ENVIRONMENTAL ASSESSMENT

MAMMAL DAMAGE MANAGEMENT IN MARYLAND AND WASHINGTON D.C.

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SUMMARY

Maryland's wildlife has many positive values and is an important part of life in the state. However, as human populations expand, and land is used for human needs, there is increasing potential for conflicting human/wildlife interactions. This Environmental Assessment (EA) analyzes the potential environmental impacts of alternatives for United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) involvement in the reduction of conflicts by mammals in Maryland, including damage to property, agricultural and natural resources, and risks to human and livestock health and safety. The proposed wildlife damage management activities could be conducted on public and private property in Maryland when the property owner or manager requests assistance and/or when assistance is requested by an appropriate state, federal, tribal or local government agency.

The preferred alternative considered in the EA, would be to continue and expand the current Integrated Wildlife Damage Management (IWDM) program in Maryland. The IWDM strategy encompass the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational assistance including non-lethal and lethal management methods, as described in the WS Decision Model (Slate et al. 1992). When appropriate, non-lethal methods like physical exclusion, cultural practices, habitat modification, repellents or harassment would be recommended and utilized to reduce damage. In other situations, mammals would be removed as humanely as possible using shooting, trapping, snare/cable restraints, or registered euthanasia drugs. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy. Other alternatives examined in the EA include an alternative in which WS does not become involved in mammal damage management (MDM), and an alternative in which WS is restricted to the use and recommendation of only non-lethal MDM methods (Chapter 3). WS involvement in mammal damage management in Maryland is closely coordinated with the Maryland Department of Natural Resources (MDNR) and all WS activities are conducted in accordance with applicable state, federal, and local laws and regulations.

The EA provides a detailed analysis of the impacts of each alternative on target mammal populations, non-target species including state and federally-listed threatened and endangered species, human health and safety, humaneness of the alternatives used, impacts on stakeholders, including impacts on aesthetic values, and impacts on regulated harvest of mammals.

ACRONYMS

AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CDC	Center for Disease Control
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWD	Chronic Wasting Disease
DEA	Drug Enforcement Administration
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
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FMIA	Federal Meat Inspection Act
FY	Fiscal Year (October 1, XXXX – September 30, XXXX)
IWDM	Integrated Wildlife Damage Management
MDA	Maryland Department of Agriculture
MDHMH	Maryland Department of Health and Mental Hygiene
MDM	Mammal Damage Management
MDNR	Maryland Department of Natural Resources
MIS	Management Information System
MOU	Memorandum of Understanding
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NHPA	Natural Historic Preservation Act
NWRC	National Wildlife Research Center
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Department of the Interior, Fish and Wildlife Service
WDM	Wildlife Damage Management
WS	Wildlife Services
WWHC	Western Wildlife Health Committee

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CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with the needs of wildlife which increases the potential for conflicting human/wildlife interactions. This Environmental Assessment (EA) evaluates the potential environmental effects of alternatives for WS involvement in mammal damage management (MDM) in Maryland.

Wildlife damage management (WDM) is the science of reducing damage or other problems associated with wildlife, and is recognized as an integral part of wildlife management (The Wildlife Society 2010). The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program is the federal agency authorized to protect American resources from damage associated with wildlife (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)). Human/wildlife conflict issues are complicated by the wide range of public responses to wildlife and wildlife damage. What may be unacceptable damage to one person may be a normal cost of living with nature to someone else.

WS' activities are conducted upon request from an entity to prevent or reduce wildlife damage to agricultural, industrial, natural resources, property, livestock, and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, tribes, private organizations, and individuals. The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (WS Directive 2.105[1]) in which a combination of methods may be used or recommended to reduce wildlife damage. These methods may include non-lethal techniques like alteration of cultural practices, habitat management, repellents, frightening devices, and physical exclusion to prevent or reduce damage. The reduction of wildlife damage may also require removal of individual animals, reducing the local animal populations through lethal means. In some instances, the goal may be to eradicate an invasive species. Program activities are not based on punishing offending animals but are conducted to reduce damage and risks to human and livestock health and safety, and are used as part of the WS Decision Model (Slate et al. 1992).

WS is a cooperatively funded, service-oriented program that receives requests for assistance with wildlife damage management from private and public entities, including tribes and other governmental agencies. As requested, WS cooperates with land and wildlife management agencies to reduce wildlife damage effectively and efficiently in accordance with applicable federal, state, and local laws and Memoranda of Understanding (MOUs) between WS and other agencies.

WS chose to prepare this EA to facilitate planning, interagency coordination and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts. WS is preparing a state-level programmatic EA as wild mammals are regulated by the state, and therefore, the best available data is often provided at the statewide level rather than a local or county basis.

[1] The WS Policy Manual (http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml) provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

1.1 PURPOSE OF THIS EA

This EA addresses and evaluates the potential impacts on the human environment from alternatives for WS involvement in the protection of agricultural and natural resources, property, livestock, and public health and safety from damage and risks associated with mammals in Maryland. Under the Proposed Action, MDM could be conducted on private, federal, state, county, and municipal lands upon request. Several mammal species have potential to be the subject of WS MDM activities including raccoons (*Procyon lotor*), red foxes (*Vulpes vulpes*), gray foxes (*Urocyon cinereoargenteus*, striped skunks (*Mephitis mephitis*), woodchucks (*Marmota monax*), beavers (*Castor canadensis*), muskrats (*Ondatra zibethica*), Virginia opossums (*Didelphis virginianus*), coyotes (*Canis latrans*), feral swine (*Sus scrofa*) white-tailed deer (*Odocoileus virginianus*), feral dogs (*Canis lupus*), feral cats (*Felis catus*), and miscellaneous small mammals, such as insectivores (shrews and moles) and rodents (mice, rats, and voles). This EA will also address limited management of mink (*Mustela vison*), bobcats (*Lynx rufus*), river otters (*Lontra Canadensis*), Eastern gray squirrels (*Sciurus carolinensis*), Eastern fox squirrels (*Sciurus niger*), red squirrels (*Tamiasciurus hudsonicus*), and weasels.

The issues and alternatives associated with mammal damage management were initially developed by WS with review by the consulting agencies. Consulting agencies assisted with the identification of additional issues and alternatives pertinent to managing damage associated with mammals. This EA will be made available to the public for review and comment prior to the issuance of a decision regarding the alternative to be implemented and its environmental impacts.

1.2 NEED FOR ACTION

Conflicts between humans and wildlife are common in Maryland. WS has a long history of partnering with Maryland Department of Natural Resources (MDNR) and other agencies and cooperators on a wide variety of wildlife species causing damage to numerous resources (USDA 2013). WS and the MDNR receive requests for assistance with wildlife damage from the public, and state, federal and local government agencies. Comprehensive surveys of mammal damage in Maryland have not been conducted, but WS does maintain a Management Information System (MIS) database to document assistance that the program provides. Table 1.1 summarizes technical assistance projects (advice/recommendations) completed by WS for Fiscal Years (FY) 2009-2013 for species covered by this EA. MIS data are limited to information that is collected from people who have requested services or information from WS. The data does not include requests received or responded to by local, state or other federal agencies or private companies. Consequently, the number of requests for assistance to WS does not reflect the full extent of need for action, but does provide an indication that needs exists.

The MDNR has management responsibility for resident mammals and conducts mammal management programs for furbearers, game species, and non-game mammals. The MDNR provides technical assistance and issues damage management permits, but rarely provides any operational assistance. WS potential involvement in the area of mammal damage management would be to provide basic recommendations, refer callers to the MDNR or private pest control companies as appropriate, or to provide direct management assistance with the implementation of mammal damage management programs upon request and as permitted or otherwise authorized by the MDNR. To date, some examples of operational programs conducted by WS have included mammal hazard management at airports, protection of property, equipment, and natural resources from damage by mammal burrowing or habitat modification activities, health and safety concerns due to transmission of wildlife disease or aggressive behavior to humans, livestock, or pets, and damage to crops. Additionally, WS cooperates with state and federal agencies to assess and manage disease risks involving wild and feral mammals and captive

wildlife. WS has provided information on species discussed to interested parties through over 30,345 technical assistance contacts during FY 2009-2013 (Table 1.1).

Table 1.1 WS' Technical assistance projects conducted in Maryland FY 2009 - FY 2013.

Species	Total	Species	Total
beavers	453	**mink**	7
bobcats	55	**moles**	41
coyotes	717	**muskrats**	56
Eastern chipmunk	124	**raccoons**	8878
Eastern cottontail	556	**red foxes**	6842
Eastern gray squirrels	2937	**river otters**	8
feral cats	63	**striped skunks**	691
feral dogs	3	**Virginia opossums**	1600
gray foxes	63	**voles**	18
woodchucks	5492	**weasels (all)**	8
mice (all)	43	**white-tailed deer**	1690
		Total	30,345

As shown in Table 1.2 damages to property, natural resources, human safety and agricultural resources associated with mammals that have been protected by WS and have totaled $1,589,419 between FY 2009 and FY 2013. Although monetary damages to human safety have been reported and verified by WS, requests for assistance often address threats that mammals can pose to human safety for which monetary losses are difficult to determine. For human safety, requests for WS' assistance have often been received to reduce the threat of disease transmission and the threat of aircraft striking mammals at airports.

Table 1.2 Resource types damaged by those mammal species addressed for FY2009 – FY2013

Species	Resource[a]				Species	Resource			
	A	N	P	H		A	N	P	H
beavers	X	X	X	X	**mink**	X		X	X
bobcats	X			X	**moles**			X	
coyotes	X	X	X	X	**muskrats**		X	X	X
Eastern chipmunk	X		X	X	**raccoons**	X	X	X	X
Eastern cottontail	X		X	X	**red foxes**	X	X	X	X
Eastern gray squirrels	X	X	X	X	**river otters**			X	X
feral cats			X	X	**striped skunks**	X		X	X
feral dogs	X			X	**Virginia opossums**	X		X	X
feral swine	X		X	X	**voles**	X		X	X
gray foxes	X		X	X	**weasels (all)**	X		X	
woodchucks	X		X	X	**white-tailed deer**	X	X	X	X
mice (all)			X	X					

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

Most requests for assistance received by WS involving threats to human safety arise from the risks associated with disease transmission in areas where the public may encounter mammals. Additional requests result from concerns over aircraft or vehicle strikes. Aircraft striking mammals can cause catastrophic failure of the aircraft, which has the potential to threaten passenger safety. The difficulties of placing a monetary value on reducing threats to human safety and natural resources are similar. The damages reported to or verified by WS are likely only a portion of the actual damages occurring in the state since those damages reported to or verified by WS are based only on requests for assistance received by WS.

1.2.1 Need for Mammal Damage Management to Protect Human Health and Safety

Human health and safety concerns and problems associated with mammals include, but are not limited to, the potential for transmission of zoonotic diseases to humans, mammal hazards at airports, and risks and actual instances of mammals injuring humans.

Zoonotic Diseases

Zoonotic diseases are diseases of animals which are communicable to humans. Some of the wild and feral mammals may carry disease causing organisms or parasites including viruses, bacteria, fungi, protozoans and rickettsial organisms which pose a risk to humans (Table 1.3). With the exception of arthropod-borne pathogens, disease transmission from wildlife to humans is uncommon with few documented occurrences. However, the infrequency of such transmission does not diminish the concerns of individuals requesting assistance that are fearful of exposure to a diseased animal because disease transmissions have been documented to occur. Usually, MDM is requested because of a perceived risk to human health or safety associated with wild animals living near humans, from animals acting out of character in human-inhabited areas during the day, or showing no fear when humans are present. 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. It is the goal of agricultural and human health programs to prevent disease/illness from occurring. It is the choice of the individual cooperator to tolerate the potential health risks or to seek to reduce those risks.

WS primary involvement in the management of zoonotic diseases would be to aid other governments and research entities in monitoring for the presence or absence of diseases in wildlife and advise on risk reduction methods. These data can be used to predict potential risks to human health and safety and aid agencies in directing management efforts. Most disease sampling occurs 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 could sample feral hogs taken by hunters or during damage management activities to test for toxoplasmosis, swine brucellosis, or other diseases. In the unlikely event of a disease outbreak or an imminent realistic threat of an outbreak, WS could also be asked to conduct localized wildlife population reduction or removal of captive wildlife to prevent spread of disease to other areas.

This section includes examples of zoonotic diseases for which WS could provide surveillance or management assistance. This discussion on zoonoses is intended to briefly address the more common known zoonoses 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 diseases. 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. Consequently, this list is not all-inclusive and new diseases may be identified in the future or may be introduced from foreign countries.

Table 1.3 Wildlife Diseases That Pose Potential Human Health Risks in the United States (modified from Davidson and Nettles 2006).

Disease	**Causative Agent**	**Hosts**
Anthrax	bacterium (*Bacillus antracis*)	cattle, sheep, horses, swine, white-tailed deer, dogs, cats
Dermatophilosis	bacterium (*Dermatophilus congolensis*)	mammals (wild and domestic)
Demodectic mange	mange mite (*Demodex odocoilei*)	white-tailed deer
Sarcoptic mange	mite (*Sarcoptes scabiei*)	red foxes, coyotes, domestic dogs
Swine brucellosis	bacterium (*Brucella suis*)	swine
Trichinosis	nematode (*Trichinella spiralis*)	swine, raccoons, foxes, rats
Rabies	virus (Rhabidovirus)	all mammals (high risk wildlife: raccoons, foxes, skunks, bats)
Visceral larval migrans	nematode (*Baylisascaris procyonis*)	raccoons
Leptospirosis	bacteria (*Leptospira interrogans*) over 180 different serovars	all mammals

Echinococcus infection	tapeworm (*Echinococcus multilocularis*)	foxes, coyotes
Bovine brucellosis	bacterium (*Brucela abortus*)	cattle & captive bison(evidence from Texas that organism has infected coyotes that scavenged aborted fetuses and placentas of infected cattle)
Toxoplasmosis	protozoan parasite (*Toxoplasma gondii*)	cats, such as bobcats, are definitive hosts, mammals and birds are intermediate hosts
Spirometra infection	tapeworm, (*Spirometra mansonoides*)	bobcats, raccoons, foxes, dogs, cats
Murine typhus	bacteria (*Rickettsia mooseri* = R. typhi)	rats, mice, as hosts for primary flea, louse or mite host
Giardiasis	protozoan parasite (*Giardia lambia, G. duodenalis*, and other *Giardia* sp.-taxonomy controversial)	beavers, coyotes, dogs, cats
Hantavirus Pulmonary Syndrome	Hantaviruses	rodents
Tularemia	Bacterium	rodents, rabbits, hares
Histoplasmosis	fungus (*Histoplasma capsulatum*)	fungus occurs in bat guano
Lyme Disease	spirocheate (*Borelia burgdorferi*)	rodents
Plague	*Yersinia pestis*	rodents
Rocky Mountain Spotted Fever	bacterium *(Rickettsii rickettsia)*	dogs and rodents

Tularemia, also known as "rabbit fever", is a disease caused by the bacterium *Francisella tularensis* (CDC 2013a). Tularemia typically infects animals such as rodents, rabbits, and hares. Usually, people become infected through the bite of infected ticks or tabanid flies, by handling infected sick or dead animals, by eating or drinking contaminated food or water, or by inhaling airborne bacteria. About 120 human cases of tularemia are reported each year in the U.S (CDC 2013a). Most cases occur in the southcentral and western states; however cases have been reported in every state except Hawaii. Without treatment with appropriate antibiotics, tularemia can be fatal (CDC 2003). The causative agent of tularemia is one of the most infectious pathogenic bacteria known, requiring as few as 10 organisms to cause disease. The Working Group on Civilian Biodefense considers tularemia to be a dangerous potential biological weapon because of its extreme infectivity, ease of dissemination, and substantial capacity to cause illness and death (Dennis et al. 2001). Many wild animal species may be infected (hares, rabbits, squirrels, muskrats, beavers, deer), and occasionally certain domestic animals can also be infected (sheep and cats). The rabbit is the species most often involved in disease outbreaks. The bacteria can also be found in ticks and deerflies. Tularemia in humans is relatively rare in Maryland, with only seven cases identified between 2003 and 2013 (CDC 2013a), and rarely occurs in wildlife.

Tick Borne Diseases. Numerous tick borne diseases have been documented as occurring in Maryland including Lyme disease, ehrlichiosis, Rocky Mountain spotted fever, and babesiosis (MDHMH 2014).

Lyme disease is the most prevalent and has been documented in every county within the state with 16,694 cases confirmed or probable between 2003 and 2013 (MDHMH 2014). The tick infests a wide variety of animals, but is most commonly found on meadow voles, mice, and deer. Rocky Mountain spotted fever is the second most occurring tick-borne disease in Maryland (MDHMH 2014).

Foreign Animal Diseases. International trade and travel and the popularity of exotic pets have resulted in an ongoing risk of foreign animal disease introduction. In some cases, these diseases may be transmissible to humans. For example, 39 individuals in Wisconsin and 42 individuals in five other midwestern states were reported as having contracted monkeypox from pet prairie dogs and/or other exotic rodents in 2003 (CDC 2009a). Symptoms of monkeypox in humans included fever, cough, rash and swollen lymph nodes. The prairie dogs were believed to have contracted the disease from African rodents imported for sale as pets. As part of the investigation of the incident, WS was requested to conduct surveillance in wild rodent populations around the residences of individuals with infected prairie dogs to see if native rodents had been exposed to the virus. In the event of a foreign animal disease outbreak in Maryland, WS could be requested to provide similar assistance and/or aid USDA Veterinary Services or state animal and human health authorities in the management of animals involved in the outbreak.

Diseases Associated with Feral Animals. 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 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 at all times but are allowed to range for extended periods of time. Those companion animals are likely to encounter and become exposed to a wide-range of zoonoses that are brought back into the home upon return where direct contact with humans increases the likelihood of disease transmission, especially if interactions occur between companion animals and feral animals of the same species. Feral animals that are considered companion animals are also likely to impact 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. Feral animals are also more likely than wildlife to be approached and handled by humans, increasing the potential for exposure to traditional wildlife diseases. Because the public may not know the animal is feral or feels that they need to care for a sick feral domestic animal increases exposure potential.

Several known diseases that are infectious to humans, including rabies, have been found in feral cats. Maryland had 71 confirmed positive rabies cases in cats from 2011-2014 (MDHMH 2014a). Another common zoonoses 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 (Gerhold 2011).

Most of the zoonoses known to infect cats 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. Gerhold (2011) and Gerhold and Jessup (2012) reviewed many of the risks that feral cats pose to human populations. It is well documented that 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).

Feral swine are potential reservoirs for at least 30 viral and bacterial diseases (Davidson 2006, Samuel et al. 2001, Williams and Barker 2001) 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). Infection may result from direct exposure to swine by handling carcasses (CDC 2009b), through contamination of food crops (California Food Emergency Response Team 2007), or through secondary infection of a third host (West et al. 2009). When diseases are transmitted through a third host, feral swine transmit the diseases to other wild mammals, birds, and reptiles, which in turn may transmit them to domestic livestock or humans. 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 may act as reassortment vessels for such viruses as the highly pathogenic H5N1 influenza virus found throughout Europe, Asia, Africa and the Middle East (Hutton et al 2006). The reassortment of viruses could lead to new strains of influenza viruses that would become easily transferrable from mammals to humans (Brown 2004). Hutton et al. (2006) stated that feral swine can be the location for the reassortment of the H5N1 virus into a virus that is easily transmitted from human to human. Although incidence of disease transmission from feral swine to humans is relatively uncommon, some diseases like brucellosis, tuberculosis and tularemia can be fatal.

Mammal Hazards to Public Safety at Airports

Airports provide ideal conditions for many wildlife species due to the large grassy areas adjacent to brushy, forested habitat used as noise barriers. Access to most airport properties is restricted; so wildlife living within airport boundaries are protected during regulated hunting and trapping seasons and are 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 et al. 2012). Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety, result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996). Aircraft collisions with wildlife can also erode public confidence in the air transport industry as a whole (Conover et al. 1995).

Maryland has more than 36 public use airports, three of which are subject to Federal Aviation Administration (FAA) Federal Aviation Regulations Part 139. Airports that are certified under Part 139 are designated based on the size of passenger aircraft that use the airport. This more typically includes larger airports with commercial service. Part 139 airports are held to a much higher standard to reduce wildlife strikes to be able to maintain their certification. Although a greater number of wildlife strikes with aircraft involve birds, mammals are also considered serious hazards. Although deer have been found to be the most significant mammal hazard at airports, numerous other mammal species pose threats to safety and aviation (Dolbeer et al. 2012). Foxes, skunks, opossums, and raccoons often venture onto airfields and become a direct threat to planes both landing and taking off. Although rare visitors, more rural airfields may deal with black bears which pose a strike risk or risk to human safety if encountered by airport personnel. Other mammals which pose hazards to aircraft and public safety include woodchucks, muskrat, and beaver, which can pose a direct strike hazard, modify habitats attracting other strike risk species, or damage equipment at the airport. Species such as rabbits and small rodents (mice and voles) can also damage equipment, cause strike risks or act as prey for mammalian and avian predators compounding strike risks.

WS assists airports in Maryland with the management of wildlife problems including the removal of mammals from the airfields, under buildings, and from common areas where people work or congregate. WS commonly follows procedures recommended in the "Wildlife Hazard Management at Airports: a Manual for Airport Personnel" (Cleary et al 2005). Airports throughout Maryland have reported a total of 52 mammal strikes from 2005 to 2015, involving four different species of terrestrial mammals (FAA 2015). It is estimated that only 20 to 25% of all bird strikes are reported (Conover et al. 1995, Dolbeer et al. 2012, Linnell et al. 1996, Linnell et al. 1999), and it's likely that mammal strikes are also underreported, especially if they involve smaller mammal species. Consequently, the number of mammal strikes in Maryland is most likely much higher than FAA records indicate. In 2013, a white-tailed deer was reported to be hit by a Cirrus SR 20/22 Washington Executive Airport at Hyde Field.

WS has an ongoing relationship with the Maryland Aviation Administration (MAA) to provide assistance with wildlife threats to aviation at Baltimore-Washington International Airport (BWI) which began in 2002. From 2003 - 2012, there was one deer-aircraft strike causing minor to significant damage to aircraft at BWI. WS provides both technical and operational assistance at BWI to alleviate conflicts associated with white-tailed deer. Methods used include providing input on airport development and landscaping projects, providing input on fencing options to exclude deer from the movement areas, training airfield personnel in hazardous wildlife identification and abatement measures, and managing hazardous animals on the airfield. As a result of this ongoing program, the threats to aviation safety have been significantly reduced.

Other Mammal Hazards to Public Health and Safety

In addition to the threat from disease transmission, requests are also received for assistance from a perceived threat of physical harm from wildlife, especially from predatory wildlife (Conover 2002, Adams et al. 2006). WS may be requested to provide assistance with reduction of risk of bites and injuries from animals that appear to have lost their fear of humans and/or are behaving aggressively toward people.

Human encroachment into wildlife habitat increases the likelihood of human-wildlife interactions. 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 urban areas often increases the survival rates and carrying capacity of wildlife species that are adaptable to those habitats (Adams et al. 2006). Often the only limiting factor of wildlife species in and around urban areas 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 seemingly unlimited amount of food, water, and shelter found within urban habitats.

