric soils may be bluish gray or gray below the surface or brownish black to black and have the smell of rotten eggs. Wetlands also have hydrophytic vegetation present such as cattails, bulrushes, willows, sedges, and water plantains. The final indicator is general hydrology which includes standing and flowing water or waterlogged soils during the growing season; high water marks are present on trees and drift lines of small piles of debris are usually present. Beaver dams usually will develop a layer of organic material at the surface because siltation can occur rapidly, but aquatic vegetation and high water marks (a new high water mark is created by the beaver dam) are usually not present. However, cattails and willows can show up rapidly if they are in the vicinity, but most hydrophytic vegetation takes time to establish.

Federal Regulations- U.S. Army Corps of Engineers

Under Section 404 of the Clean Water Act (CWA), the Corps of Engineers regulates all Waters of the U.S. Because beaver dams involve waters of the United States, dam breaching is regulated under Section 404 of the CWA. In most beaver dam breaching operations, the material that is displaced is exempt from permitting or included in a Nationwide Permit (NWP) in accordance with Section 404 of the CWA (33 CFR Part 323). A permit would be required if the impoundment caused by a beaver dam was not covered under a NWP or permitting exemption and was considered jurisdictional based on the Corps of Engineers 1987 Delineation Manual. WS personnel would survey the beaver dam site and impoundment and determine whether conditions exist suggest that the area may be a wetland as defined above. If such conditions exist, the landowner is asked the age of the dam or how long he/she has known of its presence to determine whether Swampbuster, Section 404 permit exemptions, or NWPs allow breaching of the dam. If not, the landowner is required to obtain a Section 404 permit before the dam could be removed by WS personnel.

The following explains Section 404 exemptions and conditions that pertain to the breaching of beaver dams and are WS interpretation of the Nationwide Permits.

33 CFR 323 - Permits For Discharges of Dredged or Fill Material into Waters of the United States. This regulation provides guidance to determine whether certain activities require permits under Section 404.

Part 323.4 Discharges not requiring permits. This section establishes exemptions for discharging certain types of fill into waters of the United States without a permit. Certain minor drainage activities connected with normal farming, ranching, and silviculture activities where they have been established do not require a permit as long as these drainages do not include the immediate or gradual conversion of a wetland (*i.e*., beaver ponds greater than 5 years old) to a non-wetland. Specifically, part (a)(1)(iii)(C)(i) states, "...*fill* *material incidental to connecting upland drainage facilities (e.g., drainage ditches) to waters of the United States, adequate to effect the removal of excess soil moisture from upland croplands*...". This indicates that beaver dams that block ditches, canals, or other structures designed to drain water from upland crop fields can be breached without a permit.

Moreover, (a)(1)(iii)(C)(iv) states the following types of activities do not require a permit "*The discharges of dredged or fill materials incidental to the emergency removal of sandbars, gravel bars, or other similar blockages which are formed during flood flows or other events, where such blockages close or constrict previously existing drainage ways and, if not promptly removed, would result in damage to or loss of existing crops or would impair or prevent the plowing, seeding, harvesting or cultivating of crops on land in established use for crop production. Such removal does not include enlarging or extending the dimensions of, or changing the bottom elevations of, the affected drainage way as it existed prior to the formation of the blockage. Removal must be accomplished within one year of discovery of such blockages in order to be eligible for exemption*."; this allows the breaching of beaver dams in natural streams to restore drainage of agricultural lands within one year of discovery.

Part 323.4 (a) (2) allows "*Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs in order to qualify for this exemption*."; this allows beaver dams to be breached without a permit where they have resulted in damage to roads, culverts, bridges, or levees if it is done in a reasonable amount of time.

33 CFR 330 **-** Nationwide Permit (NWP) Program. The United States Army Corps of Engineers, Chief of Engineers is authorized to grant certain dredge and fill activities on a nationwide basis if they have minimal impact on the environment. The NWPs are listed in Appendix A of 33 CFR 330 and permittees must satisfy all terms and conditions established to qualify for their use. Individual beaver dam breaching by WS may be covered by any of the following NWPs if not already exempted from permit requirements by the regulations discussed above. WS complies with all conditions and restrictions placed on NWPs for any instance of beaver dam breaching done under a specific NWP.

Nationwide permits can be used except in any component of the National Wild and Scenic River System such as waterways listed as an "*Outstanding Water Resource*", or any waterbody, which is part of an area designated for "Recreational or Ecological Significance".