As people are increasingly living with wildlife, the lack of harassing and threatening behavior by humans toward many species of wildlife, especially around urban areas, has led to a decline in the fear wildlife have toward humans. 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. Threatening behavior can be in the form of aggressive posturing, a general lack of apprehension toward humans, or abnormal behavior. Though wildlife attacking humans occurs rarely, the number of attacks appears to be on the increase. The concern of wildlife attack or aggressive behavior of wildlife towards pets is a topic that is common in many areas of Maryland, both urban and rural. In many cases, the perception that there is a danger of attack is simply because the public is seeing a species they are unfamiliar with.

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. For example, 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, individuals 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.

Deer-vehicle collisions are a serious concern nationwide because of the potential for human injury and death (Conover 1997, Conover et al. 1995, Romin and Bissonette 1996). Conover et al. (1995) estimated that more than one million deer-vehicle collisions occur annually in the United States, resulting in 29,000 human injuries and 211 human fatalities.

Emergency Response Efforts

Both large-scale natural disasters (e.g., hurricanes, tornadoes, and floods) and small-scale localized emergencies (e.g., release of exotic animals, oil spills, traffic accidents involving animal transport vehicles) may occur in which WS' personnel could be requested to assist federal, state, and local governments in charge of responding to those situations. Those requests for assistance would be on extremely short notice and rare emergencies that would be coordinated by federal, state, and local emergency management agencies. For example, WS' personnel may be requested to participate in the lethal removal of swine that were injured or were released from their transport vehicle at the scene of an accident to prevent those animals from endangering other drivers. In another example, WS' personnel may be requested to assist local and state law enforcement in immobilization or lethal control of exotic animals that have escaped due to unforeseen circumstances.

1.2.2 Need for Mammal Damage Management to Protect Agricultural Resources

Maryland is an agricultural state with 12,400 farms and over 2 million acres in farm production (NASS 2013). Maryland's market value of agricultural products sold was estimated to be about $2,271,397 in 2012 (NASS 2013). Livestock and dairy production in Maryland contribute substantially to the state's economy. As of January 2014, there were an estimated 280,000 head of beef and dairy cattle (including calves) on Maryland farms (NASS 2013). In 2013, Maryland's milk cows produced 972 million pounds of milk (NASS 2013). Additionally in 2013, an estimated 77,375 turkeys, 22,000 hogs, and 14,800 goats were on Maryland farms (NASS 2013). The state produces many agricultural commodities such as fruit crops (apples and peaches), corn, grains, potatoes, and hay (NASS 2013).

The MDNR and WS receive requests for assistance from citizens experiencing agricultural damage caused by mammals, including, but not limited to the following: 1) predation on livestock (including poultry) 2) threat and occurrence of damage to crops and stored feed and 3) risk of disease transmission. WS could conduct and assist in management efforts with various mammals, coordinated by or with the MDNR, MDA, USDA/APHIS/Veterinary Services (VS) and/or other federal, state, and local agencies, to study, monitor and/or control the occurrence and spread of animal diseases to protect livestock and other

agricultural resources. WS may also be asked to assist with management of animals housed at enclosed hunting facilities that pose a threat to agricultural resources. Feral swine are a common species found at facilities, and diseases identified in animals housed at the site may pose threats to other species within the enclosure or livestock on adjacent lands or with property damage from escaped stock.

Damage to Agricultural Products

Damage to crops by mammal species is a concern to the agricultural community. Species such as raccoons, deer, groundhog, and feral swine can cause significant damage to crops. WS provides technical assistance related to these damage events and refers many to the MDNR for assistance in obtaining permits. At the request of landowners or cooperating agencies, WS may respond to requests for assistance if necessary. Woodchucks (commonly referred to as groundhogs) are routinely reported to cause damage to field crops such as row and forage crops, orchards, nursery plants, and commercial gardens. Cottontail rabbits and voles are reported to damage orchard trees by gnawing at the base of the tree. Trees are badly damaged or the bark is girdled and trees die when feeding by rabbits and voles is severe. Similar damage occurs in nurseries, which grow landscape ornamentals and shrubs.

Raccoons commonly feed on a variety of garden and agricultural crops. DeVault et al. (2007) reported 87% of the crop depredation in northern Indiana was attributed to raccoons. The majority of raccoon damage to corn crops occurs during the milk stage of maturity as the plants are pulled down and the ears are fed upon. Cornfields are frequently interspersed among forests and waterways which make them more susceptible to raccoon depredation because fields adjacent to wooded and riparian areas often sustain higher rates of damages from raccoons (Beasley and Rhodes 2008). Damage also occurs to stored crops, such as corn silage, when raccoons tear open silage bags and/or burrow into silos resulting in losses from spoilage, and contamination with feces.

White-tailed deer can also pose a threat to agricultural crops. A 2012 report from the National Agricultural Statistics Service (NASS) Maryland Field Office shows that farmers suffered $10 million in wildlife-related losses to agriculture, with 77% of those losses attributed to deer. A total of $410,000 was spent on preventative measures (NASS 2013).

Overall, deer killed through the crop damage permit system in 2013-2014 season was 8,969 deer (MDNR 2014). WS refers deer damage calls to the MDNR for assistance in obtaining permits for deer crop damage issues. WS is available for assistance on deer damage if requested by the MDNR.

Feral swine are responsible for large scale destruction of crops, hay meadows, and pasture primarily by rooting and wallowing. Rooting is a common activity and is done year-round in search of food (Stevens 1996). The feral hog's rooting and wallowing activities damage pastures and hay meadows, spoil watering holes and can severely damage riparian habitats. Damage to crops results from direct consumption of crops and feeding related activities (i.e., trampling and rooting).

Risk of Disease Transmission

Several diseases including pseudorabies, toxoplasmosis, tuberculosis, rabies, and potentially, foot-and-mouth disease, affect domestic animals and wildlife. Monitoring for and containment or eradication of these diseases to protect Maryland agricultural and natural resource interests could include wildlife damage management activities conducted by WS in cooperation with the VS program, MDNR, or other governmental agencies. As with WS' activities to protect human health and safety, WS could play an important role in the surveillance for diseases transmissible between livestock and wildlife including

foreign animal diseases. Samples provided by WS can serve to establish important baseline data on the presence or absence of diseases in the state and can help identify areas where cooperators can focus disease management efforts.

Disease Risks from Feral Swine. Feral swine are potential reservoirs for 30 viral and bacterial diseases as well as 37 parasites that threaten the health of livestock and humans (Hutton et al 2006). Of greatest concern is infection of swine production facilities with diseases like swine brucellosis and pseudorabies. A study (Corn et al. 1986) conducted in Texas found that feral swine do represent a reservoir of diseases transmissible to livestock. Swine harvested in this study tested positive for pseudorabies, brucellosis, and leptospirosis. Other diseases carried by feral swine include hog cholera, tuberculosis, bubonic plague, and anthrax (Beach 1993). A study in Oklahoma (Saliki et al. 1998) found samples also positive for antibodies against porcine parvovirus, swine influenza and the recently emerged porcine reproductive and respiratory syndrome virus. Porcine reproductive and respiratory syndrome is a highly infectious virus, requiring only a few viral particles to initiate infection (Henry 2003). 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. WS could conduct disease surveillance in the feral swine population as part of the National Wildlife Disease Surveillance Program or other research surveillance projects.

Pseudorabies is a disease of swine that can also affect cattle, dogs, cats, sheep, and goats; and is often fatal in these other species. The disease is caused by an extremely contagious herpes virus that causes reproductive problems, including abortion, stillbirths, and even occasional death in breeding and finishing hogs. The United States is one of the world's largest producers of pork and is the second largest exporter of pork. U.S. pork production accounts for about 10 percent 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. In 2004, domestic swine in all 50 states had attained Stage V pseudorabies free status. However, pseudorabies is still found in feral swine and these animals serve as a potential source of infection for domestic animals.

Similar to pseudorabies, the USDA has been involved in a multi-year, multi-million dollar effort to eradicate brucellosis in swine and cattle and the presence of infected feral swine may complicate and delay the final success of that program (Hutton et al. 2006). Brucellosis is a bacterial disease that can also have negative effects on reproduction in swine. Witmer et al. (2003) summarized surveillance studies of feral swine populations in the United States and reported infection rates of 0-53% for swine brucellosis. Feral swine serve as a reservoir for disease reintroduction and pose a constant threat to the progress of disease eradication programs in domestic livestock.

Foreign Animal Diseases. International trade and travel and the popularity of exotic pets have resulted in an ongoing risk of foreign animal disease introduction. Introduction of a disease such as Classical Swine Fever, Foot and Mouth Disease, or other foreign animal disease could have tremendous adverse impacts on the American livestock industry. State and federal agriculture and animal health agencies, and state wildlife agencies would have primary responsibility. However, these agencies may request WS assistance in conducting surveillance for the disease in wildlife populations, and/or capture and removal of animals in order to aid in management of the disease outbreak.

1.2.3 Need for Mammal Damage Management to Protect Property

Table 1.1 illustrates how many species WS has received damage reports on in the past several years. The WS data only reflect a portion of the property damage issues in the state. The MDNR receives the majority of requests from the public in situations where mammals are causing property damage.

Burrowing activities of woodchucks can severely damage levees, dikes, earthen dams, landfills, and other structures (Federal Emergency Management Agency 2005). Woodchuck burrows under roadbeds and embankments and could potentially weaken or cause the collapse of these structures. Woodchucks also cause damage by chewing underground utility cables, sometimes resulting in power outages. Additionally, woodchuck burrows may cause damage to property when tractors and other equipment drop into a burrow or roll over due to a burrow.

Rooting by feral swine can cause damage to roadbeds, dikes, and other earthen structures. Feral swine have broken through livestock and game fences to consume animal feed and mineral supplements. In some areas, foraging swine have damaged landscaping, golf courses, and other ornamental plantings.

In addition to the risks to human health and safety discussed in Section 1.2.1, mammals can also cause considerable damage to property at airports. Foxes, skunks, and raccoons venture onto airfields and become a direct threat to planes both landing and taking off. Nationwide, during the period of 1990-2011 there have been 2,754 strikes involving civil aircraft and terrestrial mammals resulting in more than $41million in damage (Dolbeer et al. 2012). Damage to aircraft was reported for 35% of the terrestrial mammal strikes. Thirty-two species of terrestrial mammal were reported as being involved in strikes.

Deer-vehicle collisions are a serious concern nationwide because of losses to property (Conover 1997, Conover et al. 1995, Romin and Bissonette 1996). Conover et. al (1995) estimated that more than one million deer-vehicle collisions occur annually in the United States, costing over $1.1 billion in repair costs. The estimated annual total cost to repair vehicle damage from deer-vehicle collisions from 1986-2000 in Maryland was $28,000,000 (Drake et. al 2003). Often, deer-vehicle collisions in which a deer carcass was not recovered or little vehicle damage occurred go unreported. A Cornell University study estimates that the actual number of deer-vehicle collisions could be as high as six times the reported number (Decker et al. 1990).

Deer browsing damages and destroys landscaping and ornamental trees, shrubs, and flowers. As rural areas are developed, deer habitat may actually be enhanced because fertilized lawns, gardens, and landscape plants serve as high quality sources of food (Swihart et al. 1995). Furthermore, deer are prolific and adaptable, characteristics that allow them to exploit and prosper in most suitable habitat near urban areas, including residential areas (Jones and Witham 1990). The succulent property of many ornamental landscape plants, coupled with high nutrient contents from fertilizers, offers an attractive food source for deer. In addition to browsing pressure, male white-tailed deer damage ornamental trees and shrubs by antler rubbing which results in broken limbs and bark removal. While large trees may survive antler-rubbing damage, smaller saplings often die or become scarred to the point that they are not aesthetically acceptable for landscaping.

1.2.4 Need for Mammal Damage Management to Protect Natural Resources

Natural resources may be described as those assets belonging to the public which are usually managed and held in trust by government agencies for citizens. Such resources may be plants, animals and their

habitats, including threatened and endangered species and historic properties. Examples of natural resources in Maryland 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.

One example of mammal damage to natural resources is ground-nesting game bird populations with low and/or declining productivity and survivorship because of predation by species like raccoons, skunks, or foxes. For example, raccoons are considered a major predator of ground-nesting upland bird nests and poults (Speake 1980, Speake et al. 1985, Speake et al. 1969). Balser et al. (1968) recommended that predator damage management programs target the entire predator complex or compensatory predation may occur by a species not under control, a phenomena also observed by Greenwood (1986). Trautman et al. (1974) concluded that a single species predator damage management program showed some promise for enhancing ring-necked pheasant (*Phasianus colchicus*) populations. Avian species considered threatened or species of special concern in Maryland may be impacted by mammalian predators through direct predation or nest destruction. WS conducts MDM to help prevent the predation of threatened and endangered species in coastal regions. Additionally, nest predation on reptiles is a common problem associated with raccoons and other medium sized predators (Marchland et al. 2002, Wirsing et al. 2012).

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). 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. Most recently, Loss et al. (2013) estimated that free-ranging cats kill 1.4 to 3.7 billion birds and 6.9 to 20.7 billion mammals worldwide annually.

Muskrats, groundhogs, and other burrowing rodents can also damage natural resources by burrowing into earthen dams and dikes used to manage/retain ponds and riparian areas used by other wildlife species, by excessive foraging on riparian and wetland vegetation and cutting/girdling timber, seedlings, and other vegetation in natural areas, and parks, especially in riparian restoration sites.

Feral swine can compete with and prey upon native wildlife and severely damage wildlife habitats. Feral swine are omnivorous and feed on a wide variety of items, many of which are staples for native fauna. One of the more important seasonal food resources used by feral swine is wild fruit and nut crops, especially oak mast (Wood and Roark 1980). Oak mast is also an important food source for deer and wild turkey. When feral swine actively compete for mast, resident deer and wild turkey may enter the winter with inadequate fat reserves, thus threatening the viability of these native wildlife species (Beach 1993). Feral swine also predate native wildlife, especially young animals and ground nesting birds, their nestlings and eggs (Beach 1993).

In addition to competition for food discussed above, feral swine foraging also causes problems for forest regeneration through consumption of hard mast (e.g., acorns and hickory nuts and uprooting and consumption of seedlings (Campbell and Long 2009, West et al. 2009). Areas disturbed by feral swine rooting are also vulnerable to colonization by non-native invasive plant species. Rooting also accelerates plant decomposition and loss of soil nutrients (Campbell and Long 2009). The rooting and foraging behavior of feral swine can completely destroy the understory in forests and make trees less stable during windstorms.

Deer are considered a "keystone species," one that can have a profound impact on vegetation, altering species composition to the point that entire forests either fail to regenerate, or regenerate with tree species that are not beneficial for deer or other species of wildlife, or for lumber (Wallingford 2002). Deer overabundance can affect native vegetation and natural ecosystems. 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 plant diversity (Warren 1991). Studies of deer browsing in the Manassas Nation Battlefield Park in nearby Virginia by Gorsira et al. (2005) indicated that deer were having a "significant impact" on the structure and composition of the forests. Studies in Rock Creek Park in DC indicated a deer density of 82 deer/mi^2, which was much greater than the estimated carrying capacity of 6-10 deer/km (NPS 2011). Plots where deer were excluded from browsing showed a greater regeneration of oak species, while unfenced areas showed more American beech, which is susceptible to disease.

The alteration and degradation of habitat from over-browsing by deer may displace other wildlife communities (e.g., neotropical migrant songbirds and small mammals) that depend upon the understory vegetative habitat destroyed by deer browsing (VDGIF 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 3 species of birds were lost 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.

1.2.5 Need to Protect T&E Species

WS is requested to perform predator trapping to reduce depredation and habitat destruction for the endangered coastal species, especially endangered ground nesting shoreline birds like the piping plover (*Charadrius melodus*). The piping plover is classified as endangered in Maryland and nests on sandy beaches and dunes undisturbed by humans on Assateague Island in Worcester County. WS is requested to perform mammal trapping until the endangered ground nesting shoreline birds have the opportunity to complete their nesting.

Wallowing and foraging by feral swine can significantly damage wetlands and riparian areas, which may be important for threatened and endangered (T&E), and other sensitive species such as fish and mussels (Campbell and Long 2009, West et al. 2009). In Louisiana, feral swine have been implicated as the cause of elevated waterborne bacteria levels in streams, including levels which exceeded thresholds for the

protection of human health (Kaller et al. 2007). Results from DNA fingerprinting indicated that feral swine were the primary source of the *Escherichia coli* bacteria in the stream. Freshwater mussel and insects declined in stream reaches with swine activity.

1.3 DECISION TO BE MADE

This EA evaluates the environmental impacts of alternatives for WS involvement in mammal damage management in Maryland. 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. Wildlife management is a complex issue requiring coordination among state and federal agencies. The MDNR, MDA, USFWS were consulting agencies in the preparation of this EA.

Based on the scope of the EA, the lead and consulting agencies worked together to address the following questions in the EA:

- How can WS best respond to the need to reduce mammal damage in Maryland?
- Do the alternatives have significant impacts meriting an Environmental Impact Statement (EIS)?

1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

1.4.1 Actions Analyzed

This EA evaluates mammal damage management by WS to protect: property, agricultural resources, natural resources, and public health and safety in Maryland wherever such management is requested from the WS program. Protection of other resources or other program activities would be addressed in additional NEPA analysis, as appropriate.

1.4.2 Period for which this EA is Valid

If it is determined that an EIS is not needed, this EA would remain valid until the WS program in Maryland and other appropriate agencies determine that new needs for action, changed conditions or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be supplemented pursuant to NEPA. Review of the EA would be conducted each year to ensure that the EA adequately addresses current and anticipated future program activities.

1.4.3 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 authorized by the MDNR.

This EA analyzes the potential impacts of mammal damage management based on previous activities conducted on private and public lands in Maryland, where WS and the appropriate entities have entered into a MOU, cooperative service agreement, or other comparable document. Because the need for action is to reduce damage and because the program's goals and directives are to provide services when

requested, within the constraints of available funding and workforce, it is conceivable that additional mammal damage management efforts could occur. Thus, this EA anticipates the potential expansion and analyzes the impacts of such efforts as part of the alternatives.

Many of the mammal species addressed in this EA can be found statewide and are active throughout the year; 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 other federal or agency actions 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. 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 Maryland. 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[2] and Standard Operating Procedures (SOPs) described in this EA as well as relevant laws and regulations.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Maryland. 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.

1.4.4 Public Involvement

Issues related to mammal damage management as conducted by WS were initially developed by WS with assistance from the consulting agencies and tribes. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document is being made available for public review and input through a legal notice published in the *Capitol-Gazette*, 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/wildlifedamage/nepa.

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.

[2] WS' Directives could be found on the web at http://www.aphis.usda.gov/wildlifedamage.

1.5 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

Environmental Assessment: Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the United States. Management of rabies in Maryland wildlife is included in the National EA (USDA 2009) and is not included in the Maryland mammal damage management EA. However, potential impacts on mammal species anticipated in the rabies management EA have been included in the Maryland mammal damage management EA to assess cumulative impacts of program actions.

Proposal to Permit Take as provided under the Bald and Golden Eagle Protection Act Final Environmental Assessment: Developed by the USFWS, this EA evaluated the issues and alternatives associated with the promulgation of new regulations to authorize the "*take*" of bald eagles and golden eagles as defined under the Bald and Golden Eagle Protection Act. The preferred alternative in the EA evaluated the authorization of disturbance take of eagles, the removal of eagle nests where necessary to reduce threats to human safety, and the issuance of permits authorizing the lethal take of eagles in limited circumstances, including authorizing take that is associated with, but is not the purpose of, an action (USFWS 2009). A Decision and Finding of No Significant Impact (FONSI) was made for the preferred alternative in the EA. The selected alternative in the EA established new permit regulations for the "*take*" of eagles (see 50 CFR 22.26) and a provision to authorize the removal of eagle nests (see 50 CFR 22.27). The USFWS published a Final Rule on September 11, 2009 (74 FR 46836-46879).

Rock Creek Park Final White-tailed Deer Management Plan/Environmental Impact Statement: The National Park Service (NPS) at Rock Creek Park in Washington D.C. completed an EIS on white-tailed deer management in the park in 2011. The EIS examined four alternatives to address the need for deer management to alleviate damage to the natural fauna from over-browsing. Alternative D was the selected alternative that proposed a combination of methods, including sharpshooting, capture/euthanasia, and reproductive control to quickly reduce the population and maintain it at an acceptable level. The EIS is incorporated by reference in this supplement.

Marsh Restoration and Nutria Damage Reduction Environmental Assessment: Research was conducted on the Blackwater National Wildlife Refuge to evaluate the recovery of marsh vegetation if nutria were removed. Using fencing to exclude nutria, researchers found marsh vegetation recovered quickly but habitats outside the fencing continued to be lost (Bounds et al. 2003). The Nutria Control/Marsh Restoration Pilot Project Partnership was then formed. As part of the Nutria Control/Marsh Restoration Project, a Partnership Management Team was established consisting of the USFWS, the MDNR, WS, the United States Army Corps of Engineers, the Cooperative Fish and Wildlife Research Unit of the United States Geological Survey (USGS), Tudor Farms, and the University of Maryland Eastern Shore. The USFWS, in cooperation with the MDNR, the University of Maryland Eastern Shore, the USGS, and WS, prepared an Environmental Assessment (EA). A Decision and Finding of No Significant Impact (FONSI) for the EA was issued.

1.6 AUTHORITY AND COMPLIANCE

1.6.1 Wildlife Services Legislative Authority

The primary statutory authorities for the 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.

Additionally, MOU's among WS and other governmental agencies also define WS responsibilities in wildlife damage management. For example, a MOU between the Federal Aviation Administration (FAA) and WS recognizes WS role and expertise in providing wildlife hazard management assistance to the aviation community. It states, that the "FAA or the certificated airport may request technical and operational assistance from WS to reduce wildlife hazards."

1.6.2 Maryland Department of Natural Resources Legislative Authority

WS and the MDNR currently have a signed MOU, which establishes a cooperative relationship between these two agencies and outlines the roles and responsibilities of each agency for resolving wildlife damage in Maryland. The mission of the MDNR is to provide and administer a long-range comprehensive program for the exploration, conservation, development, protection, enjoyment and use of the natural resources of the State of Maryland. The MDNR serves to protect, preserve, and improve the resident wildlife and fisheries resources for use and enjoyment by all citizens of the state. All species of wildlife shall be maintained for values which may be either intrinsic or ecological or of benefit to man. Such benefits shall include (1) hunting, fishing, and other diversified recreational uses; (2) economic contributions in the best interests of the people of the state; and (3) scientific and educational uses. Under the MOU, the MDNR assumes the primary responsibility of responding to requests for assistance with resident game and furbearer species, including wild turkeys, and damage issues associated with state or federal threatened or endangered species. The MDNR can consult WS with such requests as appropriate. WS will consult the MDNR prior to taking action that involves resident game and furbearers. The MDNR forwards requests for assistance associated with migratory birds, pigeons and blackbirds, and wildlife damage threats to human health and safety at airports to WS. WS reports violations of the Migratory Bird Treaty Act and other unlawful taking of other wildlife to the MDNR

1.6.3 Maryland Department of Agriculture

The MDA is a major cooperating agency with WS to help resolve wildlife damage in Maryland. The MDA currently has a signed MOU with WS, which establishes this cooperative relationship between MDA and WS and outlines the roles and responsibilities of each agency in resolving wildlife damage issues in Maryland. The mission of the MDA is to protect plant, animal, and human health and the state's food supply through a variety of scientific and regulatory programs; to provide vision, strategic planning, and emergency response for agricultural and civil emergencies; to promote industrial safety and protect consumers through educational and regulatory programs; and to foster economic growth by promoting Maryland agriculture and agribusinesses throughout the state and abroad. Under the MOU, the MDA provides agricultural information and statistics to WS, forwards requests for wildlife damage assistance to WS, and provides information on wildlife damage management to the agricultural community. The MDA is also responsible for administering and maintaining relevant pesticide certification requirements as they apply to wildlife damage management.

1.6.4 Maryland Department of Health and Mental Hygiene

The MDHMH currently has a MOU with WS, which establishes a cooperative relationship between the two agencies and outlines the roles and responsibilities for resolving wildlife damage in Maryland. The mission of the MDHMH is to promote and protect the health of the public. Per the MOU, the MDHMH

provides technical guidance to WS on public health related issues, zoonotic diseases, and potential human health problems associated with wildlife. The MDHMH investigates zoonotic diseases in humans and human exposures to zoonotic diseases as well as provides laboratory services for diagnosis of selected wildlife diseases. The MDHMH also forwards calls about wildlife damage information to WS.

1.6.5 Compliance with Federal Laws

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

National Environmental Policy Act. All Federal actions are subject to NEPA (Public Law 91-190, 42 U.S.C. 4321 et seq.). WS follows the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500 et seq.), USDA NEPA implementing regulations (7 CFR 1b), and the APHIS Implementing Procedures (7 CFR 372) as a part of the decision-making process. NEPA sets forth the requirement that Federal actions with the potential to significantly affect the human environment be evaluated in terms of their impacts 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 Title 40, Code of Federal Regulations, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

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

Endangered Species Act (ESA). It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act (Sec. 2(c)). WS conducts Section 7 consultations with the USFWS, the agency with management authority for federally-listed threatened and endangered species, to ensure that any action authorized, funded or carried out by WS is not likely to jeopardize the continued existence of any endangered or threatened species. WS has consulted with the USFWS regarding potential risks from the proposed MDM program and will incorporate all USFWS provisions for the protection of threatened and endangered species from that consultation in program activities.

Bald and Golden Eagle Protection Act (16 USC 668-668c), as amended

Populations of bald eagles showed periods of steep declines in the lower United States during the early 1900s attributed to the loss of nesting habitat, hunting, poisoning, and pesticide contamination. To curtail declining trends in bald eagles, Congress passed the Bald Eagle Protection Act (16 USC 668) in 1940 prohibiting the take or possession of bald eagles or their parts. The Bald Eagle Protection Act was amended in 1962 to include the golden eagle and is now referred to as the Bald and Golden Eagle Protection Act. Certain populations of bald eagles were listed as *"endangered"* under the Endangered Species Preservation Act of 1966, which was extended when the modern Endangered Species Act (ESA) was passed in 1973. The *"endangered"* status was extended to all populations of bald eagles in the lower 48 States, except populations of bald eagles in Minnesota, Wisconsin, Michigan, Washington, and Oregon, which were listed as *"threatened"* in 1978. As recovery goals for bald eagle populations began to be reached in 1995, all populations of eagles in the lower 48 States were reclassified as *"threatened"*.

In 1999, the recovery goals for populations of eagles had been reached or exceeded and the eagle was proposed for removal from the ESA. The bald eagle was officially de-listed from the ESA on June 28, 2007 with the exception of the Sonora Desert bald eagle population. Although officially removed from the protection of the ESA across most of its range, the bald eagle is still afforded protection under the Bald and Golden Eagle Protection Act.

Under the Bald and Golden Eagle Protection Act (16 USC 668-668c), the take of bald eagles is prohibited without a permit from the USFWS. Under the Act, the definition of "*take*" includes actions that "*pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb*" eagles. The regulations authorize the United States Fish and Wildlife Service to issue permits for the take of bald eagles and golden eagles on a limited basis (see 74 FR 46836-46837, 50 CFR 22.26, 50 CFR 22.27). As necessary, WS would apply for the appropriate permits as required by the Bald and Golden Eagle Protection Act.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The U.S. Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods integrated into the WS program are registered with and regulated by EPA and MDA and used by WS in compliance with labeling procedures and other requirements.

Executive Order 13112 of February 3, 1999. This order directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health. To comply with Executive Order 13112, WS may cooperate with other federal, tribal, state, or local government agencies, or with industry or private individuals to reduce damage to the environment or threats to human health and safety.

Occupational Safety and Health Act of 1970 and its implementing regulations (29CFR1910) 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.

The Native American Graves and Repatriation Act of 1990. The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

National Historic Preservation Act (NHPA) of 1966 as amended. The NHPA of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that have the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the Advisory Council on Historic Preservation (i.e. State Historic Preservation Office, Tribal Historic Preservation Officers), as appropriate. WS actions on Tribal lands are only conducted at the tribe's request and under signed agreement; thus, the Tribes have control over any potential conflict with cultural resources on Tribal properties.

Each of the MDM methods described in this EA that might be used operationally by WS do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any

alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

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

Federal Meat Inspection Act. The Federal Meat Inspection Act (FMIA) applies to all meat or products obtained from any cattle, sheep, swine, goat, horse, mule, or other equines intended for distribution in commerce. Animals falling under jurisdiction of the FMIA must be inspected pre- and post mortem. Animals that are killed before they reach a slaughter facility are classified as “adulterated meat”, and cannot be used for human food per the FMIA. Feral swine fall under authority of the FMIA, and therefore could only be donated to charitable organizations for use as food by needy individuals if they are delivered alive to a USDA approved feral swine slaughter facility. Chapter 12, subchapter 1, section 623 of the FMIA provides an exemption for persons having animals of their own raising and game animals slaughtered for their own use without inspection. This provision allows landowners to utilize feral swine removed from their own property, with the understanding that meat derived from these feral swine will be consumed only by the farmer, his/her immediate family and/or nonpaying guests.

Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." Executive Order 12898, promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Environmental Justice is a priority within APHIS and WS. 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. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898.

WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. All chemicals used by WS are regulated by the EPA through FIFRA, the WDATCP, by the Drug Enforcement Agency (DEA), by MOUs with land managing agencies, and by WS Directives. The WS operational program properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate

environmental impacts to minority and low-income persons or populations. In contrast, the proposed action may benefit minority or low-income populations by reducing mammal damage such as threats to public health and safety.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045). Children may suffer disproportionately from environmental health and safety risks for many reasons, including their developmental, physical and mental status. Because WS makes 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 mammal damage management program would only occur by using 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.

Federal Food, Drug, and Cosmetic Act (21 U.S.C. 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 U.S.C. 821 et seq.). This law requires an individual or agency to have a special registration number from the federal Drug Enforcement Administration (DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA). The AMDUCA and its implementing regulations (21 CFR Part 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife. 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 the proposed action. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (i.e., a period of time 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; the Western Wildlife Health Committee (WWHC) of the Western Association of Fish and Wildlife Agencies has recommended that suitable identification markers include durable ear tags, neck collars, or other external markers that provide unique identification (WWHC 1999). 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.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; PL 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 state's Coastal Zone Management Program.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues relevant to development and comparison of MDM alternatives, including issues analyzed in detail in Chapter 4 (environmental consequences) and included in the development of SOPs. This chapter also includes a discussion of issues which were considered but not analyzed in detail for each alternative. Discussions of the affected environment are included in this chapter and in the evaluation of potential environmental impacts of the alternatives in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Although the range and habitat used by individual species varies, at least some of the wild and feral mammals discussed in this analysis can be found in any location the state where suitable habitat exists for foraging and shelter. Consequently, damage or threats of damage caused by the mammal species addressed in this EA can occur statewide wherever those mammals occur. 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 has been signed between WS and a cooperating entity.

Upon receiving a request for assistance, MDM activities could be conducted on federal, state, municipal, and private properties in Maryland. Areas where damage or threats of damage could occur include, but are not limited to, agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, railroad yards, waste handling facilities, industrial sites, natural resource areas, park lands, and historic sites; state, county, 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; 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 pose risks to human safety. The area would also include airports and military airbases where mammals are a threat to human safety and to property; and public property where mammals are negatively impacting historic structures, and cultural landscapes.

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 its 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.

Most resident mammal species are managed under Maryland code and statute without any federal oversight or protection. In accordance with applicable state or federal regulations, there are some species, such as most non-native invasive species that are not protected under state or federal law. The MDNR has the state authority to manage and authorize the taking of wild and feral mammals for damage

management purposes. Other species such as escaped domestic species oversight belongs to MDA. Feral cats, although often considered domestic animals, have no state agency oversight in Maryland and are managed at the local level by municipalities.

Usually, when a non-federal entity (e.g., agricultural producers, municipalities, counties, private companies, individuals, or any other non-federal entity) takes a MDM action, the action is not subject to compliance with the NEPA due to the lack of federal involvement in the action. Under such circumstances, the environmental baseline or status quo must be viewed as an environment that includes those resources as they are managed or impacted by non-federal entities in the absence of the proposed federal action. Therefore, in those situations in which a non-federal entity has decided that a MDM action will occur and even the particular methods that will be used, WS' involvement in the action would not affect the environmental status quo because the requestor would have conducted the action in the absence of WS' involvement. Given that non-federal entities can receive authorization to use lethal MDM methods from the MDNR (depending on the species state classification), and since most methods for resolving damage are available to both WS and to non-federal entities, WS' decision-making ability is restricted to one of three alternatives: 1) WS can either take the action using the specific methods discussed in this EA upon request, 2) WS can provide technical assistance only, or 3) WS can take no action, at which point the non-federal entity could take the action anyway, either without a permit, during the hunting or trapping season, or through the issuance of a permit by the MDNR. Under those circumstances, WS would have virtually no ability to affect the environmental status quo because the action would likely occur in the absence of WS' direct involvement.

In some situations, however, certain aspects of the human environment may actually benefit more from WS' involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity, WS' management activities may have less of an impact on non-target species and human safety than if the non-federal entity conducted the action alone. Thus, in those situations, WS' involvement may provide some benefit to the human environment when compared to the environmental status quo in the absence of such involvement.

2.2 ISSUES ANALYZED IN DETAIL IN CHAPTER 4

The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on target mammal species
- Effects on other wildlife species, including Threatened and Endangered species
- Effects on human health and safety
- Humaneness and animal welfare concerns

2.2.1 Effects on Target Mammal Species

A common issue is whether damage management actions would adversely affect the populations of target mammal species. Methods that would be available under the alternatives to resolve damage or threats are considered either non-lethal methods or lethal methods. Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage, which reduces the presence of those species at the site, and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove a mammal or those mammals responsible for causing damage or posing threats to human safety resulting 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 or dispersed from an area using non-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 populations from the use of lethal methods would be based on a measure of the number of animals killed in relation to their 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 animals killed with overall populations or trends in populations to assure the magnitude of take was maintained below the level that would cause significant adverse effects to the viability of a native species population.

2.2.2 Effects on Other Wildlife Species, including T&E Species

There are concerns that the use of nonlethal and lethal MDM methods may have unintended adverse impacts on non-target species, including state and federally-listed threatened and endangered species. 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 C.

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 the proposed management actions are not likely to jeopardize the continued existence of any endangered or threatened species. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. Applicable SOPs and other measures for the protection of state and federally-listed species are discussed in Chapter 4, Section 4.1.2, of this EA.

There may also be concerns that WS' activities could result in the disturbance of eagles that may be near or within the vicinity of WS' activities. Under 50 CFR 22.3, the term "*disturb*", as it relates to take under the Bald and Golden Eagle Act, has been defined as "*to agitate or bother a Bald and Golden Eagles to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.*" The environmental consequences evaluation conducted in Chapter 4 of this EA will discusses the potential for WS' activities to disturb eagles as defined by the Act.

2.2.3 Effects of Damage Management Methods on Human Health and Safety

Review of the potential impacts on human health and safety from MDM actions has two primary components: 1) the potential risk to human health and safety from MDM methods; and 2) the potential benefits to human health and safety when MDM actions are conducted to reduce risks caused by wild and feral mammals. WS' employees use and recommend only those methods which are legally available and are effective at resolving the damage associated with wildlife. Still, some concerns exist regarding the safety of WS' methods despite their legality. In addition to the potential risks to the public associated with WS' methods, risks to employees are also an issue. Selection of methods, as part of an integrated

approach, includes consideration of public and employee safety.

Safety of Proposed Chemical Methods

Safety concerns pertaining to the use of chemical MDM methods include the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed (e.g., animals used for food). Under the alternatives identified, the use of chemical methods would include immobilizing drugs, euthanasia drugs, and repellents (Appendix C). Chemicals proposed for use under the relevant alternatives are regulated by the EPA through FIFRA, by Maryland laws, by the DEA, by the FDA, and by WS' Directives.

Safety of Proposed Non-Chemical Methods

Non-chemical methods employed to reduce damage and threats to safety caused by mammals, could potentially be hazardous to human safety through misuse or accident. Non-chemical methods may include but are not limited to firearms, live-traps, exclusion, snares, cable restraints, body-grip traps, pyrotechnics, and other scaring devices (Appendix C). Some people may be concerned that WS' use of firearms, traps, snares, cable restraints, and pyrotechnic scaring devices could cause injuries to people. There are also concerns regarding potential fire hazard to agricultural sites and private property from pyrotechnic use.

Firearm use is a very sensitive issue and a concern because of public fears regarding the risks associated with unsafe firearms use and the threat of misuse of firearms.

WS works with cooperators to develop management strategies suited to the specific needs of each site. WS communicates the potential risks from the proposed methods to the cooperator during the development of the management strategy. The methods to be used are listed in a MOU, cooperative service agreement, or a similar document approved by the cooperator, property owner or managed by the cooperator.

Impacts on human health and safety from mammals

The concern addressed here is that the absence of adequate MDM would result in adverse effects on human health and safety because mammal damage would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased incidence of injuries, illness, or loss of human lives.

2.2.4 Humaneness and Animal Welfare Concerns of Methods Used

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

2013). 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 . . . "(CDFG 1991), such as shooting.

Pain obviously occurs in animals, but assessing pain experienced by animals can be challenging (AVMA 2007, CDFG 1991). The AVMA defines pain as being, "that sensation (perception) that results from nerve impulses reaching the cerebral cortex via ascending neural pathways" (AVMA 2013). The key component of this definition is the perception of pain. The AVMA (2013) notes that "pain" should not be used for stimuli, receptors, reflexes, or pathways because these factors may be active without pain perception. For pain to be experienced, the cerebral cortex and subcortical structures must be functional. If the cerebral cortex is nonfunctional because of hypoxia, depression by drugs, electric shock, or concussion, pain is not experienced.

Stress has been defined as the effect of physical, physiologic, or emotional factors (stressors) that induce an alteration in an animal's base or adaptive state. Responses to stimuli vary among animals based on the animals' experiences, age, species and current condition. Not all forms of stress result in adverse consequences for the animal and some forms of stress serve a positive, adaptive function for the animal. Eustress describes the response of animals to harmless stimuli which initiate responses that are beneficial to the animal. Neutral stress is the term for response to stimuli which have neither harmful nor beneficial effects to the animal. Distress results when an animal's response to stimuli interferes with its well-being and comfort (AVMA 2013).

Analysis of this issue must consider not only the welfare of the animals captured, but also the welfare of humans, livestock and some T&E species if damage management methods are not used. For example, some individuals may perceive techniques used to remove a predator that is killing or injuring pets or livestock as inhumane, while others may believe it is equally or more inhumane to permit pets and livestock that depend upon humans for protection to be injured or killed by predators.

2.3 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.3.1 No Wildlife Damage Management at Taxpayer Expense; Wildlife Damage Management should be Fee Based

An issue identified through the scoping process is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based. Maryland, funds to implement wildlife damage management activities and programs are derived from a number of sources, including, but not limited to federal, state, county and municipal governments/agencies, private organizations, corporations and individuals, homeowner/property owner associations, and others, under Cooperative Service Agreements and/or other contract documents and processes. A minimal federal appropriation is allotted for the maintenance of a WS program. The remainder of the WS program is mostly fee-based by funding from program beneficiaries such as agricultural producers, airports, individual citizens, businesses, organizations, and other federal, state, and local government agencies (USDA 2012). Technical assistance is provided to requesters as part of the federally-funded activities, but the majority of direct assistance in which WS' employees perform damage management activities is funded through cooperative service agreements between the requester and WS.

Federal, state, and local officials have decided that wildlife damage management should be conducted by appropriating funds. WS was established by Congress as the agency responsible for providing wildlife damage management to the people of the U.S. Wildlife damage management is an appropriate sphere of

activity for government programs, because aspects of wildlife damage management are a government responsibility and authorized by law.

2.3.2 Mammal Damage should be Managed by Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce mammal damage for property owners or property owners could attempt to reduce their own damage problems. Some property owners would prefer to use a private nuisance wildlife control agent because the nuisance wildlife agent is located in closer proximity and thus could provide the service at less expense, or because they prefer to use a private business rather than a government agency. However, some property owners would prefer to contract with a government agency. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues and reduced administrative burden. The relationship between WS and private industry is addressed in WS directive 3.101.

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

WS has 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 is to determine if the proposed action would potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS or a finding of no significant impact (FONSI). This EA addresses impacts for managing damage and threats to human safety associated with mammals in Maryland to analyze individual and cumulative impacts, provide a thorough analysis of other issues relevant to MDM, and provides the public an opportunity to review and comment on the analysis and alternatives.

In terms of considering cumulative effects, one EA analyzing impacts for the entire state of Maryland will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination is 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.

2.3.4 Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with NEPA. Consideration of this issue may not be the driving factor when developing site-specific management strategy. The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. However, the cost effectiveness of methods and the effectiveness of methods are linked. 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 generally receive the greatest application.

2.3.5 A Loss Threshold Should Be Established Before Allowing Lethal Methods

WS has received comments indicating 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 can be tolerated by cooperators until the damage reaches a threshold where

damage becomes an economic burden. The appropriate level of damage which may be tolerated 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.

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 plaintiffs' motion for a preliminary injunction. In part, the court found that a forest supervisor needs only show that damage from wildlife is threatened, to establish a need for wildlife damage management (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 wildlife damage management actions.

2.3.6 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 C, the lethal removal of mammals with firearms by WS to alleviate damage or threats would occur using a 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 in Maryland using firearms occurs primarily from the use of rifles. However, the use of shotguns could be employed to lethally take some species. 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 is 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 lead to contamination of water, either 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 where it was believed the lead contamination was due to runoff from the parking lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of 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 is reduced once the bullets and shot form crusty lead oxide deposits on their surfaces, which serves to naturally further reduce 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.

Take of mammals can occur during regulated hunting seasons, through the issuance of depredation permits by the MDNR, without the need to obtain a permit for species that are classified as an "unprotected species", and through other authorizations granted to landowners/managers for some species by regulations outlined by the MDNR. Consequently, WS' assistance with removing mammals would not be additive to the environmental status quo because animals removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement. Based on current information, the risks associated with lead bullets that are 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.

2.3.7 WS Impact on Biodiversity

WS' MDM program is not conducted to eradicate native wildlife populations. WS operates according to international, federal, and appropriate state laws and regulations enacted to ensure species viability. In addition, any reduction of a local group of mammals is frequently temporary because immigration from adjacent areas or reproduction replaces removed animals. WS operates on a relatively small percentage of the land area of the state, and WS' take of any wildlife species analyzed in this EA is a small proportion of the total population and insignificant to the viability and health of the population (see Section 4.2.3). Reductions in non-native species like feral hogs are likely to be beneficial because non-native species disrupt ecosystems and compete for resources with native wildlife.

2.3.8 Effects of Mammal Damage Management Activities on the Regulated Harvest of Mammals

Some individuals are concerned 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 or trapped during regulated seasons in the Maryland include: beaver, bobcat, Eastern cottontail, feral swine, fox squirrel, gray fox, gray squirrel muskrat, raccoons, red fox, red squirrel, river otter, striped skunk, Virginia opossums, and white-tailed deer.

Lethal methods used to reduce damage could locally lower target species densities in areas where damage is occurring, resulting in a reduction in the availability of those species during the regulated harvest season. Where harvest information is available, WS assesses the impact of its MDM actions in context of licensed harvest (Chapter 4). Analysis in Chapter 4 indicates that WS take is very low relative to licensed harvest (Table 4-1). Additionally, WS' MDM activities would primarily be conducted in areas where hunting access is restricted (e.g., airports, urban areas) 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 more accessible to hunters. In addition, in appropriate situations, WS commonly recommends recreational hunting and trapping as a damage management alternative for many of the species listed in this EA.

2.3.9 Global Climate Change/Greenhouse Gas Emissions

The WS program activities that may result from 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 as a result of the proposed action. The proposed action would meet requirements of applicable federal laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

2.3.10 Effects on Aesthetics

Wildlife is generally 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. Some members of the public have expressed concerns that MDM could result in the loss of aesthetic benefits to the public, resource owners, or local residents. 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.

WS MDM activities occur on a relatively limited portion of the total area in Maryland. In localized areas where WS removes some portion of certain mammalian populations, dispersal of animals from adjacent areas typically contributes to the repopulation of the area within a few weeks to a year, depending on the level of removal and the species' characteristics and abundance. Most of the species potentially affected by WS MDM activities are relatively abundant. The likelihood of viewing mammals may be temporarily reduced, but would not be noticeable in most cases. Impacts to mammalian populations would be relatively low under any of the alternatives being considered in this EA, and opportunities to view, hear, or see mammals would still be available over the vast majority of the accessible land in Maryland since WS conducts MDM on a small percentage of land.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

Chapter 3 contains a discussion of the alternatives which 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 which receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences) are described, as are alternatives considered but not analyzed in detail. This chapter also includes SOPs for mammal damage management in Maryland.

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

3.1 DESCRIPTION OF THE ALTERNATIVES

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

The Proposed Action/No Action alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques (Appendix C), identified through use of the WS Decision Model, to reduce damage and threats caused by mammals in Maryland. Under this alternative, WS, in consultation with the MDNR, would continue to 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. WS would also continue to work with the MDNR and other entities to produce and distribute materials and provide educational programs on methods for preventing damage. Funding could occur through federal appropriations or from cooperative funding.

When a request for direct operational assistance is received to resolve or prevent damage caused by mammals, WS conducts site visits to assess damage or threats and identifies the cause of the damage. WS applies the decision model described by Slate et al. (1992) to develop an effective site specific management strategy which minimizes risk of adverse environmental impacts and risks to human health and safety from MDM methods and is consistent with landowner/manager management objectives. The use of the Decision model by WS' employees under the proposed action is further discussed below in Section 3.2.3. Property owners or managers requesting assistance would be provided with information regarding the use of effective and practical non-lethal and lethal techniques. Preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy. Property owners or managers may choose to implement WS' recommendations on their own (i.e., use WS technical assistance), use contractual services of private businesses, use volunteer services of private organizations, or use the services of WS (i.e., direct operational assistance). Property owners may also take management action themselves without consulting another private or governmental agency, or take no action.

GonaCon™ is a method could be considered an option under this alternative. However, studies have shown that the use of GonaCon™ in open populations of deer, sterilization is not sufficient to counter act the influence of immigration population size within a reasonable amount of time (Merrill et al. 2006). Merrill et al. found that in a closed population, the use of sterilization could take 2-3 years to reduce the population by 60%, but in an open population, sterilization "would not likely reduce the population size regardless of management effort. To control the population, the number of deaths must be higher than they number of births plus the number of immigrants (Merrill et al. 2006). To make the use of sterilization effective, an IWDM approach is necessary to achieve the required birth to death ratio.