NWP 3 authorizes the rehabilitation of those structures, such as culverts, homes, and bridges, destroyed by floods and "*discrete events*," such as beaver dams, if the activity is commenced within 2 years of the date when the beaver dam was established.

NWP 18 allows minor discharges of dredged and fill material, including the breaching of beaver dams, into all waters of the United States provided that the quantity of discharge and the volume of excavated area does not exceed 10 cubic yards below the plane of the ordinary high water mark (this is normally well below the level of the beaver dam) or is in a "*special aquatic site*" (wetlands, mudflats, vegetated shallows, riffle and pool complexes, sanctuaries, and refuges). The District Engineer must be "*notified*" (general conditions for notification apply), if the discharge is between 10-25 cubic yards for a single project or the project is in a special aquatic site and less than 1/10 of an acre is expected to be lost. If the values are greater than those given, a permit is required. Beaver dams rarely would exceed 2 or 3 cubic yards of backfill into the waters and probably no more than 5 cubic yards would ever be exceeded. Therefore, this stipulation is not restrictive. Beaver dams periodically may be breached in a special aquatic area, but normally the aquatic site will be returned to normal. However, if a true wetland exists, and beaver dam breaching is not allowed under another permit, then a permit must be obtained from the District Engineer.

NWP 27 provides for the discharge of dredge and fill for activities associated with the restoration of wetland and riparian areas with certain restrictions. On non-federal public and private lands, the owner must have: a binding agreement with USFWS or NRCS to conduct restoration; a voluntary wetland restoration project documented by NRCS; or notify the District Engineer according to "notification" procedures. On federal lands, including United States Army Corps of Engineers and USFWS, wetland restoration can take place without any contract or notification. This NWP "*...applies to restoration projects that serve the purpose of restoring "natural" wetland hydrology, vegetation, and function to altered and degraded non-tidal wetlands and "natural" functions of riparian areas. This NWP does not authorize the conversion of natural wetlands to another aquatic use*..." If operating under this permit, the breaching of a beaver dam would be allowed as long as it was not a true wetland (*i.e*., 5 or more years old), and for non-federal public and private lands the appropriate agreement, project documentation, or notification is in place.

A quick response immediately resulting from permitting requirements can be critical to the success of minimizing or preventing damage. Exemptions contained in the above regulations or NWPs provide for the breaching of the majority of beaver dams that Florida WS encounters. The primary determination that must be made by WS personnel is whether a beaver impounded area has become a true wetland or is just a flooded area. The flexibility allowed by these exemptions and NWPs is important for the efficient and effective resolution of many beaver damage problems because damage escalates rapidly in many cases the longer an area remains flooded

State of Florida Permit Exemptions

Existing Culverts and Other Existing Drainage Systems

WS maintaining or returning water flow to an existing system by removing debris (beaver dam) placed by beaver, would be defined as "*routine custodial maintenance*" of said culvert and be exempt from permit by DEP under 62-346.050 and 62-346.051

62-346.050 Permits Required.
(1) Unless an activity qualifies for an exemption under Rule 62-346.051,
F.A.C., or a noticed general permit under Chapter 62-341, F.A.C., an individual permit under this chapter must be obtained from the Department prior to the construction, alteration, operation maintenance or repair (*excluding routine custodial maintenance*), abandonment, or removal of a stormwater management system.

62-346.051 Exemptions from Permitting.
(7) Maintenance and Restoration of Systems (d) Operation and routine custodial maintenance of activities legally in existence, provided the terms and conditions of the permit, exemption, or other authorization for such activities continue to be met, and provided the work is conducted in a manner that does not cause violations of water quality standards. However, this exemption shall not apply to any activity that is altered, modified, expanded, abandoned, or removed.

Agriculture and Silviculture

Beaver dam removal activities conducted by WS on agricultural or forestry lands may be exempt from permit under Florida Administrative Code 40A, 40B, or 40C. For any beaver dams that may meet these criteria, WS would contact the appropriate Water Management District office for guidance.

Summary

Wetland and water quality regulations within Florida are complex and in many cases subjective. Some beaver dams that WS would remove clearly fall under one of the listed exemptions. In situations where permit exemption is questionable, WS will contact the appropriate FDEP and/or Water Management District office for guidance. In most instances, Florida state laws and regulations are more restrictive than federal regulation. If the appropriate state agency recommends that the Army Corp of Engineers be contacted on a particular issue, WS will do so.