3.1.2 Alternative 2: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would be restricted to only using or recommending non-lethal methods to resolve damage caused by mammals in Maryland (Appendix C). Lethal methods could continue to be used under this alternative by those persons experiencing damage by mammals without involvement by WS. In situations where non-lethal methods were impractical or ineffective to alleviate damage, WS

could refer requests for information regarding lethal methods to the MDNR, local animal control agencies, or private businesses or organizations. Property owners or managers may choose to implement WS' non-lethal recommendations on their own or with the assistance of WS, implement lethal methods on their own, or request assistance (non-lethal or lethal) from a private or public entity other than WS.

Reproductive control is 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). GonaCon™, a reproductive inhibitor, is a non-lethal method that could be implemented in certain situations. However, as indicated under Alternative 1, the effectiveness of GonaCon™ is reduced when IWDM methods are limited. GonaCon™ is registered for use in Maryland and is authorized on federal lands in D.C. This alternative would necessitate increased use of live-capture devices.

3.1.3 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 Maryland. Information on MDM methods would still be available to producers and property owners through other sources such as MDNR or pest control organizations. Currently, MDNR only provides direct MDM assistance in limited situations, but does provide technical assistance and issues permits for MDM activities as appropriate. Requests for information would be referred to these entities.

In Maryland, persons experiencing damage caused by mammals could continue to resolve damage by employing those methods legally available. All methods described in Appendix C would be available for use by persons experiencing damage or threats from mammal species. Some take may require additional permitting from the MDNR or certification by the MDA to use restricted chemicals. Other restrictions may include the use of immobilizing drugs or euthanasia chemicals. Immobilizing drugs and euthanasia chemicals can only be used by WS, licensed veterinarians, or those that are trained and working under the supervision of an appropriate DEA license holder.

3.2 MAMMAL DAMAGE MANAGEMENT STRATEGIES USED BY WS

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1 and 2 described above. Alternative 3 would terminate both technical assistance and operational MDM by WS. Appendix C is a more thorough description of the methods that could be used or recommended by WS.

3.2.1 Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in the most cost-effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, elimination of invasive species (e.g., feral swine) or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2 The IWDM Strategies Employed by WS

Technical Assistance Recommendations
"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods and approaches. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for use by non-WS entities. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems. These strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor by WS results in tolerance/acceptance of the situation. In other instances, management options are discussed and recommended.

Under APHIS NEPA implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving mammal damage problems.

Direct Damage Management Assistance
Direct damage management assistance includes damage management activities that are directly conducted or supervised by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and when a *Work Initiation Document for Wildlife Damage Management* or other comparable instruments provide for direct damage management by WS. The initial investigation defines 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 are often required to effectively resolve problems, especially if restricted-use pesticides are necessary or if the problems are complex.

Educational Efforts
Education is an important element of WS program activities because wildlife damage management is about finding compromise 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. Maryland WS routinely disseminates recommendations and information to individuals sustaining damage. Additionally WS provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups related to wildlife damage management and disease issues. Wildlife Services frequently cooperates with other agencies in education and public information efforts including cooperative presentations or publications. Technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are 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 arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. NWRC scientists work closely with wildlife managers, researchers, field specialists and others to develop and evaluate wildlife damage management techniques. NWRC scientists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

3.2.3 Wildlife Services Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model and described by Slate et al. (1992) (Figure 3-1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate to reduce damage. WS personnel assess the problem 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 are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts 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.

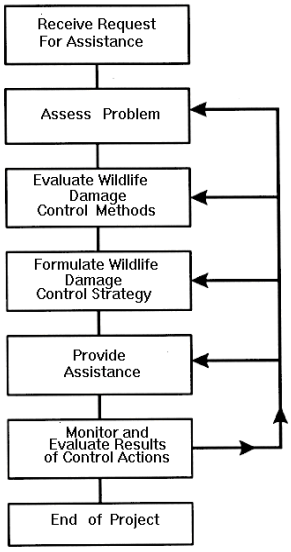

Figure 3.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

Community-based Decision Making

The WS program in Maryland follows 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 depending on the alternative selected. WS and other state, tribal and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available.

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) are able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentation by WS on mammal damage management activities. This process allows decisions on mammal damage management activities to be made based on local input. They may implement management recommendations provided by WS or others on their own, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

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

3.3.1 Lethal Mammal Damage Management Only By WS

Under this alternative, WS would not use or recommend any non-lethal MDM methods, but would only conduct lethal MDM. This alternative was eliminated from further analysis because some mammal damage problems can be resolved effectively through non-lethal means. Additionally, lethal methods may not always be available for use due to safety concerns, such as the discharge of firearms.

3.3.2 Exhaust All Feasible Non-lethal Methods before Using Lethal Methods

This alternative would require that all non-lethal methods or techniques described in Appendix C be applied to all requests for assistance to reduce damage and threats to safety from mammals in Maryland. If the use of all 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 those persons experiencing mammal damage but would only prevent the use of those methods by WS until all non-lethal methods had been employed.

People 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) is similar to a non-lethal before lethal alternative because the use of non-lethal methods is considered and given preference where practical and effective (WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not add additional information to the analyses in the EA.

3.3.3 Compensation Only for Mammal Damage Losses

Reimbursement provides producers monetary compensation for losses, it does not remove the problem nor does it assist with reducing future losses. The compensation only alternative would require the establishment of a system to reimburse persons impacted by mammal damage. This alternative was eliminated from further analysis because it is not financially feasible or practical to provide compensation for all mammal damage. There is not any federal law that authorizes compensation to address mammal damage in Maryland.

3.3.4 Trap-Neuter-Release Program for Feral and Free Ranging Cats

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

TNR philosophy.

Many veterinarians and public health officials oppose TNR programs based on health concerns and disease threats. The potential for diseases and parasites transmission to humans either from direct contact during sterilization or the risk of exposure after the animal is released is a concern. The National Association of State Public Health Veterinarians and the American Veterinarians Medical Association oppose TNR programs based on health concerns and threats (AVMA 1996). First, diseases and parasites transmitted by cats to humans including ringworm, bartonellosis, larval migrans, cat scratch fever, toxoplasmosis, and vector-borne zoonotic diseases are not controlled in colony situations. Second, rabies is a major concern because cats are the number one domesticated species testing positive for rabies in the U.S. and other species commonly infected by the disease are also attracted to feeding stations in cat colonies.

The Wildlife Society (TWS), founded in 1937, is the wildlife manager's professional equivalent of the AVMA. Their special expertise is the health of the environment and maintenance of our nation's wildlife resources. TWS has spent more than two years developing its policy No. 25 on feral and free-ranging cats, and this policy clearly identifies the problems associated with these non-native predators. The society's policy includes support for "passage and enforcement of local and state ordinances prohibiting the public feeding of feral cats, especially on public lands, and release of unwanted pet or feral cats into the wild." It also indicates opposition to "passage of any local or state ordinances that legalize the maintenance of the 'managed' (i.e., TNR) free-ranging cat colonies" (AVMA 2004).

Many other organizations have developed similar policies, including the following: the Association of Fish and Wildlife Agencies, the Association of Avian Veterinarians, the American Association of Wildlife Veterinarians, the Council of State and Territorial Epidemiologists/National Association of State Public Health Veterinarians, the ABC, the American Ornithologists' Union, the National Audubon Society, and various state wildlife federations and commissions. A painless injection is far kinder than the fate that feral cats will meet if left to survive on their own" (AVMA 2004). As a result 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.

3.3.5 Bounties

Payment of funds (bounties) for killing some mammals suspected of causing economic losses have not been supported by natural resource agencies, such as MDNR, as well as most wildlife professionals for many years (Latham 1960). 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 the entire state of Maryland. 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.

3.3.6 Technical Assistance Only

This alternative would restrict WS to only providing technical assistance (advice) on MDM. Producers, property owners, agency personnel, or others could obtain permits from the MDNR as needed and could conduct mammal damage management using any of the legally available nonlethal and lethal techniques. Technical assistance information is also readily available from entities other than WS such as the USFWS, universities, extension agents, FAA, and private individual and organizations. Consequently,

environmental impacts of this alternative are likely to be similar to Alternative 3 – No WS Mammal Damage Management Program. Consequently, the agencies have determined that detailed analysis of this alternative would not contribute substantive new information to the understanding of environmental impacts of damage management alternatives and have chosen to not analyze this alternative in detail.

3.4 STANDARD OPERATING PROCEDURES (SOPs) FOR MAMMAL DAMAGE MANAGEMENT

The current WS program, nationwide and in Maryland has developed SOPs for its activities that reduce the potential impacts of these actions on the environment. Some key standard operating procedures pertinent to the proposed action and alternatives of this EA include:

- The WS Decision Model is used to identify effective wildlife damage management strategies and their effects.

Target, Non-target, and Threatened and Endangered Species

- WS personnel are trained and experienced to select the most appropriate method for taking problem animals and excluding non-target species.

- WS has consulted with the USFWS and MDNR regarding potential impacts of the proposed alternatives on state and federally-listed T&E species. Reasonable and prudent measures or other provisions identified through consultation with the USFWS and MDNR will be implemented to avoid adverse effects on T&E species.

- WS would initiate informal consultation with the USFWS following any incidental take of T&E species.

- Research is being conducted to improve MDM methods and strategies so as to increase selectivity for target species, to develop effective non-lethal control methods, and to evaluate and minimize non-target hazards and environmental effects of MDM techniques.

- In the event that WS recommends habitat modification (e.g., modifying a wetland) as a damage management practice for the landowner/manager, WS will advise the landowner/manager that they are responsible for checking with state and federal authorities regarding regulations and endangered species protections that may be applicable to the proposed project.

- WS uses chemical methods for MDM that have undergone rigorous research to prove their safety and lack of serious effects on non-target animals and the environment.

- U.S. EPA approved label directions are followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse effects to the environment when chemicals are used in accordance with label directions.

- Live-traps would be placed so that captured animals would not be readily visible from any road or public area.

- Traps and snares will be set a sufficient distance from exposed animal carcasses to prevent the capture of scavenging birds.

- Foothold trap pan tension devices will be used to reduce hazards to non-target species that weigh less than the target species.

- Captured non-target animals would be released unless it is determined by WS personnel that the animal would not survive.

- Where applicable, annual WS take will be considered with the statewide "total harvest" (e.g., WS take and other licensed harvest) when estimating the impact on wildlife species.

- Management actions would be directed toward localized populations or groups and/or individual offending animals, dependent on the magnitude of the problem.

Health and Safety

- All WS personnel in Maryland using restricted chemicals and controlled substances (immobilization and euthanizing drugs) are trained and certified by, or operate under the direct supervision of, program personnel or others who are trained in the safe and effective use of chemical MDM materials.

- Appropriate warning signs are posted on main entrances or commonly used access points to areas where foothold traps, cable restraints, snares or rotating jaw (conibear-type) traps are in use.

- WS' employees would follow approved procedures outlined WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001).

- Material Safety Data Sheets for pesticides and controlled substances are provided to all WS' personnel involved with specific WDM activities.

- Research is being conducted to improve MDM methods and strategies so as to increase selectivity for target species, to develop effective non-lethal control methods, and to evaluate non-target hazards and environmental effects.

- Pesticide use, storage, and disposal conform to label instructions and other applicable laws and regulations, and Executive Order 12898.

- All WS actions are conducted in accordance with applicable state, federal and local laws, including permit conditions and regulations as dictated by the MDNR in WS Special Use Permit.

- Damage management projects conducted on public lands would be coordinated with the management agency.

Humaneness and Animal Welfare Concerns of Methods Used

- All WS actions are conducted in accordance with applicable state, federal and local laws, including regulations mandating that land traps set for mammals be checked as dictated by the MDNR in WS Special Use Permit.

- Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate.

- Management controls are in place within WS and its Immobilization and Euthanasia Committee to maintain personnel training and certification.

- Where practical, euthanasia procedures approved by the AVMA that cause minimal pain would be used.

- Use of newly-developed, proven, non-lethal methods would be encouraged when appropriate.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions when selecting an appropriate alternative for meeting the purpose of the proposed action. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. The environmental consequences of each alternative are analyzed in comparison with the no action alternative (Alternative 1) to determine if the real or potential effects would be greater, lesser, or the same.

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

Cumulative Effects: Cumulative effects are discussed in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and non-target species, including T&E species.

Direct Effects: Direct effects are caused by the action and occur at the same time and place.

Indirect effects: Indirect effects are caused by the action and are later in time or farther removed in distance. May include effects related to induce changes in population density, ecosystems, and land use changes.

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

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 as a result 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.

4.0 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative to determine the extent of actual or potential impacts on the issues addressed in detail, including a cumulative impact analysis. The analysis also takes into consideration mandates, directives, and the procedures of WS and the MDNR.

4.1 Effects on Target Mammal Species Populations

4.1.1 Alternative 1: Integrated Mammal Damage Management Program (Proposed Action/No Action)

A common issue is whether damage management actions would adversely affect the populations of target mammal species, especially when lethal methods are employed. Alternative 1 addresses requests for assistance received by WS through technical and operational assistance where an integrated approach to methods would be employed and/or recommended. 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 are employed. Non-lethal methods would be given priority when addressing requests for assistance (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 has already used non-lethal methods, WS would not likely recommend or continue to employ those particular methods since their use has already been proven ineffective in adequately resolving the damage or threat.

Many non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are 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. Non-lethal methods are not 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 are generally regarded as having minimal impacts on overall populations of wildlife since individuals of those species are unharmed. The use of non-lethal methods would not have adverse impacts on mammal populations in the state under any of the alternatives.

The use of lethal methods 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 are often 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 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 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 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 and trapping seasons and the allowed take during those seasons is the responsibility of the MDNR. 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 with hunting and/or trapping seasons would be occurring in addition to any take that could occur by WS under the alternatives or recommended by WS.

The issue of the potential impacts of conducting the alternatives on the populations of those target mammal species addressed in this EA are analyzed for each alternative below. Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance using methods described in Appendix B to those persons requesting assistance with managing damage and threats associated with mammals. Generally, WS only conducts damage management on species whose population densities are high or concentrated and usually only after they have caused damage. No indirect effects were identified for this issue.

Beaver Population Information and Effects Analysis

Beaver occur across most of North America and can be found throughout Maryland, primarily utilizing freshwater wetlands, rivers, streams, and lakes (Baker and Hill 2003). Beaver populations and occurrence is often directly related to habitat and harvest, with isolated populations being more susceptible to population reduction programs or changes in habitat quality (Hardinsky 2010). Beavers were hunted almost to extinction in the mid-1800s. However, beavers are now common throughout Maryland and the rest of the United States (MDNR 2015).

Beaver are managed as a furbearing species by the MDNR, with a regulated trapping season that occurs from December 15 to March 16 (in all counties except Garrett and Allegany which runs from December 1 to March 16) with an unlimited harvest. This harvest is highly dependent on fluctuations in fur prices.

Based on previous requests for assistance received by WS, the take of beaver by WS would not exceed 100 beaver annually. Using the average five year annual harvest data to assess WS' impacts on the population, WS' take of 100 beaver would represent 5.84% of the harvest (Table 4.1). This level of take is considered to be a very low magnitude. Given that the actual population is much higher than the annual harvest, WS' take is an even lower magnitude of the statewide population.

Table 4.1 – Number of beaver addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	4	2	1,598	0.25%
2010	3	0	2,047	0.15%
2011	2	1	960	0.21%
2012	5	0	1,492	0.33%
2013	30	0	2,469	1.21%
AVERAGE	**9**	**0.60**	**1,713**	**0.43%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of beaver removed in Maryland by all entities is shown in Table 4.1. The unlimited harvest levels allowed by the MDNR during the length of the trapping season provides an indication that direct or cumulative removal, including removal for damage management, would not reach a level where overharvest of the beaver population would occur resulting in an undesired population decline. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Coyote Population Information and Effects Analysis

The distribution of coyotes in 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 use a variety of habitats from large tracts of forested land to urban neighborhoods. Coyotes feed on a wide variety of items such as rabbits, carrion, rodents, ungulates (usually fawns), insects (such as grasshoppers), fruits, vegetative matter, as well as livestock and poultry. In some areas, coyotes feed on human refuse at dump sites and take small domestic pets such as cats and dogs (Voigt and Berg 1987). In Maryland, coyote occupy most of the state's habitat types (MDNR 2015).

Coyotes breed between January and March and are able to breed their first year (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, but causes large annual variation in total number of coyotes breeding. In a study in Texas, the percentage of females having litters varied from 48

to 81% (Knowlton 1972). Gier (1968) reported average litter sizes of 4.8 to 5.1 pups in years with low rodent numbers, but litters of 5.8 to 6.2 pups during years with high rodent numbers. Litter sizes of one to 19 pups have been reported (National Audubon Society 2000). According to the MDNR, "recent analysis in Virginia has verified an approximate 29% annual growth rate in its coyote population. Maryland and Virginia share similar habitat types and land use patterns. Therefore, it is probable that Maryland's coyote population is displaying comparable trend characteristics" (MDNR 2015).

Coyotes are classified as furbearers in Maryland, and have a regulated trapping season with unlimited take. In addition, coyotes can be legally taken by hunting all year around during daylight hours and from October 15- March 16 during day or night.

The coyote is probably the most extensively studied carnivore, and considerable research has been conducted on population dynamics. Data from scent-station indices suggest that density increases from north to south. Coyote densities as high as 2/km^2 (5/mi^2) have been reported in the southwestern and west-central U.S., 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 mi^2 would likely be applicable to coyote densities across much of their range. Exact coyote population densities in Maryland are unknown. Using a coyote population density of 0.5 to 1.0 coyote/mi^2 and the total area of Maryland of 12,407 mi^2 (U.S. Census Bureau unpublished data), a statewide coyote population could be estimated at 6, 203 to 12, 407 coyotes.

Based on previous requests for assistance received by WS, the proposed take of coyotes by WS would not exceed 50 coyotes annually during all damage management activities statewide.

The annual statewide fur harvest of coyotes in Maryland has ranged from 269 to 1,184 individuals with an annual average harvest of 718 coyotes over the past five years (Table 4.2). WS killed only one coyote in Maryland between 2009 and 2013 (Table 4.2). Using the conservative estimate of 6,203 coyotes, the lethal removal of up to 50 coyotes during MDM activities would impact up to 0.81% of the estimated coyote population and 6.96% of the average annual harvest by sportsman. 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).

Table 4.2 – Number of coyotes addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	1	0	269	0.37%
2010	0	0	877	0%
2011	0	0	1184	0%
2012	0	0	587	0%
2013	0	0	674	0%
AVERAGE	**0.20**	**0**	**718**	**0.07%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of coyotes removed in Maryland by all entities is shown in Table 4.4. The unlimited harvest levels allowed by the MDNR during the length of the trapping and hunting seasons provides an indication that direct or cumulative removal, including removal for damage management, would not reach a level where overharvest of the coyote population would occur resulting in a population decline. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Eastern Cottontail Rabbits Population Information and Effects Analysis

Eastern cottontails are found throughout Maryland on farms, in orchards, and in backyards. They are abundant in all counties, but are usually more plentiful in Piedmont and mountainous areas (MDNR 2015). Cottontails are a regulated small game species in Maryland and the MDNR has established seasons from November 1-February 28 and daily bag limit of four for this species. Population densities for cottontail rabbits vary with habitat quality, but one rabbit per 0.4 hectares (one acre) is a reasonable average (Craven 1994). Rabbits live only 12-15 months, but they can raise as many as six litters per year of one to nine young (usually four to six); (National Audubon Society 2000).

WS estimates that no more than 250 Eastern cottontail may be taken per year for MDM. Almost all of rabbits would be removed from airport, commercial, or industrial habitats where hunting is not likely to occur. Eastern cottontail damage management activities would target single rabbits or local populations of the species at sites where their presence was causing unacceptable damage to agriculture, human health or safety, natural resources, or property. The average number of Eastern cottontails intentionally taken by WS from FY 2009-FY 2013 was 44, and unintentionally taken was an average of five.

Given the high productivity of cottontail rabbits and that WS actions will be confined to very small, scattered portions of the state that are usually not subjected to hunting, WS' limited lethal take of Eastern cottontail would have no adverse impacts on overall rabbit populations in the state.

The unlimited harvest levels allowed by the MDNR during the length of the hunting season provides an indication that direct or cumulative removal, including removal for damage management, would not reach a level where overharvest of the rabbit population would occur resulting in an undesired population decline. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest.

Feral Cats Population Information and Effects Analysis

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 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). Executive Order 13112 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, 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 on invasive species. Removal of the animals will restore the environmental status quo for this area.

When conducting feral cat management projects, WS would give preference to live-capture methods. Live-captured cats would be transferred to local animal shelters and/or animal control offices when

practical. Lethal control would not be used on cats bearing obvious identification (e.g., collars). Although preference would be given to live-capture methods, based on current and anticipated requests for assistance with feral cat management, WS estimates that up to 50 feral cats may be lethally removed by WS per year. WS would only use AVMA approved euthanasia measures for lethal removal of cats. Most non-lethal or lethal removal of cats would be conducted for projects protecting human health and safety, valuable wildlife, or captive birds and other animals. The proposed lethal take of cats is insignificant to the total population of this species in the state. In metropolitan areas, animal control officers capture and remove dozens of feral cats each year. Nationwide, the Humane Society of the United States estimates that there are 50 million feral cats nationwide and between three and four million cats are euthanized in shelters each year. Any MDM involving lethal control actions by WS would be restricted to isolated individual sites. Some local populations may be temporarily reduced as a result of MDM projects aimed at reducing damage at a specific site. In those cases this would be considered a beneficial impact on the environment because these species are not considered part of the native ecosystem. However, given the reproductive capacity of feral cats and the limited and localized nature of WS' proposed actions, WS' limited lethal removal of feral cats is unlikely to reduce overall populations of this species in Maryland.

The average number of feral cats intentionally taken by WS from FY 2009-FY 2013 was two. Although removal of these species up to and including extirpation could be seen as desirable, because of the productivity and distribution of these species and the limited nature of WS work, WS is unlikely to ever do more than limit populations at the specific local sites where WS works. Based on the above information and WS limited lethal take of feral cats in Maryland, WS would have no significant direct or cumulative effects on local or statewide feral cat populations.

Feral Dog Population Information and Effects Analysis

Like domestic dogs, feral dogs (sometimes referred to as wild or free-ranging dogs) appear in a variety of shapes, sizes, colors, and even breeds. 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. Some feral dogs use human garbage for food while others rely on hunting and scavenging like other wild canids. Feral dogs are usually secretive and wary of people and 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 (Hygnstrom et al. 1994). Travel routes to and from the gathering or den sites may be well defined. Food scraps and other evidence of concentrated activity may be observed at gathering sites. Feral dogs may occur wherever people are present and permit dogs to roam free, or where people abandon unwanted dogs.

Feral dogs are often found in forested areas or shrub lands in the vicinity of 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 (Green and Gipson 1994).

WS in Maryland has removed zero feral dogs from 2009-2013. WS makes the best possible attempt to avoid lethal take on feral dogs and prefers live-capture. As a program policy, all dogs that are captured during MDM activities would be returned to the dog's owner (if identification is available), transported to a local animal shelter, or euthanized.

The number of feral and free-ranging dogs in Maryland is unknown. Because feral and free-ranging dogs are considered to be a detriment to native wildlife species similar to feral cats, removing dogs could be considered to have beneficial effects on the environment by eliminating predation and competition from an exotic species. Based upon the above information, WS' capture and relocation of dogs would not have negative effects on local or statewide populations of this species in Maryland.

In future programs, WS may be requested to address damage being caused by feral dogs in Maryland to protect any resource being damaged or threatened. It is possible that WS could kill as many as 20 feral dogs each year in Maryland. Feral dogs would be removed in projects aimed at protecting human safety, valuable wildlife, or livestock. When the removal of feral dogs is deemed appropriate to alleviate damage, reduce predation risks, or threats to human health and safety associated with feral dogs, live-capture or lethal methods would be employed. Each and every incident that involves a domestic dog will be handled on a case-by-case basis. If WS is requested to use live-capture techniques and subsequently captures a dog, those dogs captured would be either relinquished to the proper authority on site, or will be transported by WS. If WS does perform transportation of dogs, the dogs would be immediately delivered and relinquished to the animal control or pet shelter facility. In cases when the dog owner could be identified, WS would either relinquish the dog to the pet owner or to the responsible authority. The local animal control officer or animal shelter would be responsible for the care and disposition of the dog.

Although removal of these species up to and including extirpation could be seen as desirable, because of the productivity and distribution of these species and the limited nature of WS work, WS is unlikely to ever do more than limit populations at the specific local sites where WS works. Based on the above information and WS limited lethal take of feral dogs in Maryland, WS would have no significant direct or cumulative effects on local or statewide feral dog populations.

Feral Swine Population Information and Effects Analysis

Feral swine, also known as "*wild pigs*", "*wild boars*", and "*feral hogs*", are medium to large sized hoofed mammals, which look similar to domestic swine. These animals breed any time of year but peak breeding times usually occur in the fall. Litters sizes usually range from one to 12 piglets (Mayer and Brisbin 2009). Feral swine are the most prolific wild mammal in North America. Given adequate nutrition, a feral swine population can reportedly double in just four months (Barrett and Birmingham 1994). Feral swine may begin to breed as young as four months of age and sows can produce two litters per year (Mayer and Brisbin 2009). Feral swine are found in variable habitat in most of the United States, with the highest densities occurring in the southern United States. Populations are usually clustered around areas with ample food and water supplies.

There are currently no known populations of feral swine in Maryland. Feral swine populations are known in neighboring West Virginia, Virginia and Pennsylvania. If feral swine are detected in Maryland, they may be addressed by the WS program in response to requests by federal agencies, state agencies, municipal agencies, or the public at any location in the state. Agricultural producers may request assistance with managing damage to standing crops or disease threats to domestic livestock. MDNR may request assistance to protect natural areas, parks or recreation areas, or T&E species. Public health agencies may request assistance in reducing feral swine densities where disease threats to people may exist.

To address any future requests for assistance associated with feral swine, the Maryland WS program may

use any legal methods among those outlined by Barrett and Birmingham (1994), West et al. (2009), and Hamrick et al. (2011) as suitable for feral swine damage management to assist in ensuring feral swine do not become established in Maryland. Feral swine would most likely be primarily lethally removed by shooting. Feral swine captured using live-capture methods would be subsequently euthanized pursuant to WS Directive 2.505 or custody transferred to allow for permanent captivity based on the preference of MDNR and/or the MDA. The purpose of any feral swine management activities in Maryland would be to completely eliminate any known population resulting in complete extirpation or transfer into permanent captivity, with an initial estimate of up to 150 feral swine annually. These goals would be consistent with Executive Order 13112.

Gray Fox Population Information and Effects Analysis

The gray fox range includes southern Canada and most of the United States, except for portions of the Northwestern United States. The range extends south into Mexico and Central America (Godin 1977). Gray fox mate from January through May and produce litters of two to seven kits after an average gestation period of 53 days. Rabies and distemper are associated with this species (National Audubon Society 2000). Gray fox are classified as furbearers in Maryland, with a regulated hunting and trapping season with unlimited take (MDNR 2014). The annual statewide fur harvest of gray fox in Maryland has ranged from 2,850 to 3,945 individuals with an annual average of 3,226 gray fox over the past five years (Table 4.3).

Published estimates of gray fox density vary from 1.2 to 2.1 / km^2 (3.1 to 5.4 / mi^2) depending on location, season, and method of estimation (Errington 1933, Gier 1948, Lord 1961, Trapp 1978). Over areas larger than 5,000 km^2 (1,930 mi^2) in which habitat quality varies, densities are likely lower. Exceptionally high fox densities have been recorded in some situations (Grinnell et al. 1937, Hallberg and Trapp 1984).

Population data for gray fox in Maryland is currently not available. To determine an estimated population in Maryland, the best available data will be used. There are 2.6 million acres of forestland (USDA 1999) and about 1.4 million acres of cropland (NASS 2013) in Maryland. Using the assumptions that only 75% of the forest and crop lands throughout the state have sufficient habitat to support gray fox, that gray fox are only found in these habitats, and gray fox densities average 3.1gray fox/mi^2 the gray fox population could be estimated at approximately 14,531 individuals. Considering gray fox inhabit a large variety of habitats, including suburban areas, and may occupy more than 75% of the forested and cropland habitat available, an estimate of 14,53 gray fox is likely low.

WS killed 10 gray fox in Maryland as part of MDM activities between 2009 and 2013 (Table 4.3). In future programs, WS may be requested to address MDM, but lethal removal would not exceed 50 animals annually. Using the population estimate of 14,531, WS' lethal take of 50 gray fox would represent 0.34% of the Maryland population and 1.55% of the average annual harvest by sportsmen. Thus, the lethal removal of gray fox during MDM activities will not adversely affect the gray fox population in Maryland and will not limit the ability to harvest gray fox in the state during the regulated trapping season.

Table 4.3 – Number of gray fox addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	0	0	3036	0.0%
2010	3	0	3020	0.10%
2011	3	0	3945	0.08%
2012	3	0	2850	0.11%
2013	1	1	3281	0.03%
AVERAGE	**2**	**0.20**	**3226**	**0.06%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of gray foxes removed in Maryland by all entities is shown in Table 4.3. Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on gray fox populations. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Muskrat Population Information and Effects Analysis

Muskrats occur over most of North America, can be found throughout Maryland, and utilize both fresh and marine wetlands and streams. Muskrats are prolific breeders, producing two litters of young each year. Litter size varies from one to 14, with six to seven being the average number of young. However, their short life span and numerous mortality factors cause severe short-term population fluctuations (Godin 1977).

Muskrats are managed by the MDNR as a furbearer species with a trapping season with no daily or season take limit. In damage situations, property owners, dwelling occupants, farmers, and their agents, may take muskrats via lawful procedures to alleviate damage to property and other resources after contacting a Natural Resource Police Officer. Sportsmen have harvested an average of 33,499 muskrats annually from 2009-2013 (Table 4.4).

Muskrats are considered widespread and common throughout most of the state. WS has removed a total of three muskrats from 2009-2013 to respond to damage complaints. Based on previous requests for assistance received by WS, the take of muskrats by WS would not exceed 100 muskrats annually. Using the average annual hunter harvest data to assess WS' impacts to the muskrat population, WS' take of 100 muskrats would represent 0.30% of the average annual harvest by sportsmen (Table 4.4). This level of take is considered to be a very low magnitude. Given that the actual population is much higher than the annual harvest, WS' take is an even lower magnitude of the statewide population.

The unlimited harvest levels allowed by the MDNR during the length of the trapping season provides an indication that cumulative take, including take for damage management, would not reach a level where overharvest of the muskrat population would occur resulting in an undesired population decline. The MDNR has regulatory authority over the management of wildlife, including muskrat, and all take by WS has occurred and would continue to occur only after being authorized by the MDNR and only at the levels authorized.

Table 4.4 – Number of muskrats addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	0	202	27,567	0.73%
2010	0	30	30,664	0.10%
2011	2	69	41,581	0.17%
2012	1	29	44,295	0.07%
2013	0	22	23,387	0.09%
AVERAGE	**0.60**	**70**	**33,499**	**0.23%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of muskrats removed in Maryland by all entities is shown in Table 4.4. Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on muskrat populations. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Raccoons Population Information and Effects Analysis

Raccoons are 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).

Absolute raccoon population densities are difficult or impossible to determine because of the difficulty in knowing the percentage of the population that has already been counted or estimated and the additional difficulty of knowing how large an area the raccoons are 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. WS has conducted multiple density studies on raccoons for the Oral Rabies Vaccination program. While no studies were conducted in Maryland, raccoon densities have ranged from 24.9/mi^2 to 28.1/ mi^2 in similar habitat in surrounding states.

Raccoons are managed by the MDNR as a furbearer game species and may be harvested with no daily or season bag limit for trapping and hunting. In damage situations, a landowner or their agent may kill or have killed raccoons that have damaged property, gardens, livestock, or homes after receiving permission from a MDNR Natural Resource Police Officer. The annual seasonal harvest of raccoons ranges from 15,775-20,014 raccoons with an average of 17,602 raccoons from 2009-2013. WS has removed an average of 26 raccoons per year during this same time frame as part of WDM efforts.

In future programs, WS may be requested to address damage being caused by raccoons anywhere in Maryland to protect resources or human health and safety. Activities would target single animals or local populations of the species at sites where their presence was causing unacceptable damage to agriculture,

human health, natural resources, or property. Some local populations may be temporarily reduced if raccoons are lethally removed. Based upon an anticipated increase for requests for WS' assistance, up to 200 raccoons could be lethally removed by WS annually to alleviate damage, including raccoons that may be lethally taken during activities associated with rabies. Using the average five year annual sportsman harvest data to assess WS' impacts to the raccoon population, WS' take of 200 raccoon would represent 1.14% of the average annual harvest (Table 4.5). This level of take is considered to be a very low magnitude. Given that the actual population is much higher than the annual harvest, WS' take is an even lower magnitude of the statewide population.

The harvest levels allowed by the MDNR during the length of the hunting and trapping seasons provides an indication that cumulative take, including take for damage management, would not reach a level where overharvest of the raccoon population would occur resulting in an undesired population decline. The MDNR has regulatory authority over the management of wildlife, including raccoons, and all take by WS has occurred and would continue to occur only after being authorized by the MDNR and only at the levels authorized. The MDNR's oversight of WS, hunting/trapping seasons, and private pest control operator take would ensure that the cumulative take would not have a negative impact on the overall raccoon population.

Table 4.5 – Number of raccoon addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	7	83	15,775	0.04%
2010	1	22	17,367	0.01%
2011	57	34	20,014	0.28%
2012	31	6	16,063	0.19%
2013	36	29	18,790	0.19%
AVERAGE	**26**	**35**	**17,602**	**0.14%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of raccoons removed in Maryland by all entities is shown in Table 4.5. Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on raccoon populations. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Red Fox Population Information and Effects Analysis

Red fox are generally solitary animals as adults, except when mating (Phillips and Schmidt 1994). Dispersal serves to equalize fox densities over large areas. Annual harvests in localized areas in one or more years will likely have little impact on the overall population in subsequent years, but may reduce localized predation (Allen and Sargeant 1993). Phillips (1970) stated that fox populations are resilient and for fox control (by trapping) to be successful, pressure on the population must be almost continuous. Phillips (1970) and Voigt (1987) also concluded that habitat destruction affects fox populations to a greater extent than short-term over-harvest.

Red fox are classified as furbearers in Maryland, with a regulated hunting and trapping season with unlimited take. Also, a landowner or their agent may kill or have killed foxes that have damaged property, gardens, or homes after receiving permission from a MDNR Natural Resource Police Officer. Sportsmen have harvested an average of 18,193 red fox annually from 2009-2013. This species is considered widespread and very common throughout most of the state. WS has removed an average of 49 red fox per year to respond to damage complaints. Based on previous requests for assistance received by WS, the total take of red fox by WS, including red fox that could be taken as part of the rabies program, would not exceed 100 red fox annually. WS' lethal take of 100 red fox would represent 0.55% of the average annual harvest of red fox during the regular hunting/trapping season (Table 4.6). This level of take is considered to be a very low magnitude. Given that the actual population is likely much higher than the harvest level, WS' lethal removal of 100 red fox is not likely to adversely impact red fox populations in Maryland and will not limit the ability to harvest red fox in the state during the regulated trapping season.

The unlimited harvest levels allowed by the MDNR during the length of the hunting and trapping seasons provides an indication that cumulative take, including take for damage management, would not reach a level where overharvest of the red fox population would occur resulting in an undesired population decline.

Table 4.6 – Number of red fox addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	22	3	9,225	0.24%
2010	28	0	18,946	0.15%
2011	51	2	21,912	0.23%
2012	82	0	16,228	0.51%
2013	63	0	24,657	0.26%
AVERAGE	**49**	**1**	**18,193**	**0.27%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of red foxes removed in Maryland by all entities is shown in Table 4.6. Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on red fox populations. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Rodents and Insectivores Population Information and Effects Analysis

Native Species: Rodents (mice, voles, etc.) and insectivorous mammals (shrews and moles) are taken by WS during wildlife hazard management, assessments, and monitoring at airports and airbases because these species serve as attractants to birds such as raptors which create direct hazards to aircraft. Native rodents which may be the target of WS activities at airports include the meadow vole, deer mouse, and white-footed mouse. Insectivorous mammals which may be the target of WS activities at airports include Eastern mole and short-tailed shrews. Most rodent species are very prolific: meadow vole (up to 17 liters annually, typically 4-5 young per litter), white-footed mouse (multiple litters, five young each), deer mice (3-4 litters, 4-6 young each), and short-tailed shrews (two to three litters with 5 to seven young each)

(Merritt 1987). Eastern moles have one or two litters per year with two to five young each. Large population fluctuations are characteristic of many small rodent populations.

Method of lethal take for these species by WS would be trapping. Removal of these species by WS would be done at specific isolated sites (e.g. airports). Impacts of these activities to rodent and insectivore populations would be minimal due to the species' relatively high reproductive rates and because rodent/insectivore damage management recommended and conducted by WS would be at a limited number of specific local sites with the use of legal methods. Based upon the above information, WS limited lethal take of 200 small rodents annually may cause temporary reductions at the specific local sites where WS works, but would have no adverse impacts on overall populations of the species in Maryland.

Non-native Rodent Species: Norway Rats, black (roof) rats, and house mice are not native to North America and were accidentally released into this country. In the wild, the impact of these species is seen by many as entirely detrimental (Burt and Grossenheider 1980). These species eat anything digestible and may prey on eggs or offspring of native species and compete with native species for resources. Executive Order 13112 Invasive Species directs federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health. Although removal of these species up to and including extirpation could be seen as desirable, because of the productivity and distribution of these species and the limited nature of WS work, WS is unlikely to ever do more than limit populations at the specific local sites where WS works. Based on the above information and WS limited lethal take of rodents in Maryland, WS would have no significant direct or cumulative effects on local or statewide non-native rodent populations.

Striped Skunk Population Information and Effects Analysis

The striped skunk is common throughout the U.S., except for the arid southwest, and Southern Canada. They are an omnivore which feeds on insects, small mammals, the eggs of ground nesting birds, and amphibians. Striped skunks are typically non-aggressive and will attempt to flee when approached by humans. However, when provoked, skunks will give a warning and assume a defensive posture prior to discharging their foul-smelling musk (Godin 1977). Adult skunks begin breeding in late February and yearling females (born in the preceding year) mate in late March. Litters commonly consist of five to nine young with two litters per year possible. The home range of a striped skunk fluctuates with season, feeding activities, and dispersal (Godin 1977). 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).

No population estimates are available for striped skunks in Maryland. Striped skunks can be found in a variety of habitats across the state. Therefore, a population estimate will be derived based on the best available information for skunks to provide an indication of the magnitude of take proposed by WS to alleviate damage and threats of damage. There are about 2.05 million acres of farmland in Maryland (NASS 2013). If only 50% of the farmland throughout the state has sufficient habitat to support stripped skunks, skunks are only found on farmland, and skunk densities average one skunk per 77 acres, a statewide striped skunk population could be estimated at nearly 13,323 skunks. Skunks can be found in a variety of habitats, including urban areas, throughout the state; therefore, skunks likely occupy more than 50% of the farmland area in the state. However, to determine the magnitude of the proposed take by WS to alleviate or prevent damage, skunks occupying only 50% of the farmland area was used to provide a minimum population estimate.

Striped skunks are managed by the MDNR as a furbearer species with a trapping season that occurs from November through March. There is no daily or season take limit for trapping of striped skunks. In damage situations, property owners, dwelling occupants, farmers, and their agents, may take skunks via lawful procedures to alleviate damage to property, agricultural resources (including livestock, crops, or poultry), and other resources after contacting a Natural Resource Police. Sportsmen have harvested a range of 315 to 841 skunks at an average of 522 skunks annually from 2009-2013 (Table 4.7).

WS has removed a total of two striped skunks from FY 2009-2013 to respond to damage complaints and disease issues, including work at airports and rabies related projects. WS continues to receive an increasing number of requests for assistance with skunks. Based on recent requests for assistance and in anticipation of receiving additional requests for assistance, WS could annually take up to 100 skunks to alleviate damage or threats of damage associated with those requests.

With a statewide population estimated at 13,323 skunks, an annual take of up to 100 skunks by WS would represent 0.75% of the population and would represent 19% of the average annual sportsman harvest. The unlimited harvest allowed by the MDNR during the annual trapping seasons provides some indication the population of skunks is not subject to overharvest during the annual harvest seasons and from damage management activities. WS' take combined with hunter harvest and all other forms of mortality would not result in negative cumulative impacts to the statewide skunk population.

Table 4.7 – Number of striped skunk addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	0	1	478	0.21%
2010	0	0	841	0.0%
2011	0	0	500	0.0%
2012	1	0	475	0.21%
2013	1	0	315	0.32%
AVERAGE	**0.40**	**0.20**	**522**	**0.15%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of striped skunks removed in Maryland by all entities is shown in Table 4.7. Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on striped skunk populations. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Virginia Opossum Population Information and Effects Analysis

The reproductive season of the Virginia opossum typically occurs from December to February, depending on latitude (Gardner 1982). 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, it was 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 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. No population estimates are available for opossums in Maryland.

The opossum is managed by the MDNR as a furbearer species with a trapping and hunting season. There is no daily or season take limit for either trapping or hunting of opossum. In damage situations, property owners, dwelling occupants, farmers, and their agents, may take opossums via lawful procedures to alleviate damage to property, agricultural resources (including livestock, crops, or poultry), and other resources after contacting a Natural Resource Police. Sportsmen have harvested between 1,608 and 4,060 opossums with an average of 2,606 opossums annually from 2009-2013 (Table 4.8).

This species is considered widespread and very common throughout the state. WS has removed an average of 21 opossums per year to respond to damage or disease complaints. Based on previous requests for assistance received by WS, the take of opossum by WS would not exceed 100 opossum annually. Using the average five year annual sportsman harvest data to assess WS' impacts to the opossum population, WS' take of 100 opossum would represent 3.84% of the harvest (Table 4.8). This level of take is considered to be a very low magnitude. Given that the actual population is much higher than the annual harvest, WS' take is an even lower magnitude of the statewide population.

Table 4.8 – Number of Virginia opossum addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest*	Percent of Annual Harvest Removed by WS
2009	0	2	4,060	0.05%
2010	0	0	2,259	0.0%
2011	41	3	2,712	1.51%
2012	35	0	1,608	2.18%
2013	28	0	2,393	1.17%
AVERAGE	**21**	**1**	**2,606**	**0.98%**

* These are the numbers reported in MDNR hunting and trapping surveys.

The number of opossums removed in Maryland by all entities is shown in Table 4.8. Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on opossum populations. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

White-tailed Deer Population Information and Effects Analysis

White-tailed deer are one of the most ubiquitous and well-known wild animals in Maryland, and its large population has a huge effect on other kinds of wildlife and on the environment as a whole. Does can breed when they are six to seven months old when quality food is available. Year-old does may have one fawn, and older does generally have twins and, sometimes, triplets (Allen and Cromer 1977).

An ideal habitat is brush-stage forest with a wide variety of tree and plant species. White-tailed deer are highly adaptable and live in many habitats, including woodlots in farming country, suburbs, and deep woods. Mature bucks usually have larger home ranges than those of does and younger deer (Fergus 2000). Since white-tailed deer thrive in habitat that is composed of woods and openings, the expansion of housing developments into forests or onto farms provides excellent white-tail habitat. Streets and home sites created in a wooded area produce habitat preferred by white-tailed deer. Open farm fields become better deer habitat as new home owners plant trees and shrubs on their bare home site. Deer populations have escalated in these suburban landscapes where exceptional habitat is available and hunting is limited (MDNR 2004).

As deer populations increased in the state, damage associated with deer also increased. The Maryland white-tailed deer population is estimated on three criteria, which include population modeling, harvest trend analysis, and monitoring vital statistics of the deer herd. The population increased from an estimated 246,000 deer in 1998 to a high of nearly 295,000 individuals in 2002 before declining to 229,000 in 2008 (MDNR 2009). Methods used to resolve damage or threats to human safety can involve altering the behavior of target species and may require the use of lethal methods when appropriate. Under the proposed action, WS would incorporate non-lethal and lethal methods in an integrated approach in which all or a combination of methods may be employed to resolve a request for assistance. WS would recommend both non-lethal and lethal methods (to include regulated hunting) to interested individuals, as governed by federal, state, and local laws and regulations. Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage thereby, reducing the presence of those species at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed appropriate by WS' personnel. WS refers the public to the MDNR for assistance with hunting programs and deer damage permits.

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 animals removed from the population using lethal methods under this alternative would be dependent on the number of requests for assistance received, the number of deer involved with the associated damage or threat, the efficacy of methods employed, and the permitting of the removal by the MDNR.

WS removed an average of 417 white-tailed deer between 2009 and 2013 (Table 4.9) to reduce damage at airports, agricultural research centers, and fenced federal facilities. In anticipation of future deer damage management requests, WS could remove up to 1,500 deer annually as permitted by the MDNR. However, in the event of a disease outbreak (Foot and Mouth or CWD), WS could take up to 10,000 deer in coordination with other natural resource management agencies in Maryland and DC. Therefore, 10,000 deer is used to analyze WS potential impacts to the statewide deer population in Maryland.

The MDNR collects and compiles information on white-tailed deer population trends and take, and uses this information to manage deer populations. This information has been provided to WS to assist in the analysis of potential impacts of WS activities on the deer herd in Maryland. There is no hunting in DC, including NPS lands. Currently, the MDNR estimates that there are about 223,000 deer in Maryland (MDNR 2013). There are no existing deer population's estimates for DC. Using the 2012-2013 hunter harvest estimate (87,541), the number of deer killed under MDNR issued Deer Management Permits (7,940 in 2012), and the potential lethal take of 10,000 deer annually by WS (in case of a disease outbreak), the possibility of WS lethal deer damage management activities adversely affecting the overall Maryland deer population (223,000) is considered low. The cumulative take (4.48% of the overall

populations and 10.5% of the total lethal take) appears to be far beneath the level that would begin to cause a continuous decline in the regional deer population. WS' limited removal of up to 10,000 white-tailed deer annually would have no significant direct or cumulative effects on deer populations in Maryland.

GonaCon™, is considered a non-lethal method. Therefore, the impacts to the statewide deer population from using reproductive inhibitors are negligible. The effects of white-tailed deer damage management activities on this issue are expected to remain insignificant.

Table 4.9 – Number of white-tailed deer addressed in Maryland from FY 2009 to FY 2013

Year	WS Authorized Intentional Take	WS Unintentional Take	MD Statewide Annual Estimated Season Harvest	Percent of Annual Harvest Removed by WS
2009	469	0	100,437	0.47%
2010	441	0	100,663	0.44%
2011	372	0	98,663	0.38%
2012	444	0	98,029	0.45%
2013	360	0	87,541	0.41%
AVERAGE	**417**	**0**	**97,067**	**0.43%**

The number of white-tailed deer removed in Maryland by all entities is shown in Table 4.9. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

Woodchuck Population Information and Effects Analysis

Woodchucks (also known as groundhogs) are found throughout much of the eastern and midwestern U.S., with distribution across Maryland. They use a variety of open habitat types including agricultural areas, old fields, forest edges, fencerows, urban, and suburban settings. One limiting factor in the occurrence of woodchucks is soil types which allow for burrowing activities. Woodchucks have one litter a year that ranges from two to six young. Woodchucks breed at age one and live four to five years. Only one litter a year is produced with an average of five kits (Merritt 1987, Armitage 2003). Woodchuck densities vary from area to area, depending on food availability, soil type, hunting pressure and predation. Populations with up to six or seven individuals per acre have been documented. However, a population of four per acre is considered abundant, and the average is probably closer to one per acre of farmland (Fergus 2001).

To analyze potential impacts of WS' activities on woodchuck populations in Maryland, the best available information will be used to estimate a state-wide population. There are over 2,051,756 acres of currently active farmland in the state of Maryland (NASS 2013). Based on Fergus, there may be an average of one woodchuck per acre of farmland. Using a modest estimate of one woodchuck for every acre of farmland, a conservative statewide woodchuck population could be estimated at approximately two million individuals.

The MDNR is responsible for the management of the states woodchuck population but does not conduct population census or estimated harvest take for woodchucks. The woodchuck is classified as

"unprotected mammals". There is a continuous open season on hunting woodchucks with hunting license required and no bag limit (except in Baltimore and Frederick counties) which indicates that cumulative take, including take for damage management, would not reach a level where overharvest of the woodchuck populations would occur resulting in an undesired population decline.

Between FY 2009 and FY 2013, WS has employed lethal methods to lethally remove an average of 148 woodchucks in the state during MDM activities. Based on previous activities conducted by WS and in anticipation of receiving additional requests for assistance, up to 400 woodchucks could be lethally removed by WS annually to alleviate threats to human health and safety, natural resources, property, and agriculture. Based on a population estimated at 2 million woodchucks, take of up to 400 woodchucks annually by WS would represent 0.02% of the estimated population. The number of woodchucks lethally removed annually by other entities to alleviate damage is unknown; however, take by other entities to alleviate damage caused by woodchucks is not likely to reach a magnitude where adverse effects would occur to the statewide population. Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on woodchuck populations.

Other Target Species

Target species, in addition to the mammals analyzed above, have been lethally removed in small numbers by WS or could be lethally removed when requested to resolve damage or threats of damage. WS could lethally remove the following species not to annually exceed the number associated with each species: bobcat (10), mink (10), river otter (10), squirrels (fox, gray, and red, 50 each), and weasels (all species, 10 each). None of these mammal species are expected to be removed by WS at any level that would adversely affect overall statewide mammal populations. Damage management activities would target single animals or local populations at sites where their presence was causing unacceptable damage to agriculture, human health or safety, natural resources, or property. Some local populations may be temporarily reduced as a result of removal activities to reduce damage at a local site. The estimated WS removal would be of low magnitude when compared to the number of those game species harvested each year, and would be of extremely low magnitude when compared to the statewide population of those species. Those species are not considered to be of low densities in the state.

WS will analyze the take of river otter as an indicator of no significant direct or cumulative adverse impacts. River otter represent the most sensitive species included in this group. Therefore, if otter are not adversely impacted by WS' removal, no other species in this group should suffer negative impacts to their statewide populations.

River Otter Population Information and Effects Analysis

The river otter has a range that stretches across most of Canada, Alaska, and the continental United States, except for desert regions and areas without trees (Godin 1977). This species is associated with riparian habitats such as areas along streams, rivers, swamps, ponds, and lakes. Otters use pre-existing natural shelters such as beaver houses, beaver bank dens, muskrat houses, woodchuck dens, hollow logs, and log jams (Godin 1977). Otters reach breeding maturity at two to three years of age. Breeding takes place from mid-winter to early spring with delayed implantation. Litter size ranges from one to six offspring, although most litters contain two to four offspring. Young otters begin to eat solid food at two months and are weaned at three months of age (Hunt 1986).

River otters are classified as furbearers in Maryland, with a regulated trapping season with take of otter dependent on location in the state (MDNR 2014). WS may be requested to address predation threats from

river otters, but lethal removal would not exceed 10 animals annually. The annual statewide fur harvest of river otters has been between 100 and 363 individuals from 2009-2013. Using the average of the five years, WS' lethal removal of 10 river otters would represent 4.29% of the average annual harvest of otters during the regular trapping season. Given that the otter population is much higher than the two year average annual season harvest, the lethal removal of river otters by WS would not have significant direct impacts to the river otter population and should not limit the ability to harvest river otters in the state during the regulated trapping season.

WS does not anticipate any cumulative adverse impacts as well. WS coordination with the MDNR ensures that the removal by WS and other entities occurs within allowable harvest levels.

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 will facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It will 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. Data collected by organizations/agencies conducting research and monitoring will provide a broad species and geographic surveillance effort.

To provide the most useful information and a uniform structure for surveillance, strategies for collecting samples could be employed. Those strategies include:

Investigation of Illness/Death in Mammals: A systematic investigation of illness and death in mammals may be conducted to determine the cause of the illness or death. This strategy offers the best and earliest probability of detection if a disease is introduced into the United States. Illness and death involving wildlife are often detected by or reported to natural resource agencies and entities. This strategy capitalizes on existing situations of mammals without additional mammals being handled or killed.

Surveillance in Live Wild Mammals: This strategy involves sampling live-captured, apparently healthy mammals to detect the presence of a disease. Mammal species that represent the highest risk of being exposed to, or infected with, the disease because of their movement patterns, or mammals that may be in contact with species from areas with reported outbreaks would be targeted. Where possible, this sampling effort would be coordinated with local projects that already plan on capturing and handling the desired mammal species. Coordinating sampling with ongoing projects currently being conducted by state and federal agencies, universities, and others maximizes use of resources and minimizes the need for additional mammal capture and handling.

Surveillance in Harvested Mammals: Check stations for harvestable mammal species provide an opportunity to sample dead mammals to determine the presence of a disease, and could supplement data collected during surveillance of live mammals. Sampling of mammals harvested or taken as part of damage management activities would focus on species that are most likely to be exposed to a disease.

Under the disease sampling strategies listed above that could be implemented to detect or monitor mammalian 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, hair 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 mammal species addressed in this EA and would not result in any take of mammals that would not have already occurred in the absence of disease sampling (*e.g.*, hunter harvest).

Summary
Evaluation of WS' activities relative to wildlife populations indicated that program activities will likely have no cumulative adverse effects on populations in Maryland. WS' actions would be occurring simultaneously, over time, with other natural processes and human-generated changes that are currently taking place. Those activities include, but are not limited to:

- Natural mortality of wildlife
- Human-induced mortality through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in population densities

All those factors play a role in the dynamics of wildlife 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. WS' actions taken to minimize or eliminate damage are constrained as to scope, duration and intensity, for the purpose of minimizing or avoiding impacts to the environment. WS evaluates damage occurring, including other affected elements and the dynamics of the damaging species; determines 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.

4.1.2 Alternative 2: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would not intentionally remove any target mammal species because no lethal methods would be used. Although the methods employed by WS would not be intended to result in the death of the animal, some methods, such as live-capture and anesthesia can result in injury or death of target animals despite the training and best efforts of management personnel. This type of take is likely to be limited to a few individuals and would not adversely impact populations of any species.

Although WS lethal take of mammals would not occur, it is likely that without WS conducting some level of lethal MDM activities for these species, private MDM efforts would increase. Cumulative, direct and indirect impacts on target species populations would be variable depending upon actions taken by affected landowners/resource managers and the level of training and experience of the individuals conducting the MDM. Depending upon the experience, training and methods available to the individuals conducting the MDM, potential adverse direct and indirect impacts on target mammal populations would likely be the same or greater than with Alternative 1. Some individuals experiencing damage may take illegal or unsafe action against the problem species either indirectly due to lack of training, or directly out of frustration of continued damage. In these instances, more target species may be taken than with a professional MDM program (Alternatives 1). Ready access to WS assistance with non-lethal MDM may decrease private efforts to use lethal techniques. Therefore, take of target species may be less than anticipated with Alternatives 3. Overall impacts on target species populations would be similar to or

slightly higher than Alternative 1 depending upon the extent to which resource managers use the assistance provided by WS. However, for the reasons presented in the population effects analysis in section 4.1.1, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

4.1.3 Alternative 3: No Federal WS Mammal Damage Management

Under this alternative, WS would not conduct mammal damage management activities. WS would have no direct involvement with any aspect of addressing damage caused by mammals and would provide no technical assistance. Mammals could continue to be lethally taken to resolve damage and/or threats occurring either through permits issued by the MDNR, during the regulated hunting or trapping seasons, or without a permit as allowed in certain situations by state laws and regulations. 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 impacts similar to the proposed action.

Since mammals would still be taken under this alternative, the potential effects on the populations of those mammal species would be similar among all the alternatives for this issue. Any actions to resolve damage or reduce threats associated with mammals could occur by other entities despite WS' lack of involvement under this alternative. However, for the reasons presented in the population effects analysis in section 4.1.1, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

4.2 Effects on Other Wildlife Species, including T&E Species

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.

4.2.1 Alternative 1: Integrated Mammal Damage Management Program (Proposed Action/No 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 requesting assistance. 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.

WS personnel are experienced and trained in wildlife identification and 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 are 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 take

during program activities, the potential for adverse impacts to non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Direct, Indirect, and Cumulative Effects:
Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage are intended to elicit fright responses in wildlife. When employing those methods to disperse or harass target species, any non-targets in the vicinity of those methods when employed are also likely dispersed from the area. Similarly, any exclusionary device constructed to prevent access by target species also excludes 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 are employed of both target and non-target species. Therefore, any use of non-lethal methods has similar results on both non-target and target species. Though 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. Overall, potential impacts to non-targets from the use of non-lethal methods would not adversely impact populations since those methods are often temporary.

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

Mammals could still be lethally taken during the regulated harvest season, when causing damage, and through the issuance of permits under this alternative. 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. WS' involvement in the use of or recommendation of non-lethal methods would ensure non-target impacts are considered under WS' Decision Model. 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 would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by mammals under this alternative would include shooting, body-gripping traps, snap traps, euthanasia after live-capture, and registered fumigants and toxicants. Available methods and the application of those methods to resolve mammal damage is further discussed in Appendix C.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method.

While every precaution is 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 can result in the incidental take of unintended species. Those occurrences are infrequent and should not affect the overall populations of any species under the proposed action. WS' take of non-target species during activities to reduce damage or threats to human safety associated with mammals in Maryland is expected to be extremely low to non-existent (Tables 4.1-4.9). The muskrat non-target take may appear to be high; however, it is mostly associated with the Marsh Restoration and Nutria Damage Reduction Program which is analyzed under a separate EA (USDA 2014). Non-target muskrat take has rarely occurred in other projects throughout Maryland. WS would monitor the take of non-

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

Only fumigants and toxicants registered with the EPA pursuant to the FIFRA and the MDA would be recommended and used by WS under this alternative. Fumigants and toxicants, including restricted use toxicants, could be used by licensed non-WS' pesticide applicators in Maryland, therefore, WS' use of fumigants and toxicants would provide no additional negative impacts on non-target species. WS personnel are trained and licensed in the safe and effective use of fumigants and toxicants as well as the behavior and biology of both target and non-target wildlife species. WS personnel's training in combination with following label requirements presents a low risk of exposure of non-targets species to registered fumigants and toxicants. Additionally, WS personnel would collect and/or properly dispose of all unused toxicant/treated bait and/or carcasses of target species taken with fumigants and toxicants to reduce threats to non-target species through direct or secondary exposure. WS would utilize locking bait stations to restrict access of non-target species to rodenticides such as anticoagulants. As appropriate, WS would use signage and other means of notification to ensure the public is aware of fumigant or toxicant applications or applications sites, to ensure non-target domestic species such as dogs are not exposed.

Under the Bald and Golden Eagle Act, activities that could result in the "take" of eagles cannot occur unless the United States Fish and Wildlife Service allow those activities to occur through the issuance of a permit. Take could occur through purposeful take (e.g., harassing an eagle from an airport using pyrotechnics to alleviate aircraft strike hazards) or non-purposeful take (e.g., unintentionally capturing an eagle in a trap). Both purposeful take and non-purposeful take require a permit from the United States Fish and Wildlife Service (see 50 CFR 22.26, 50 CFR 22.27). In those cases where purposeful take could occur or where there is a high likelihood of non-purposeful take occurring, WS would apply for a permit for those activities.

However, routine activities conducted by WS' personnel under the proposed action alternative could occur in areas where bald eagles were present, which could disrupt the current behavior of an eagle or eagles that were nearby during those activities. As discussed previously, "take" as defined by the Bald and Golden Eagle Protection Act, include those actions that "disturb" eagles. Disturb has been defined under 50 CFR 22.3 as those actions that cause or are likely to cause injury to an eagle, a decrease in productivity, or nest abandonment by substantially interfering with their normal breeding, feeding, or sheltering behavior.

WS has reviewed those methods available under the proposed action alternative and the use patterns of those methods. The routine measures that WS conducts would not meet the definition of disturb requiring a permit for the non-purposeful take of bald eagles. The USFWS states, "eagles are unlikely to be disturbed by routine use of roads, homes, or other facilities where such use was present before an eagle pair nesting in a given area. For instance, if eagles build a nest near your existing home, cabin, or place of business you do not need a permit" (USFWS 2012). Therefore, activities that are species specific and are not of a duration and intensity that would result in disturbance as defined by the Act would not result in non-purposeful take. Activities, such as walking to a site, discharging a firearm, or riding an ATV along a trail, generally represent short-term disturbances to sites where those activities take place. WS would conduct activities that were located near eagle nests using the National Bald Eagle Management Guidelines (USFWS 2007). The categories that would encompass most of these activities are Category D

(Off-road vehicle use), Category F (Non-motorized recreation and human entry), and Category H (Blasting and other loud, intermittent noises). These categories generally call for a buffer of 330 to 660 feet for category D and F, and a ½-mile buffer for category H. WS would take active measures to avoid disturbance of bald eagle nests by following the National Bald Eagle Management Guidelines. However, other routine activities conducted by WS do not meet the definition of "disturb" as defined under 50 CFR 22.3. Those methods and activities would not cause injuries to eagles and would not substantially interfere with the normal breeding, feeding, or sheltering behavior of bald eagles.

The proposed mammal damage management could benefit many other wildlife species that are impacted by predation or competition for resources. For example, fox often feed on the eggs, nestlings, and fledglings of ground nesting bird species, browsing damage from deer overabundance may affect species diversity, or raccoons may feed on T&E species of mussels in a stream. This alternative has the greatest possibility of successfully reducing mammal damage and conflicts to wildlife species since all available methods could possibly be implemented or recommended by WS.

T&E Species Effects

Special efforts are 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 T&E effects are described in Chapter 3 of this EA.

Federally Listed Species - The current list of species designated as threatened and endangered in Maryland as determined by the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Services was obtained and reviewed during the development of this EA. Appendix D contains the list of species currently listed in the state along with common and scientific names.

Because of the statewide scope and number of species and activities covered under this EA, WS will consult with and follow the procedures and guidelines provided by the USFWS Maryland Field Office to assist in determining whether a Section 7 consultation is needed on a project by project basis. These procedures are provided via the Information, Planning, and Consultation System administered by the USFWS.

For each mammal damage management project, WS personnel will access the website and review the list for the project location to determine if federally listed species are where the project is to be conducted, and if so, could they be located at the project site during the period when the project will be conducted. If the proposed project occurs in a city or town with no known federally listed, proposed, or candidate species present, no further coordination with the USFWS is needed. A "No Species Present" letter stating "no species are known to occur in the project area" will be included with the project file.

If one or more federally listed, proposed, or candidate species occurs in the city or town where the project will be conducted, WS will determine whether these species are likely to occur within the proposed project area by comparing the habitat present within the proposed project action area with habitat that is suitable for the species. This will be done through a review of the information provided in species profiles and fact sheets on the USFWS website, from the MDNR, or any other sources of information available to WS to determine types of habitat the species use. This will be used by WS personnel to determine whether the proposed project area has any potential for listed species habitat. If the project site is in appropriate habitat for federally listed species, additional investigation will be made.

If potential listed species habitat is present although the species has not been documented from that

specific location or if federally listed species are known to occur at the project site, WS personnel will consult with the USFWS, and if necessary obtain the appropriate formal or informal Section 7 Consultation as required under the ESA. By utilizing the established procedures from the USFWS, it ensures that WS' operations comply with all USFWS regulations and mitigating measures. This will also ensure that significant direct, indirect, and cumulative impacts are avoided on T&E species. Based on currently known project sites, WS has made a no effect determination for all federally listed species.

State Listed Species – The current list of state listed species as determined by the MDNR was obtained and reviewed during the development of the EA (see Appendix E). Based on the review of species listed, WS has determined that the proposed activities would not adversely affect those species currently listed by the state. Any activity involving state-listed mammals being analyzed in this EA would require prior authorization by the MDNR through permitting or specific authorization.

4.2.2 Alternative 2: Non-lethal Mammal Damage Management Only by WS

Under this alternative, risks to non-target species from WS actions would likely be limited to the use of frightening devices, exclusionary devices, and the risks of unintentional capture of a non-target in a live-capture device as outlined under Alternative 1. Although the availability of WS assistance with non-lethal MDM methods could decrease incentives for non-WS entities to use lethal MDM methods, non-WS efforts to reduce or prevent damage could result in less experienced persons implementing mammal damage management methods and lead to a greater removal of non-target wildlife.

Direct, Indirect, and Cumulative Effects:
WS efforts to protect rare, threatened or endangered species would not be as effective as the preferred alternative because WS would be unable to access lethal techniques if non-lethal techniques are ineffective. Lethal efforts to protect these species would have to be conducted by other natural resource management entities. Capture and release (e.g., for disease monitoring) and capture and relocate would be allowed under this alternative. There is the extremely remote chance that the capture devices could result in the death of a non-target animal. However, given that these devices would be applied with provisions to keep the target animal alive, the risks to non-target species are very low and would not result in adverse impacts on non-target species populations.

If mammal damage problems were not effectively resolved by non-lethal control methods, members of the public may resort to other means of lethal control such as the use of shooting or the use of pesticides. This could result in less experienced persons implementing control methods and could lead to greater risks to non-target wildlife than the proposed action. For example, shooting by persons not proficient at mammal identification could lead to killing of non-target mammals. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of chemical toxicants which could lead to unknown effects on local non-target species populations, including T&E species. Hazards to raptors, including bald eagles and peregrine falcons, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals. While cumulative impacts would be variable, WS does not anticipate any significant cumulative impacts from this alternative.

Effects on T&E species: WS will not have any direct negative impact on T&E species. Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to species like the bald eagle and peregrine falcon. Risks to T&E species may be lower with this alternative than

with Alternative 3 because people would have ready access to assistance with non-lethal MDM techniques. WS could advise individuals as to the potential presence of state and federally listed species in their area.

4.2.3 Alternative 3: No Federal WS Mammal Damage Management

Under this alternative, WS would not be directly involved with mammal damage management activities. 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 MDNR, take would continue to occur during the regulated harvest season, 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 persons who implement mammal damage management activities on their own or through recommendations by the other federal, state, and private entities. Although some risks occur from those that implement mammal damage management in the absence of any involvement by WS, those risks are likely low and are similar to those under the other alternatives.

Direct, Indirect, and Cumulative Effects:
The ability to reduce damage and threats of damage 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. The risks to non-targets and T&E species would be similar across the alternatives since most of those methods described in Appendix C would be available across the alternatives. If those methods available were applied as intended, direct, indirect, and cumulative effects to non-targets would be minimal to non-existent. If methods available were applied incorrectly or applied without knowledge of mammal behavior, risks to non-target wildlife would be higher under this alternative. If frustration from the lack of available assistance causes those persons experiencing mammal damage to use methods that were not legally available for use, direct, indirect, and cumulative effects on non-targets would be higher under this alternative. People have resorted to the use of illegal methods to resolve wildlife damage that have resulted in the lethal removal of non-target wildlife (e.g., USFWS 2001, FDA 2003). Therefore, adverse direct, indirect, or cumulative impacts to non-targets, including T&E species, could occur under this alternative; however WS does not anticipate any significant cumulative impacts.

Effects on T&E species: WS will not have any direct impact on T&E species. Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to species like the state-listed peregrine falcon. Risks to T&E species may be higher with this alternative than with the other alternatives because WS would not have any opportunity to provide advice or assistance with the safe and effective use of MDM techniques or have the opportunity to advise individuals regarding the presence of T&E species.

4.3 Effects on Human Health and Safety

4.3.1 Alternative 1: Integrated Mammal Damage Management Program (Proposed Action/No Action)

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. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS would be similar to those risks addressed by the other alternatives.

WS' employees who conduct activities would be knowledgeable in the use of methods, 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. Prior to and during the utilization of lethal methods, WS' employees would consider risks to human safety based on location and method. Risks to human safety from the use of methods would likely be greater in urban areas when compared to 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 is controlled and monitored, the risks to human safety from the use of methods would likely be less. If damage management activities occur at parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety increases. Activities would generally be conducted when human activity is minimal (e.g., early mornings, at night) or in areas where human activities are minimal (e.g., in areas closed to the public).

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 would include immobilizing drugs, euthanasia drugs, reproductive inhibitors, fumigants, toxicants, and repellents.

The use of immobilizing drugs under the identified alternatives 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 are used to temporary handle and transport animals to lessen the distress of the animal from the experience. Drug delivery to immobilize mammals is likely to occur on site with close monitoring of the animal to ensure proper care of the animal. Immobilizing drugs are fully reversible with a full recovery of sedated animals occurring. A list and description of immobilizing drugs available for use under the identified alternatives can be found in Appendix C.

Euthanizing drugs would be administered under similar circumstances to immobilizing drugs under the relevant proposed alternatives. Euthanizing drugs would be administered to animals live-captured using other methods. Euthanized animals would be disposed of in accordance with WS Directives; therefore, would not be available for harvest and consumption. 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 C.

The cooperator requesting assistance is 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; thereby, making the cooperator aware of the use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods.

Safety issues related to the misuse of firearms and the potential human hazards associated with firearms use are issues identified when employed to reduce damage and threats. To help ensure safe use and awareness, 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 are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS and cooperating agencies would work closely with cooperators requesting assistance to ensure all safety issues are considered before firearms are deemed appropriate for use. The use of all methods, including firearms, must be agreed upon with the cooperator to ensure the safe use of those methods.

The low-level flights used for wildlife management including wildlife surveys are inherently higher risk than those for general aviation. Low-level flights introduce hazards such as power lines and trees, and the safety margin for error during maneuvers is diminished compared to high-level flights. Accidents have been associated with WS aerial operations and are a concern to WS. Some of WS's accidents have involved pilot error while others are directly related to mechanical failure. WS developed the WS Aviation Training Center with the goal of reducing pilot error accidents to zero. The WS Aviation Training Center provides safety training, individual instruction and aviation consultation to all aviation programs in WS. The center trains pilots to effectively respond to different types of mechanical failures and other safety concerns associated with low-level flight. WS complies with all Federal Aviation Administration issued Service Bulletins, Airworthiness Directives, aircraft manufacturing recalls, and similar documents.

In 2007 and 2008, WS conducted a programmatic safety review to assess and improve employee safety. The review covered nine WS program areas including the aviation program. The review of the aviation program was conducted by the Interagency Committee on Aviation Safety. The review team concluded that the WS aviation program is being operated in a safe, efficient and effective manner and that the program met the Interagency Committee on Aviation Safety requirements for the Gold Standard Certificate for Excellence. At this time, the WS program is the only USDA aviation program to be awarded this certification. WS' program pilots and contractors are highly skilled with commercial pilot ratings and have passed proficiency tests in the flight environment encountered by WS. WS' pilots are trained in hazard recognition and surveillance flights would only be conducted in safe environments. Federal aviation regulations require pilots to fly a minimum distance of 500 feet from structures and people, and all employees involved in these operations are mindful of this. Although the goal of the aviation program is to have no accidents, accidents may still occur. However, the protective measures implemented by WS keep the risk of aircraft accidents and injuries to the public and aircraft crew low.

The use of restraining devices (*e.g*., foot-hold traps, cage traps) and body-gripping traps have also been identified as a potential issue. Restraining devices and body-gripping traps are typically set in situations where human activity is minimal to ensure public safety. Restraining devices and body-gripping traps

rarely cause serious injury and are triggered through direct activation of the device. Therefore, human safety concerns associated with restraining devices and body-gripping traps used to capture wildlife, including mammals, require direct contact to cause bodily harm. Again, restraining devices are not located in high-use areas to ensure the safety of the public and pets. Signs warning of the use of those tools in the area are posted for public view at access points to increase awareness that those devices are being used and to avoid the area, especially pet owners.

Lethal methods available under the proposed action would include the use of firearms; kill traps (*e.g.*, conibear traps, snap traps, glue traps); live-capture followed by euthanasia; registered fumigants and toxicants, and the recommendation that mammals be harvested during the regulated hunting or trapping season established for those species by the MDNR.

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

Per the EPA label, deer vaccinated with GonaCon™ will be marked. However, deer vaccinated with GonaCon™ are safe for human consumption. The EPA (Farwell 2009) stated "There is little likelihood of exposure to hormonally active compound from deer meat because GnRH is a protein that is digested and not absorbed intact." As with any controlled use pesticide, those administering GonaCon™ will take all label precautions including the use of proper PPE and proper storage, transportation, and disposal procedures of equipment and vaccine medium. Impacts of the program on this issue are expected to remain insignificant.

All WS' personnel who handle and administer chemical methods would be properly trained in the use of those methods. Training and adherence to agency directives would ensure the safety of employees applying chemical methods. Mammals euthanized by WS or taken using chemical methods would be disposed of in accordance with WS Directive 2.515. All euthanasia would occur in the absence of the public to further minimize risks, whenever possible.

All WS' personnel who apply fumigants and toxicants registered with the EPA pursuant to the FIFRA and the MDA are licensed as commercial pesticide applicators by the MDA. WS personnel are trained in the safe and effective use of fumigants and toxicants. Training and adherence to agency directives and label requirements would ensure the safety of both employees applying fumigants and toxicants and members of the public. To the extent possible, toxicants, treated baits, and/or mammals taken with fumigants or toxicants by WS will be collected and/or disposed of in accordance with label requirements to reduce risk of secondary toxicity to people who may be exposed to them or attempt to consume them. WS would utilize locking bait stations to restrict access of children to rodenticides such as anticoagulants. As appropriate, WS would use signage and other means of notification to ensure the public is aware of fumigant or toxicant applications or applications sites, to ensure people, including children, are not exposed.

The recommendation of repellents or the use of those repellents registered for use to disperse mammals 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 be directly used by WS under this alternative would also 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 or recommendation of repellents 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 are 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.

Drugs used in capturing, handling, and euthanizing wildlife for wildlife hazard management purposes include ketamine, a mixture of ketamine and xylazine, sodium pentobarbital, potassium chloride, and Beuthanasia-D. Meeting the requirements of the Animal Medicinal Drug Use Clarification Act should prevent any significant adverse impacts on human health with regard to this issue. SOPs include:

- All drug use 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 drugs would be released well before controlled 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 humans. 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.

By following those procedures in accordance with Animal Medicinal Drug Use Clarification Act, wildlife management programs would avoid any significant impacts on human health with regard to this issue.

The recommendation by WS that mammals be harvested during the regulated hunting and/or trapping seasons which are established by the MDNR 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 MDNR 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.

Direct, Indirect, and Cumulative Effects:

No adverse direct or indirect effects to human safety have occurred from WS' use of methods to alleviate mammal damage from FY 2010 through FY 2014. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low. No adverse direct effects to human health and safety are expected through the use of live-capture traps and devices or other non-lethal methods. Since WS personnel are required to complete and maintain firearms safety training, no adverse direct effects to human health and safety are expected as a result of the misuse of firearms by WS personnel. Additionally, all WS personnel are properly trained on all chemicals handled

and administered in the field, ensuring their safety as well as the safety of the public. Therefore, adverse direct effects to human health and safety from chemicals used by WS are anticipated to be very low. The amount of chemicals used or stored by WS and cooperating agencies would be minimal to ensure human safety. No adverse indirect effects are anticipated from the application of any of the chemicals available for WS. WS does not anticipate any additional adverse cumulative impacts to human safety from the use of firearms when recommending that mammals be harvested during regulated hunting seasons to help alleviate damage.

4.3.2 Alternative 2: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would not use lethal MDM methods. Concerns about human health risks from WS' use of lethal mammal damage management methods would be alleviated because no such use would occur. However, most lethal methods would still be available to licensed pest control operators. Benefits to the public from WS' MDM activities will depend on the ability of WS to resolve problems using non-lethal methods and the effectiveness of non-WS MDM efforts. In situations where risks to human health and safety from mammals cannot be resolved using nonlethal methods, benefits to the public will depend on the efficacy of non-WS use of lethal MDM methods. If lethal MDM programs are implemented by individuals with less experience than WS, they may not be able to effectively resolve the problem or it may take longer to resolve the problem than with a WS program.

Direct, Indirect, and Cumulative Effects:
Since most methods available to resolve or prevent mammal damage or threats are available to anyone, the direct, indirect, and cumulative effects to human safety from the use of those methods are similar between the alternatives. Private efforts to reduce or prevent damage would be expected to increase, and would likely result in less experienced persons implementing chemical or other damage management methods which may have variable adverse direct, indirect, and/or cumulative effects to human and pet health and safety than under Alternative 1. Ignorance and/or frustration caused by the inability to reduce losses could lead to illegal use of toxicants by others which could lead to unknown direct, indirect, and/or cumulative impacts to humans and pets.

4.3.3 Alternative 3: No Federal WS Mammal Damage Management

Under the no mammal damage management 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 experiencing damage.

Direct, Indirect, and Cumulative Effects:
Similar to Alternative 2, reproductive inhibitors, immobilizing drugs, and euthanasia chemicals would not be available under this alternative to those persons experiencing damage or threats from mammals. However, fumigants, toxicants, 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 are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. Habitat modification and harassment methods are also generally regarded as posing minimal adverse direct and indirect effects to human safety. Although some risks to safety are likely to occur with the use of pyrotechnics, propane cannons, and exclusion devices, those

risks are minimal when those methods are used appropriately and in consideration of human safety. However, methods employed by those 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, pose minimal risks to human safety.

4.4 Humaneness and Animal Welfare Concerns of Methods Used

4.4.1 Alternative 1: Implement an Integrated Mammal Damage Management Program (Proposed Action/No 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 which are generally regarded as humane. Non-lethal methods would include resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, reproductive inhibitors, cage traps, nets, and repellents.

WS may use EPA registered and approved chemicals to manage damage caused by some mammals. Some individuals consider the use of such chemicals to be inhumane. WS personnel are experienced, professional and humane in their use of management methods. Under this alternative, mammals would be killed by experienced WS personnel using the best and most appropriate method(s) available.

The AVMA states "... euthanasia is the act of inducing humane death in an animal" and that "...that if an animal's life is to be taken, it is done with the highest degree of respect, and with an emphasis on making the death as painless and distress free as possible" (AVMA 2013). Additionally, euthanasia methods should minimize any stress and anxiety experienced by the animal prior to unconsciousness." Although use of euthanasia methods to end an animal's life is desirable, as noted by the AVMA, "For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but use terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible" (AVMA 2007).

AVMA (2013) notes, "While recommendations are made, it is important for those utilizing these recommendations to understand that, in some instances, agents and methods of euthanasia identified as appropriate for a particular species may not be available or may become less than an ideal choice due to differences in circumstances. Conversely, when settings are atypical, methods normally not considered appropriate may become the method of choice. Under such conditions, the humaneness (or perceived lack thereof) of the method used to bring about the death of an animal may be distinguished from the intent or outcome associated with an act of killing. Following this reasoning, it may still be an act of euthanasia to kill an animal in a manner that is not perfectly humane or that would not be considered appropriate in other contexts. For example, due to lack of control over free-ranging wildlife and the stress associated with close human contact, use of a firearm may be the most appropriate means of euthanasia. Also, shooting a suffering animal that is in extremis, instead of catching and transporting it to a clinic to euthanize it using a method normally considered to be appropriate (e.g., barbiturates), is consistent with one interpretation of a good death. The former method promotes the animal's overall interests by ending its misery quickly, even though the latter technique may be considered to be more acceptable under normal conditions (Yeates 2010). Neither of these examples, however, absolves the individual from her or his responsibility to ensure that recommended methods and agents of euthanasia are preferentially used."

AVMA (2013) recognizes that there is "an inherent lack of control over free-ranging wildlife, accepting that firearms may be the most appropriate approach to their euthanasia, and acknowledging that the quickest and most humane means of terminating the life of free-ranging wildlife in a given situation may not always meet all criteria established for euthanasia (i.e., distinguishes between euthanasia and methods that are more accurately characterized as humane killing). Because of the variety of situations that may be encountered, it is difficult to strictly classify methods for termination of free-ranging wildlife as acceptable, acceptable with conditions, or unacceptable. Furthermore, classification of a given method as a means of euthanasia or humane killing may vary by circumstances. These acknowledgments are not intended to condone a lower standard for the humane termination of wildlife. The best methods possible under the circumstances must be applied, and new technology and methods demonstrated to be superior to previously used methods must be embraced.

Direct, Indirect, and Cumulative Effects:
The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology. MDM methods viewed by some persons as inhumane would be employed by WS under this alternative. These methods would include shooting, trapping, toxicants/chemicals, and snares. Despite SOPs and state trapping regulations designed to maximize humaneness, the perceived stress and trauma associated with being held in a trap or snare until the WS employee arrives at the capture site to dispatch or release the animal, is unacceptable to some persons. Other MDM methods used to remove target animals including shooting and body-gripping traps (i.e., Conibear) result in a relatively humane death because the animals die instantly or within seconds to a few minutes. These methods however, are also considered inhumane by some individuals.

WS has improved the selectivity and humaneness of management techniques through research and development. 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 MDM methods are used in situations where non-lethal damage management methods are not practical or effective. No indirect or cumulative adverse impacts were identified for this issue.

4.4.2 Alternative 2: Non-lethal Mammal Damage Management Only by WS

The issues of humaneness of methods under this alternative are likely to be perceived to be similar to humaneness issues discussed under the proposed action. This perceived similarity is derived from WS' recommendation of methods that some 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.

Direct, Indirect, and Cumulative Effects:
WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target mammal species and to ensure methods are 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 pain and suffering are likely to be regarded as greater than those discussed in the proposed action.

4.4.3 Alternative 3: No Federal WS Mammal Damage Management

Under this alternative, WS would have no involvement in any aspect of mammal damage management in Maryland. Those persons 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 general public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

Direct, Indirect, and Cumulative Effects:
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 general public to use to resolve damage and threats caused by mammals.

SUMMARY

No significant cumulative environmental impacts are expected from any of the three Alternatives. Under the Proposed Action, the lethal removal of mammals by WS would not have significant impacts on overall native mammal populations in Maryland, but some short-term local reductions may occur. Some efforts to reduce damage caused by non-native species could result in elimination of the species from local areas or the state (e.g., feral swine). No risk to public safety is expected when WS' programs are provided and accepted by requesting individuals in Alternative 1 since only trained and experienced wildlife biologists/specialists would conduct and recommend MDM activities. There is a slight increased risk to public safety when persons who reject WS assistance and recommendations in Alternatives 1 and 2 conduct their own MDM activities, and when no WS assistance is provided in Alternative 3. In all three Alternatives, however, the increase in risk would not be to the point that the impacts would be significant. Although some persons will likely be opposed to WS's participation in MDM activities on public and private lands within Maryland, the analysis in this EA indicates that WS Integrated MDM program will not result in significant cumulative adverse impacts on the quality of the human environment. Table 4.15 summarizes the expected impact of each of the alternatives on each of the issues.

Table 4.15 Summary of Potential Impacts.

Issue	Alternative 1 Integrated Mammal Damage Management Program (Proposed Action/No Action)	Alternative 2 Non-lethal MDM Only by WS	Alternative 3 No Federal WS MDM Program
1. Target Mammal Species Effects	Low effect - reductions in local target mammal numbers; would not significantly affect local or state native populations.	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel variable but likely would not significantly affect local or state populations.	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel variable but likely would not significantly affect local or state populations.
2. Effects on Other Wildlife Species, Including T&E Species	Low effect - methods used by WS would be highly selective with very little risk to non-target species. WS would provide operational assistance with T&E species protection.	Low effect - methods used by WS would be highly selective with very little risk to non-target species. WS only able to provide limited operational assistance with T&E species protection.	No effect by WS. Impacts by non-WS personnel would be variable. WS would not provide operational assistance with T&E species protection.
3. Human Health and Safety Effects	The proposed action has the greatest potential of successfully reducing this risk. Low risk from methods used by WS.	Low risk of injuries from methods used by WS. WS less likely to resolve risks associated with animals than with Alt 1. Efforts by non-WS personnel to use lethal MDM techniques could result in less experienced persons implementing control methods, a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.

4. Humaneness and Animal Welfare Concerns of Methods Used	Impact by WS low to moderate effect - methods viewed by some people as inhumane would be used by WS.	Impact by WS Lower effect than Alt 1 since only non-lethal methods would be used by WS. Impacts by non-WS personnel would be variable.	No effect by WS. Impacts by non-WS personnel would be variable.

APPENDIX A

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APPENDIX B

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APPENDIX C

MAMMAL DAMAGE MANAGEMENT METHODS

Resource owners and government agencies use a variety of techniques as part of integrated mammal damage management programs. All lethal and non-lethal methods have limitations based on costs, logistics, practicality, or effectiveness. There are also regulatory constraints on the availability and use of some MDM techniques. Mammal damage management methods currently available to the Maryland WS program are described here. If other methods are proven effective and legal to use in Maryland, they could be incorporated into the Maryland WS program, pursuant to permits, other authorizations, agreements with landowners, NEPA compliance, and applicable laws, regulations, and policies.

Wildlife Services MDM efforts are not intended to reduce overall native mammal populations in the state or region although in some instances, reduction of local population densities may be conducted to address site specific damage problems. However, projects to address problems with non-native species such as feral hogs may be intended to reduce or eliminate the local, regional (within state), or state populations of these species. Depending upon the alternative selected, the specific control methods and techniques that could be used are as follows:

NON-LETHAL METHODS (NON-CHEMICAL)

Cultural Methods and Habitat Management includes the application of practices which 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 to deter animals from entering a protected area, removal of trees from around buildings to reduce access by squirrels and raccoons, or planting lure crops on fringes of protected crops. Some mammals which 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. Making trash, bird food, and garbage unavailable and removing all pet food from outside during nighttime hours can reduce the presence of skunks, raccoons, and opossums when they become a problem. If tree squirrels are damaging property or causing a nuisance, care in preventing them from obtaining bird seed left in bird feeders can often greatly reduce their presence. This may mean hanging bird feeders by thin wire from tree limbs, or constructing mounting poles which cannot be climbed by these animals.

Other habitat management strategies may include physical manipulation of the natural environment. As an example, continual destruction of beaver dams and removal of dam construction materials on a daily basis will sometimes cause beavers to move to other locations, although this strategy can be far more expensive than removing beavers in conjunction with dam removal. 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. Use of these devices is very limited among private landowners. Such methods have variable results and rarely provide acceptable levels of control unless used in an integrated program with other strategies.

In general, WS involvement in cultural methods and habitat management is limited to technical assistance (advice). Implementation of the methods and associated legal requirements are the responsibility of the landowner/manager. When WS makes habitat management recommendations, WS advises landowners/managers that they are responsible for compliance with all applicable state federal and local regulations including the ESA.

Animal Behavior Modification. This refers to tactics that deter or repel damaging mammals and thus, reduce damage to the protected resource. These 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 (e.g., flashing lights). Unfortunately many of these techniques are only effective for a short time before animals habituate (i.e., learn there is not a real threat; Conover 1982). The position of such frightening devices should be changed frequently because over a period of time, animals usually become used to scare devices (Pfiefer and Goos 1982). Using motion activated systems instead of systems which are activated on regular intervals may also extend the effective period for a frightening devices. Some devices used to modify behavior in mammals may include:

- Electronic guards (siren/strobe-light devices)
- Propane exploders
- Pyrotechnics
- Laser lights
- Human effigies

Wildlife Exclusion (physical exclusion) pertains to preventing access to resources through fencing or other barriers. Fencing of small critical areas can sometimes prevent animals which cannot climb from entering areas of protected resources. Fencing of culverts, drain pipes, and other water control structures like that used with a Beaver Deceiver™ can sometimes prevent beavers from building dams which plug these devices. In those applications, however, consideration must be given for water flow so that the fence does not act to catch and hold water-borne debris. Fencing, especially if it is installed with an underground skirt, can prevent access to areas for many mammal species which dig, including coyotes, foxes, woodchucks, beaver, and muskrat. 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 or levies at times, especially to deter muskrat, woodchucks, and other burrowing rodents. Electrical water barriers have proven effective in limited situations for beaver; an electrical field through the water in a ditch or other narrow channel, or hot-wire suspended just above the water level in areas protected from public access, have been effective at keeping beaver out. The effectiveness of an electrical barrier is extended when used in conjunction with an odor or taste cue that is emitted because beaver will avoid the area even if the electrical field is discontinued (Kolz and Johnson 1997). Similarly, electric fences of various constructions have been used effectively to reduce damage to various crops by raccoons, bears and other species (Boggess 1994).

Electric Fencing and Maintenance

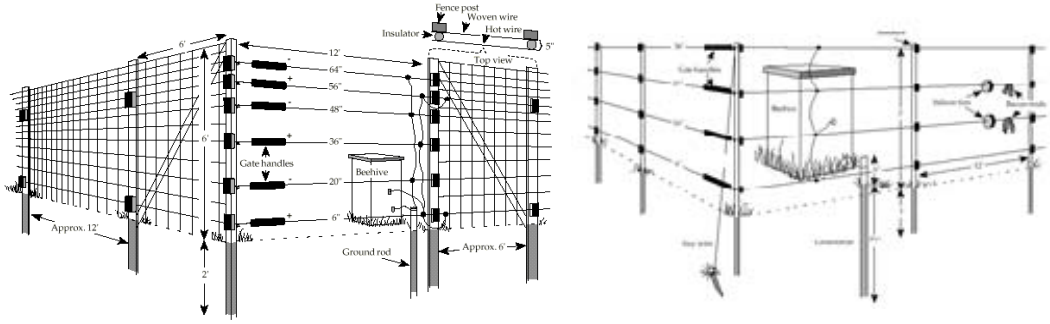
Electric fencing has proven effective in deterring a wide variety of mammal species. Electric fencing has also been effective in reducing crop damage from deer and also discouraging raccoons from gardens. Fencing, however, can be an expensive abatement measure. When developing a damage prevention program, consideration is given to the extent, duration, and expense of damage in relation to the expense

of using fencing. Numerous fence designs have been used with varying degrees of success. Electric fence chargers increase effectiveness.

To energize the fences, a 110-volt outlet or 12-volt deep cell (marine) battery is connected to a high-output fence charger. The fence charger and battery should be protected against weather and theft. Warning signs should be used to protect human safety. Electric fences must deliver an effective shock to repel the mammal that is interested in a particular resource. Animals can be lured into licking or sniffing the wire by attaching attractants to the fence, such as peanut butter, which is effective in attracting such species as deer, and raccoons.

Fence voltage should be checked each week at a distance from the fence charger; it should yield at least 3,000 volts. To protect against voltage loss, the battery and fence charger should be kept dry and their connections free of corrosion. Make certain all connections are secure and check for faulty insulators (arcing between wire and post). Also clip vegetation beneath the fence. Each month, check the fence tension and replace baits or lures as necessary. Always recharge the batteries during the day so that the fence is energized at night.

Below are two common examples of electric fences used for bears. Electric fences for other species would be very similar with their overall height and wire spacing varying depending on the species that is causing the conflict.



(Figure C-1)

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 the noise associated with the discharge of a firearm.

The success of frightening methods depends on an animal's fear of, and subsequent aversion to, offensive stimuli (Shivak and Martin 2001). A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. Over time, animals often habituate to commonly used scare tactics and ignore them (Dolbeer et al. 1986, Graves and Andelt 1987, Bomford 1990). In addition, in many cases, animals frightened from one location become a problem at another. Scaring devices, for the most part, are directed at specific target species and operated by private individuals or personnel of the Maryland WS working in the field. However, several of these devices, such as scarecrows and propane exploders, are automated.

Harassment and other methods to frighten animals are probably the oldest methods of combating wildlife damage. These devices may be either auditory or visual and provide short-term relief from damage. A number of sophisticated techniques have been developed to scare or harass wildlife from an area. The use of noise-making devices (*e.g*., electronic distress sounds, alarm calls, propane cannons, and pyrotechnics) is the most popular. Other methods include harassment with visual stimuli (*e.g*., flashing or bright lights, scarecrows, human effigies, balloons, Mylar tape, and wind socks), vehicles, or people. Some methods such as the Electronic Guard use a combination of stimuli (siren and strobe light). These are used to frighten predators from the immediate vicinity of the damage prone area. As with other damage management efforts, these techniques tend to be more effective when used collectively in a varied regime rather than individually. However, the continued success of these methods frequently requires reinforcement by limited shooting or other local population reduction methods.

Other frightening methods in use are rubber bullets and beanbags that are shot from shotguns. Rubber bullets and beanbags do not kill or pass through an animal, but are intended to hurt them enough to avoid a particular activity again. Rubber bullets and beanbags have been used mostly for nuisance predators (*e.g*., raccoons in garbage cans). When a predator associates being shot with raiding a garbage can or other nuisance activity, it is hoped that they will avoid that activity in the future.

Relocation of damaging mammals to other areas following live capture generally would not be biologically effective, or cost-effective. Relocation to other areas following live capture would not generally be effective because problem species are highly mobile and can easily return to damage sites from considerable distances, habitats in other areas are generally already occupied, and relocation would most likely result in similar damage problems at the new location. Relocated animals can have poor survival rates at the new site (Rosatte and MacInnes 1989, Wright 1978, Frampton and Webb 1974) although careful timing of relocation and selection of release site can markedly improve survival rates (Griffith et al. 1989). Relocating animals also runs the risk of spreading parasites and diseases to previously uninfected areas. For example, the spread of raccoon variant of rabies in the eastern U.S. was likely unintentionally accelerated through the translocation of infected raccoons (Krebs et al. 1999). Translocation of wildlife is discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions for the relocation of damaging mammals that might be a viable solution, such as when the mammals are considered to have high value such as T&E species. Under the right conditions, relocating wildlife can be a viable and effective wildlife management technique (Craven et al. 1998). Maryland WS would only relocate wildlife at the direction of and only after consulting with the USFWS and/or MDNR to coordinate capture, transportation, and selection of suitable relocation sites, as well as compliance with all proper guidelines.

Animal Capture Devices. WS specialists can use a variety of devices to capture mammals. For reasons discussed above under "Relocation", small to medium sized mammals captured are usually killed via gunshot, cervical dislocation, or one of the chemical euthanasia methods listed below. However there are occasions where captured animals are relocated, or, in the case of some disease surveillance projects, may be released on site.

Bow nets are small circular net traps used for small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is often set over a food source and it is triggered by an observer using a pull cord or remote controlled electronic switch.

Cable restraints are traps made of light cable with a locking device, and are used to catch small and medium sized mammals. The cable is placed in the path of an animal in the form of a loop. When the target species walks into the cable restraint, the loop becomes smaller in size, holding the animal as if it were on a leash. When used as a live capture device, cable restraints are equipped with integrated stops that permit tightening, but do not choke the animal.

Cage traps are live capture devices used to catch a variety of small to medium sized mammals. Cage traps come in a variety of sizes and are generally made of galvanized wire mesh, and consist of a treadle inside the cage that triggers the door to close behind the animal being captured. Cage traps can range from the extremely small, intended for the capture of rodents and other small mammals to the large corral/panel traps fitted with a routing or saloon style repeating door, used to live-capture feral hogs.

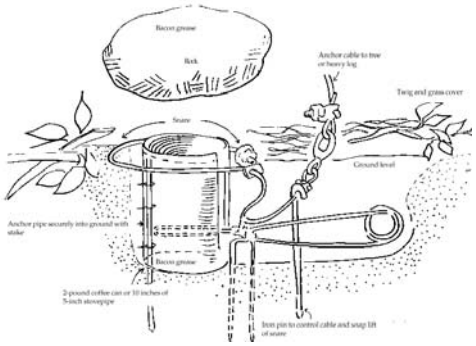
Beaver live traps include the Hancock traps (suitcase/basket type cage traps) and commercially produced traps designed to live-capture beaver. The Hancock trap is constructed of a metal frame covered in chain-link fence that is hinged with springs. Trap appearance is similar to a large suitcase when closed. Other traps are constructed of steel and placed in running water or on the edge where a beaver may swim into it. When set, the trap is opened to allow an animal to enter, and when tripped the sides close around the animal.

Catch poles consist of a long pole with a cable noose at one end. The noose end is typically encased in plastic tubing. Catch poles can be used to safely catch and restrain animals such as feral dogs and raccoons.

Colony traps are multi-catch traps used to either live-capture or drown muskrats. There are various types of colony traps. One common type of colony trap consists of a cylindrical tube of wire mesh with a one-way door on each end (Novak et al. 1987). Colony traps are set at entrances to muskrat burrows or placed in muskrat travel lanes.

Foothold traps are devices that come in a variety of sizes that allows the traps to be species specific to some degree. Depending on the circumstances, pan-tension devices, trap placement and lure selection can also be used to reduce risks to non-target species. These traps can be set on land or in water. They are made of steel with springs that close the jaws of the trap around the foot (and sometimes the leg) of the target species. These traps may have offset steel or padded jaws, which hold the animal. Newer modifications commonly referred at “dog proof” or “species specific” traps have been designed to reduce the chance of non-target captures. There are a variety of different designs commercially available, but the general design consists of 1-2 inch steel tubing (cylinder or square). There is a trigger at the closed end of the tubing attached to a spring. The trigger must be pushed or pulled when an animal grasp it and a leveraged bar is released by the spring holding the animals arm/paw in place. Because of the size of the opening and trigger mechanism it is extremely difficult for a canine to trigger the trap. This type of trap is commonly used for raccoons. Non-target animals would be released unharmed.

Foot snares are spring activated (i.e., Aldrich-type) foot snares (Figure C-3) that would be used in situations that preclude the use of culvert traps. Foot snares are a safe and effective capture device when properly set and inspected (Miller et al 1973, Johnson and Pelton 1980).



(Figure C-2)

Hand nets are used to catch small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles.

Net guns are devices that project a net over a target animal using a specialized gun.

Cannon / Rocket Nets: Cannon or rocket netting involves setting bait in an area that would be completely contained within the dimensions of a manually propelled net. The launching of the rocket net occurs too quickly for the animals to escape. Rocket netting is normally used for birds and larger mammal species such as deer but can be used to capture other mammal species.

Sherman box traps are small live traps used to capture small mammals such as rodents. These traps are often made of galvanized steel or aluminum and fold up for easy transport. Sherman box traps also consist of a treadle towards the back of the trap that triggers the door to close behind the animal being captured.

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 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.

Aerial Surveying is a commonly used tool for evaluating and monitoring damage and establishing population estimates and locations of various species of wildlife. The WS uses aerial surveying

throughout the United States to monitor damages and/or populations of coyotes, fox, wolves, feral swine, feral goats, feral dogs, bobcats, mountain lions, white-tailed deer, pronghorn antelope, elk, big-horn sheep, and wild horses but any wildlife species big enough to see from a moving aircraft could be surveyed using this method. As with aerial shooting, the WS program aircraft-use policy helps ensure that aerial surveys are conducted in a safe and environmentally sound manner, in accordance with federal and state laws. Pilots and aircraft must also be certified under established WS program procedures and policies.

Tracking Dogs or trailing dogs are commonly used to track and "*tree*" target wildlife species, such as mountain lions, bobcats, and raccoons. Although not as common, they sometimes are trained to track coyotes (Rowley and Rowley 1987, Coolahan 1990). Dogs commonly used are different breeds of hounds, such as blue tick, red-bone, and Walker. They become familiar with the scent of the animal they are to track and follow, and the dogs strike (howl) when they detect the scent. Tracking dogs are trained not to follow the scent of non-target species. Personnel of the Maryland WS typically find the track of the target species at fresh kills or drive through the area of a kill site until the dogs strike. Personnel would then put their dogs on the tracks of the target predator. Typically, if the track is not too old, the dogs can follow the trail and tree the animal. The animal usually seeks refuge up a tree, in a thicket on the ground, on rocks or a cliff, or in a hole. The dogs stay with the animal until personnel arrive and dispatch, tranquilize, or release the animal, depending on the situation. A possibility exists that dogs could switch to a fresher trail of a non-target species while pursuing the target species. This could occur with any animal that they have been trained to follow, and could occur with an animal that is similar to the target species. For example, dogs on the trail of a mountain lion could switch to a bobcat, if they cross a fresher track. With this said, this risk can be minimized greatly by the personnel of the Maryland WS looking at the track prior to releasing the dogs and calling them off a track if it is determined that they have switched tracks.

NON-LETHAL METHODS (CHEMICAL)

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calm 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.

Telazol (tiletamine) is another anesthetic used in wildlife capture. It is 2.5 to 5 times more potent than ketamine; therefore, it generally works faster and lasts longer. Currently, tiletamine can only be purchased as Telazol, which is a mixture of two drugs: tiletamine and zolazepam (a tranquilizer). Muscle tension varies with species. Telezol produces extensive muscle tension in dogs, but produces a more relaxed anesthesia in coyotes, wolves, and bears. It is often the drug of choice for these wild species (Fowler and Miller 1999).

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 are 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.

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. Many repellents are commercially available for mammals, and are registered primarily for herbivores such as rodents and deer. Repellents are not available for many species which may present damage problems, such as some predators or furbearing species. Repellents are variably effective and depend to a great extent on the resource to be protected, time and length of application, and sensitivity of the species causing damage. Acceptable levels of damage control are usually not realized unless repellents are used in conjunction with other techniques, as part of an integrated damage management program. In Maryland, repellents must be registered with Maryland Department of Agriculture.

GonaCon™ is a single-shot immunocontraceptive that has shown great promise in pen and field tests for reducing fertility in white-tailed deer for up to five years without a booster vaccine. The vaccine prevents eggs from being released from the ovaries, eliminating estrus and some behaviors associated with the breeding period "or rut". The tool is limited by the need to capture and inject each animal.

LETHAL METHODS (NON-CHEMICAL)

For reasons discussed above under "Relocation", animals captured using the non-lethal capture methods are usually killed via gunshot, cervical dislocation, or one of the chemical euthanasia methods listed below. Other lethal mechanical methods are:

Body Gripping (Conibear) Traps are steel framed devices used to capture and quickly kill mammals, especially aquatic species. These traps come in a variety of sizes and may be used on land or in the water depending on trap size and state and local laws. The traps are made of two steel square frames that are hinged on two sides and have one or two springs.

Cervical Dislocation is sometimes used to euthanize small rodents which are captured in live traps and when relocation is not a feasible option. The animal is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. When done properly, the AVMA approves this technique as humane method of euthanasia and states that cervical dislocation is a humane technique for euthanasia of small rodents (Beaver et al. 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Beaver et al. 2001).

Shooting is selective for target species and may involve the use of spotlights, night vision, or thermal imagery. A handgun, shotgun or rifle may be utilized. Shooting is an effective method to remove a target number of mammals in damage situations. Removal of specific animals in the problem area can oftentimes provide immediate relief from a problem. Shooting is sometimes utilized as one of the first lethal damage management options because it offers the potential of resolving a problem more efficiently and selectively than some other methods. Shooting may sometimes be one of the only damage management options available if other factors preclude setting of damage management equipment. Firearm use may be a public concern because of issues relating to safety and misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a

refresher course annually thereafter (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are required to meet criteria contained in the Lautenberg Amendment which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. WS activities where shooting is used include, but are not limited to, take of mammals in damage situations pursuant to MDNR authorization.

Snap traps are used to remove small rodents. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area. These traps pose no imminent danger to pets or the public. Snap traps are a commonly used to survey small rodent populations, such as mice and voles.

Sport Hunting/Trapping is sometimes recommended by WS as a viable damage management method when the target species can be legally hunted and/or trapped, and activities can meet site security and safety objectives. A valid hunting or trapping license and other licenses or permits may be required by the MDNR. This method provides sport, income and/or food for hunters/trappers and requires no cost to the landowner. Sport hunting/trapping is occasionally recommended if it can be conducted safely for coyotes, feral hogs, deer and other damage causing mammals.

LETHAL METHODS (CHEMICAL)

All chemicals used by WS are registered as required by US Department of Justice Drug Enforcement Administration (DEA) and MDA. WS personnel that use restricted-use chemical methods are WS certified and are required to adhere to all certification requirements set forth in FIFRA and Maryland pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

Potassium chloride, a common laboratory chemical, is injected by WS personnel as a euthanizing agent after an animal has been anesthetized.

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. 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 and trained WS personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

Zinc Phosphide is a toxicant used to kill rodents, lagomorphs and nutria. It 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 (Hill and Carpenter 1983, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, and Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in 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 prairie dog tissue (Johnson and Fagerstone 1994).

Use of zinc phosphide on various types of fruit, vegetable, or cereal baits (e.g., apples, carrots, sweet potatoes, oats, and barley) has proven to be effective at suppressing nutria populations. All chemicals used by WS are registered under MDA and administered by DEA. Zinc phosphide is federally registered for use by APHIS/WS. Specific bait applications are designed to minimize non-target hazards (Evans

1970). WS personnel that use chemical methods are certified as pesticide applicators by MDA and are required to adhere to all certification requirements and pesticide control laws and regulations set forth by MDA. No chemicals are used on federal or private lands without authorization from the land management agency or property owner/manager.

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 (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 zinc phosphide grain bait consumption or, for scavenging bird species, from eating poisoned. 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. They determined that no differences were observed from pretreatment until after treatment in populations of eastern cottontail rabbits (*Sylvilagus floridanus*) and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by non-target wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (*Peromyscus maniculatus*) 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.

Ramey et al. (2000) reported that five weeks after treatment, no ring-necked pheasants (*Phasianus colchicus*) had been killed as a result 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) poison 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 have also been reported by Tietjen and Matschke (1982). Deisch et al. (1989) reported on the effect zinc phosphide has on invertebrates. They 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 (Desich 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect population's 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).

Gas Cartridges are incendiary devices composed of carbon and sodium nitrate. When ignited and placed in the target animal's burrow, the resultant carbon monoxide and other gases cause asphyxiation. WS

will not use gas cartridges in areas where State and Federally listed species may be in burrows with the target animal

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 the Maryland WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Anticoagulant Rodent Baits could be used in bait stations in and around airport structures. The use and proper placement of bait stations and will minimize the likelihood that the bait will be consumed by non-target species. There may also be secondary hazards from anticoagulant baits. These risks are reduced somewhat by the fact that the predator scavenger species will usually need exposure to multiple carcasses over a period of days. Areas where anticoagulants are used will be monitored and carcasses picked up and disposed of in accordance with label directions. Risks to scavengers are also minimized by continual efforts to reduce overall wildlife activity at the airport. As already stated, WS would consult with MDNR before applying rodenticides at airports in order to confirm that no state-listed threatened or endangered rodents would be harmed in the process.

APPENDIX D

SPECIES LISTED BY THE U.S. FISH AND WILDLIFE SERVICE[1]

[1]List obtained from
http://ecos.fws.gov/tess_public/reports/species-listed-by-state-report?state=MD&status=listed

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.

Summary of Animals listings:

Status	Species/Listing Name
E	Amphipod, Hay's Spring Entire (*Stygobromus hayi*)
E	Bat, Indiana Entire (*Myotis sodalis*)
E	Darter, Maryland Entire (*Etheostoma sellare*)
T	Knot, red (*Calidris canutus rufa*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
T	Sea turtle, green Except where endangered (*Chelonia mydas*)
E	Sea turtle, hawksbill Entire (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley Entire (*Lepidochelys kempii*)
E	Sea turtle, leatherback Entire (*Dermochelys coriacea*)
E	Squirrel, Delmarva Peninsula fox Entire, except Sussex Co., DE (*Sciurus niger cinereus*)
E	Sturgeon, shortnose Entire (*Acipenser brevirostrum*)
T	Tiger beetle, Northeastern beach Entire (*Cicindela dorsalis dorsalis*)
T	Tiger beetle, Puritan Entire (*Cicindela puritana*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf Entire (*Alasmidonta heterodon*)
E	Whale, finback Entire (*Balaenoptera physalus*)
E	Whale, humpback Entire (*Megaptera novaeangliae*)
E	Whale, North Atlantic Right Entire (*Eubalaena glacialis*)

Chapter 1 Plants -- 6 listings

Status	Species/Listing Name
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)

Status	Species/Listing Name
E	Dropwort, Canby's (*Oxypolis canbyi*)
E	Gerardia, sandplain (*Agalinis acuta*)
E	Harperella (*Ptilimnium nodosum*)
T	Joint-vetch, Sensitive (*Aeschynomene virginica*)
T	Pink, swamp (*Helonias bullata*)

APPENDIX E

MARYLAND'S ENDANGERED ANIMALS
Maryland Department of Natural Resources
Wildlife and Heritage Division

Planarians		
Hoffmaster's Cave planarian	***Macrocotyla hoffmasteri***	**Endangered**
A planarian	***Procotyla typhlops***	**Endangered**
Mollusks		
Dwarf wedge mussel	***Alasmidonta heterodon***	**Endangered**
Triangle floater	***Alasmidonta undulate***	**Endangered**
Brook floater	***Alasmidonta varicosa***	**Endangered**
Blue ridge spring snail	***Fontigens orolibas***	**Endangered**
Green floater	***Lasmigona subviridis***	**Endangered**
Crustaceans		
Franz's cave isopod	***Caecidontea franzi***	**Endangered**
Maus' isopod	***Caecidontea mausi***	**Endangered**
Dearolf's cave amphipod	***Crangonyx dearolfi***	**Endangered**
Biggers' cave amphipod	***Stygobromus biggersi***	**Endangered**
Greenbrier cave amphipod	***Stygobromus emarginatus***	**Endangered**
Shenandoah cave amphipod	***Stygobromus gracilipes***	**Endangered**
Rock creek groundwater amphipod	***Stygobromus kenki***	**Endangered**
A groundwater amphipod	***Stygobromus sextarius***	**Endangered**
Insects		
Superb jewelwing	***Caloperyx amata***	**Threatened**
Selys' sunfly	***Helocordulia selysii***	**Threatened**
White corporal	***Ladona exusta***	**Endangered**
Elfin skimmer	***Nannothemis bella***	**Endangered**
Appalachian snaketail	***Ophigomphus incuratus uncuratus***	**Endangered**
Spatterdock darner	***Rhionaeschna mutate***	**Endangered**
Treetop emerald	***Somatochlora provocans***	**Endangered**
Eastern sedge barrens planthopper	***Limotettix minuendus***	**Endangered**
Tiger beetle	***Cicindela abdominalis***	**Endangered**
Tiger beetle	***Cicindela ancocisconensis***	**Endangered**
Northeastern beach tiger beetle	***Cicindela dorsalis dorsalis***	**Endangered**
White tiger beetle	***Cicindela dorsalis media***	**Endangered**
Little white tiger beetle	***Cicindela lepida***	**Endangered**
Green-patterned tiger beetle	***Cicindela patruela***	**Endangered**
Puritan tiger beetle	***Cicindela puritana***	**Endangered**
Six-banded longhorn beetle	***Dryobius sexnotatus***	**Endangered**
Tenebrionid beetle	***Helops cisteloides***	**Endangered**
Seth forest water scavenger beetle	***Hydrochus spangleri***	**Endangered**
Tenebrionid beetle	***Schoenicus puberulus***	**Endangered**
Great purple hairstreak	***Atlides halesus***	**Threatened**

Northern metalmark	***Calephelis borealis***	**Threatened**
Frosted elfin	***Callophrys irus***	**Endangered**
Hoary elfin	***Callophrys polios***	**Endangered**
Harris' checkerspot	***Chlosyne harrisii***	**Threatened**
Easrly hairstreak	***Erora laeta***	**Endangered**
Mottled duskywing	***Ernnis martialis***	**Endangered**

Two-spotted skipper	***Euphyes bimacula***	**Endangered**
Bog copper	***Lycaena epixanthe***	**Endangered**
Compton tortoiseshell	***Nymphalis vau-album***	**Endangered**
Palamedes swallowtail	***Papilio palamedes***	**Endangered**
Chermock's mulberry wing	***Poanes Massasoit chermocki***	**Endangered**
Rare skipper	***Problema bulenta***	**Threatened**
Grizzled skipper	***Pyrgus Wyandot***	**Endangered**
Hickory hairstreak	***Satyrium caryaevorus***	**Endangered**
Edwards' hairstreak	***Satyrium edwardsii***	**Endangered**
Northern oak hairstreak	***Satyrium favonius ontario***	**Endangered**
King's hairstreak	***Satyrium kingi***	**Endangered**
Atlantis fritillary	***Speyeria atlantis***	**Threatened**
Fish		
Shortnose sturgeon	***Acipenser brevirostrum***	**Endangered**
Flier	***Centrarchus macropterus***	**Threatened**
Blackbanded sunfish	***Enneacanthus chaetodon***	**Endangered**
Maryland darter	***Etheostoma sellare***	**Endangered**
Glassy darter	***Etheostoma vitreum***	**Threatened**
American brook lamprey	***Lampetra appendix***	**Threatened**
Pearl dace	***Margariscus margarita***	**Threatened**
Comely shiner	***Notropis amoenus***	**Threatened**
Ironcolor shiner	***Notropis chalybaeus***	**Endangered**
Stonecat	***Noturus flavus***	**Endangered**
Logperch	***Percina caprodes***	**Threatened**
Stripeback darter	***Percina notogramma***	**Endangered**
Amphibians		
Eastern tiger salamander	***Ambystoma tigrinum***	**Endangered**
Green salamander	***Aneides aeneus***	**Endangered**
Eastern hellbender	***Cryptobranchus alleganiensis***	**Endangered**
Eastern narrow-mouthed toad	***Gastrophryne carolinensis***	**Endangered**
Barking treefrog	***Hyla gratiosa***	**Endangered**
Mountain chorus frog	***Pseudacris brachyphona***	**Endangered**
Reptiles		
Loggerhead sea turtle	***Caretta caretta***	**Threatened**
Green sea turtle	***Chelonian mydas***	**Threatened**
Leatherback sea turtle	***Dermochelys coriacea***	**Endangered**
Atlantic hawksbill sea turtle	***Eretmochelys imbricata***	**Endangered**
Northern coal skink	***Eumeces anthracinus***	**Endangered**
Rainbow snake	***Farancia ertrogramma***	**Endangered**
Bog turtle	***Glyptemys muhlenbergii***	**Threatened**
Northern map turtle	***Graptemys geographica***	**Endangered**
Kemp's ridley sea turtle	***Lepidochelys kempii***	**Endangered**
Mountain earthsnake	***Virginia valeriae pulchra***	**Endangered**
Birds		
Northern goshawk	***Accipiter gentilis***	**Endangered**
Henslow's sparrow	***Ammodramus henslowii***	**Threatened**
Short-eared owl	***Asio flammeus***	**Endangered**
Upland sandpiper	***Bartramia longicauda***	**Endangered**
Piping plover	***Charadrius melodus***	**Endangered**
Wilson's plover	***Charadrius wilsonia***	**Endangered**

Sedge wren	***Cistothorus platensis***	**Endangered**

Olive-sided flycatcher	***Contopus cooperi***	**Endangered**
Blackburnian warbler	***Dendroica fusca***	**Threatened**
Gull-billed tern	***Gelochelidon nilotica***	**Endangered**
Loggerhead shrike	***Lanius ludovicianus***	**Endangered**
Black rail	***Laterallus jamaicensis***	**Endangered**
Swainson's warbler	***Limnothlypis swainsonii***	**Endangered**
Mourning warbler	***Oporornis philadelphia***	**Endangered**
Black skimmer	***Rynchops niger***	**Endangered**
Least tern	***Sternula antillarum***	**Threatened**
Royal tern	***Thalasseus maximus***	**Endangered**
Bewick's wren	***Thryomanes bewickii***	**Endangered**
Mammals		
Sei whale	***Balaenoptera borealis***	**Endangered**
Blue whale	***Balaenoptera musculus***	**Endangered**
Finback whale	***Balaenoptera physalus***	**Endangered**
Black right whale	***Eubalaeana glacialis***	**Endangered**
Humpback whale	***Megaptera novaeangliae***	**Endangered**
Southern rock vole	***Microtus chrotorrhinus carolinensis***	**Endangered**
Eastern small-footed bat	***Myotis leibii***	**Endangered**
Indiana bat	***Myotis sodalist***	**Endangered**
Allegheny woodrat	***Meotoma magister***	**Endangered**
Sperm whale	***Physeter macrocephalus***	**Endangered**
Delmarva fox squirrel	***Sciurus niger cinereus***	**Endangered**
Southern water shrew	***Sorex palustris punctulatus***	**Endangered**